

Online Publication Date: 9 December, 2011

Publisher: Asian Economic and Social Society

International Journal of
Asian Social Sciences



Patent and research exemption: Challenges for research capacity and utilization in universities, research institutions and industry in Botswana

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Citation: Njoku O. Ama, Charles M. Fombad (2011): “ Patent and research exemption: Challenges for research capacity and utilization in universities, research institutions and industry in Botswana” International Journal of Asian Social Science, Vol.1, No.5,pp. 157-180.



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Abstract

This study examined the opinions of a stratified sample of 366 researchers drawn from universities, research institutions and industries in Botswana on the challenges of patent and research exemptions on research capacity and utilization. The study found out the level of patent awareness and intellectual property awareness in the country generally is low (67%), while 69% of the researchers did not understand what the patent system is. Although 36% of the researchers were aware that they could conduct their researches or experiments on patented inventions without infringing on the rights of patentee to their inventions by invoking research exemptions, only 9 percent knew the procedure for invoking research exemption. Also, 77% were of the view that universities and research institutions should be granted research exemptions. The study further revealed that 8 percent of the researchers had applied for patent while 0.5% of the registered patentees in Botswana were locals. The most pressing challenge highlighted by researchers for inability to apply for patent was unawareness of conventions/laws governing patent practices. The study, therefore, recommends immediate knowledge-based interventions by Government of Botswana to create awareness among researchers and the entire population on Intellectual Property Rights within which the patent system falls. In addition, it is strongly recommended that legislation introducing an experimental use exemption should be introduced to encourage research and innovations.

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Brief Background on Botswana

Botswana is a landlocked country in Southern Africa and occupies an area of approximately 582, 000 square kilometres. It is bordered by Angola and Zambia in the north, Zimbabwe in the North East, South Africa in the East and South, and Namibia in the West. In addition, it touches Zambia at the confluence of the Zambezi and Chobe rivers in the extreme north. With a population of about 1.8 million (UN, 2007), its population density of 3.2 people per square kilometre is quite low. The growth rate of 2.4% is expected to drop significantly in the next few years mainly due to the high mortality impact of the HIV/AIDS pandemic.

Like most African countries, it inherited its legal system from the colonial era, but with the peculiar feature shared by a few countries in the Southern African region, such as South Africa, Lesotho and Swaziland, it combines elements of two distinct European legal traditions namely, the English Common law and the Roman-Dutch law, both of which form the basis of its legal system. The 1966 Constitution provides for an independent judiciary

and a recent study has shown that Botswana has one of the freest and most independent judiciaries in the region, if not on the continent. The legal system in general regulates and protects property rights of both citizens and foreigners, and there has, since independence been considerable efforts made through investor-friendly laws and economic policies to attract foreign investors. In the 2008 budget speech, the Minister of Finance however, noted that further administrative reforms on the part of Government to ease the regulatory burden and delays in the provision of services were necessary to sustain robust economic performance (Government of Botswana, 2008).

Research in Botswana is, however, guided by the Anthropological and /or Monuments and Relics Act. While development oriented research is a priority, in the interest of expanding knowledge in various fields, research of a more academic and theoretical nature is permitted wherever possible. Over the past three decades, there were 2,437 publications by researchers from Botswana (My Net Research, n.d). The country-level research productivity is rated medium. The research topics with the greatest number of

publications are in the areas of Geosciences, Multidisciplinary Ecology; Environmental Sciences; Water Resources and Veterinary Sciences. While most research collaboration has been at the local level, national researchers have collaborated with researchers from the USA, South Africa, England and Australia.

Botswana national research, science and technology plan

Botswana has a national research, science and technology plan (Republic of Botswana, 2005), which is informed by the need for a centre of excellence to earn a reputation as a significant resource for the progress of science and technology and the spread of innovation, a strong dependency on imported fuel such as oil and electricity, a resurgence of diseases, such as TB and increasing HIV-related infections, a wealth of untapped indigenous knowledge in traditional Botswana society, and importance of information and communication technology (ICT) as vital for the country's future as a pervasive enabler of industry and developmental solutions. The national development priorities and challenges include economic diversification, poverty and unemployment, HIV/AIDS and the sustainable use of natural resources (Republic of Botswana, 2003). The country has a narrow economic base dominated by minerals; high levels of unemployment which is estimated at 23.8% by the 2002/03 Household Income and Expenditure Survey (especially among young people), higher levels of poverty among women than men, and a declining but still high proportion of people living in poverty; high levels of HIV infection which is estimated at 17.1% (Central Statistics Office, 2004a), increasing mortality as a result of AIDS, declining life expectancy and the possible erosion of productivity, knowledge and skills (Central Statistics Office, 2004b); decline in species, the increasing importance of tourism, recurrent drought, as well as land degradation (Republic of Botswana, 1990a; Republic of Botswana, 1990b).

Table 1 summarises the key attributes of the current National System of Innovation in Botswana which include: low expenditure on R&D, low conversion of research outputs, limited involvement of the private sector, and few collaborative partnerships. There are also a number of positive development as can be seen from the table, namely, a relatively good publications output, and a highly qualified workforce a significant proportion of which is female (CSIR 2005). Only five patents were registered internationally between 1994 and 2004.¹

The Basis and Scope of Intellectual Property Law in Botswana

The main sources of Botswana IP law are however statutory law. Prior to 1996, the protection of industrial property rights (patents, trademarks and industrial designs) in Botswana was essentially by the extension of protection granted in the United Kingdom and South Africa (Department of Science and Technology, 2006). Owners of rights which were protected in these countries forwarded the certificates of grant and registration to Botswana's IP office and the Registrar would simply enter the details of the protected IPR in the respective registers. In 1996, Botswana enacted its first comprehensive legislation on the matter, the Industrial Property Act, 1996 as amended by the Industrial Property (Amendment) Act 1997. This Act deals with the protection of patents, trademarks, utility models and industrial designs. To implement this Act, the Industrial Property Regulations of 1997 was enacted. The Department of the Registrar of Companies, Business Names, Patents, Trademarks, Utility Models, and Industrial Designs which operates within the Ministry of Trade and Industry is responsible for implementing both the Act and the regulations. A 1965 Copyright Act, that had clearly become inadequate following Botswana's accession to the Berne Convention in 1998 was repealed and replaced by the Copyright and Neighbouring Rights Act 2000 (as amended by the Copyright and Neighbouring Rights (Amendment) Act, 2005). The Act deals with the protection of the rights of performers, broadcasters, producers and publishers. There were considerable delays with its implementation and it eventually became effective only from October 2006. Implementing regulations were introduced with the enactment of the Copyright and Neighbouring Rights Regulations, 2007.

Botswana' membership of treaties

There are a number of international treaties to which Botswana has signed. They include, the Paris Convention on Industrial Property (Paris Convention)¹ and becoming a member of the World Intellectual Property Organisation (WIPO), the Agreement on Trade Related Aspects of Intellectual

¹ Botswana acceded to this Convention on 15 January 1998 and its membership became effective on 15 April 1998.

Table 1: Key attributes of Botswana’s National System of Innovation

Attribute	Botswana	Benchmark
Gross expenditure on research and development (GERD)	0.43%	Minimum 1% for developing nations
Private sector contribution to GERD	3%	70% in Korea
Total number of researchers	2,165	
Researchers as a proportion of workforce	2.7 per 1000 workers	Singapore and UK 10 per 1000, Korea 8 per 1000.
% Female Researchers	29%	Poland 38%, South Africa 37%, Zambia 14%
% Researchers with MSc or PhD	48%	34% in South Africa
Publication equivalents per researcher	0.7	1.0 World standard
Patents	5 International patents in 10 years (1994-2004)	
Experimental Development as % of Total R&D	19%	60-65% for highly innovative Economies(See the OECD Compendium on S&T Indicators, available from ww.oecd.org) TP

Source (Republic of Botswana, 2005)

Patents

A patent is an exclusive right granted by the State for an invention that is new, involves an inventive step and is capable of industrial application². It gives the owner the exclusive right to prevent or stop others from making, using, offering for sale, selling or importing a product or a process based on the patented invention, without the owner’s prior permission. This exclusive right is granted to the creator of an invention in exchange of full disclosure of information about the invention. The invention involving an inventive step implies that the disclosed information should enable a person skilled in the same art to follow the steps as disclosed and be able to arrive at the same outcome achieved by the inventor.

A patent is protected for a period of twenty (20) years from the filing date, after which it falls into public

domain. The applicant for a patent can decide to withdraw the patent application before the grant of his/her patent, or a granted application may be abandoned as a result of non renewal of the annual maintenance fees. In either case, the patent immediately falls into public domain.

Only the inventor or person to whom he has assigned the right to the invention may apply for a patent (Section 10(1) of the Industrial Property Act 1996). Where two or more people have made the invention jointly, the right to the patent belongs to them jointly.(Sect 10(2) of Industrial Property Act 1996). Where however, two or more people made the invention independently of each other, the person whose application bears the earliest filing date or priority date has the right to the patent, unless the application was abandoned, withdrawn or was rejected by the Registrar.(Section 11(3) of Industrial Property Act 1996) Where the invention was made within the scope and in the course of the inventor’s employment, then in the absence of an agreement to the contrary, the right to the patent belongs to the employer (Section 11(4) of Industrial Property Act 1996). Nevertheless, an invention can be jointly owned in specified shares between an employee and

² For purposes of Article 27 of the TRIPS Agreement, the terms “inventive step” and “capable of industrial applications may be deemed by a Member to be synonymous with the terms “non-obvious” and “useful” respectively.

his employer where the invention is the result of both the personal contribution of the employee and the resources supplied by the employer. Generally, the right to a patent may be transferred by the inventor by cession, assignment, testamentary disposition or by operation of law (Section 12 of Industrial Property Act 1996).

Application, grant and maintenance of patents

The procedure for the application and grant of patents in Botswana is regulated by the 1996 Act as well as the Industrial Property Regulations 1997. An application for the grant of a patent must be made on specified forms together with the application fees at the Registrar of Patents, Marks and Designs. The specifications on the form include a description of the invention, one or more claims, drawings or formula where necessary for a clear understanding of the description and an abstract. These specifications are described in detail in section 13(1) of the Act.

There are three alternative routes through which an application for patent may be filed. These are the national, regional and international routes. The onus is on the inventor to decide which route to use to file an application and the scope of the coverage of the protection. After receiving the application, the Registrar must accord it a filing date once he is satisfied that the application contains:

- an express or implicit indication that the grant of a patent is sought;
- information which will enable the Registrar to establish the identity of the applicant, and
- information which, on the face of it, appears to be a description of the invention.³

After according a filing date, the Registrar examines the application to determine whether it complies with the requirements of section 13 (1) and (2) of the Act. The substantive examining authority for Botswana is the African Regional Industrial Property Organisation (ARIPO). After the examination, ARIPO submits a substantive examination report on which the Registrar bases his decision whether or not to reject the application.⁴ Where he grants a patent, the Registrar must issue a certificate of grant of patent

³ Section 21(1) of the 1996 Act. Subsections (2) to (5) deal with the situation where the information received is inadequate and the effect it has on the filing date.

⁴ ARIPO provides this service for free although the member countries pay membership fees. This means that Botswana applicants are not required to pay "search and examination fees" for now, although this may change once Botswana joins the Patent Cooperation Treaty (PCT). This explains why the fee paid for patent protection in Botswana is the lowest in the region.

and a copy of the patent to the applicant, record the said patent in the patent register and publish in the Journal, a reference to the grant of the patent. The Journal is the official publication of the Registrar of Patents, Marks and Designs through which the public is informed about applications for the registration of patents, designs and marks as well as about the grant and revocation of these IP rights.⁵ Notwithstanding how the application for patent is filed, the final decision to grant or not to grant a patent is made by the Registrar of Companies (Registrar/ROC) (Republic of Botswana, 2006).

Research exemptions to patent use

The goal of a research exemption is to enable fundamental and commercial research. Its scope, however, is unclear and there is no common standard. The research exemption, which implies that one can 'invent around' a patented technology, develop an improvement, gain additional knowledge or develop a completely different product, is one of the main justifications of the patent system. Experimenting, therefore, on the protected object is generally allowed, but under patent law there is a strict requirement that this is done for non-commercial purposes (IPR Helpdesk, 2006).

Article 8.1 of the TRIPS Agreement empowers member states in formulating or amending IP laws and regulations to adopt measures necessary to protect public health and nutrition, and to promote the public interest in sectors of vital importance to their socio-economic and technological development, provided that such measures are consistent with the provisions of this Agreement. Thus under this article, the onus will be on the state to consider that purpose of the patent and balance such protection against other values of the society, including the interests of education and research. It is important that the information generated under the patent process being both output and input into knowledge should be available for further experimentation and research in the interest of scientific and technological progress (Correa, 2004).

Article 30 of the TRIPS Agreement on exceptions to rights conferred to a patent, urges member states to "provide limited exceptions to the exclusive rights conferred by a patent, provided that such exceptions do not unreasonably conflict with a normal exploitation of the patent and do not unreasonably prejudice the legitimate interests of the patent owner, taking into account of the legitimate interests of the

⁵ Section 23 of the 1996 Act.

third parties". One of such "limited exceptions" is for third parties' use of the protected inventions for experimentation and research. This type of exception has been incorporated into many national laws regarding patents and other types of IPRs. For example, under section 24(3) (a)(iii) of the 1996 Industrial Property Act of Botswana Act, these exceptions are provided for in these terms:

"3(a) The rights under the patent shall not extend to...(iii) acts done only for experimental purposes relating to a patented invention..."

For the fact that experimentation or research are not enumerated exclusive rights of the patent owner, exercises involving them and for which it may be necessary to make or use patented product or process calls for exceptions. Such exceptions promote not only innovations but also encourage inventions and invalidation of wrongly granted patents.

As Kalyan and Nandan (2004) pointed out, while exclusivity in patent rights encourages invention and innovation by providing economic incentives, exemptions for research or experimental purposes encourage innovative improvement, testing and use of patented inventions. In invoking research exemptions, the legitimate interests of the two parties (the patent owner and the third parties) must be at stake. For the patent owner, it could be losing economic benefits whereas for the third parties it can be those of follow-on innovators, competitors, and users, as well as the interests of society at large, such as public health crisis or advancing science and technology.

The three-step test: Its application to research exception

A lot of researches in institutions are directed towards knowledge acquisition, do not have commercial intent and are therefore not of any direct competition with patent owners. Such researches do meet the limited character of the research exception. Research exceptions that allow researchers to make or use patented materials in laboratories and for the purpose of generating knowledge will normally be of shorter duration than the life span of a patent. It will normally not violate the first test.

Research exception also meets the conditions of the second criteria of Article 30 of the TRIPS Agreement. Even when the researches in the institutions are conducted on the patented invention, and because the researches are not commercial oriented, they do not unreasonably conflict with the

normal exploitation of the patent owner. The patent owner's rights to exclude others from certain commercial benefits of the products or process are not jeopardized.

The patent owner's legitimate interest is purely commercial. It does not include the power to control researches and as such there is no need to strike a balance between the patent owner's interests and that of the third parties. Research exception in this case is validated. Young scientists and innovators do not need to be prevented from using the pool of available knowledge generated by their predecessors' work to develop creative and inventive capacities. In a globalized world, considering the legitimate interests of the third parties would imply that there should be no geographical barriers in the utilization of available knowledge (Correa 2004).

Linking patents and research exemptions with universities, research institutions and industry in Botswana

In developed countries, concern over the effects patents are having on scientific innovation both in business and academic research circles have escalated in recent years because of factors such as increased pressure on public research organizations to patent inventions arising from their research, increased use of the patent system, and the increased propensity of patent owners to enforce their rights (Dent *et al* 2006). In the US, this originally occurred as a result of the Bayh-Dole Act 1980 which for the first time formally allowed universities and other institutions receiving federal research and development funding to patent inventions in order to promote technology transfer. Since then, there has been a tremendous growth in public-private research partnership. Firms, universities, and other publicly supported research institutions have aggressively pursued the issue of patenting and the acquisition of licensing to be able to acquire authority to be part of other inventions.

In Europe, academic patenting is seen as an important part of the larger phenomenon of university - industry technology transfer. In particular, patents are a key tool for protecting innovation in a number of science-based technologies, such as chemicals, pharmaceuticals, biotech, and many fields of electronics. Academic scientists contribute to these technologies both indirectly, by widening the science base, and directly, by producing inventions susceptible of industrial application, and therefore protected by patents. In recent years, many European countries and the EU have introduced many legislative changes and policy

initiatives aimed at pushing universities to take more patents out of their research, due to perceived problems in Europe and perceived advantages in US with respect to technology transfer via patenting (Gueña and Nesta, 2004; Walsh et al, 2005).

The African continent has also witnessed significant development in the area of IP. On 9th December 1976 some African countries, in Lusaka, Zambia, created ARIPO for the effective and continuous exchange of information and the harmonization and co-ordination of their laws, policies and activities in intellectual property matters, and the study and promotion of and co-operation in IP matters in collaboration with the Economic Commission for Africa, WIPO and other appropriate organisations. The membership of this body has grown to over 16 states (ARIPO, 2004). As we saw earlier, Botswana has become a member of many of these IP treaties and organisations, such as ARIPO and WIPO. As a result, it is obliged to implement the requirements of these treaties.

There are many research institutions, universities and industries in Botswana which over the years have been actively engaged in research. There has so far been no study undertaken to see whether any of the research has produced output that has or could have been patented. Nor is it clear to what extent, if any, the existing system of patents and research exemptions is impacting, negatively or positively, in the building of research capacity and innovations in the country. What is now clear is that with the looming recession, and the need to develop and promote local expertise and industry, the patent and research exemption system in place can play a crucial role.

Generally, the fact that patentees enjoy monopoly over their inventions under the patent laws will make it difficult for researchers in the developing countries to assist their governments through technological innovations and the transfer of knowledge. It is also very well known that most inventions and researches that are utilized in the developing countries are conducted and developed in the developed countries. Therefore, access by developing countries to the results of publicly funded research in the developed countries should be promoted within the IP system as a measure to an effective transfer of technology to developing countries (WIPO 2004). It is important that clear provisions on transfer of technology be included in the WIPO treaties.

One of the suggestions that have been put up to salvage the direct impact of patent is the research

exemption, particularly in the universities and research institutions. Despite the contestation of these provisions in countries such as the United States, the principle behind the research exemption is that it provides a platform to allow states to exempt their researchers from being prosecuted when they further explore inventions that have been patented, particularly for the purpose of generating further improvements on those inventions. The advantages and disadvantages of the use of research exemption as a tool to bridge the dual purpose of the patent system, namely, providing incentives to innovate and disclosing technology that might otherwise be kept secret, have been discussed extensively in the literature (see Cohen, 2005; Geuna and Nesta, 2004; Australian Government, 2005; IPR Helpdesk, 2006). There is little in the existing literature on the situation in Third World countries such as Botswana.

This study is exploratory in nature and has the following specific objectives:

- (1) Determine the extent and level of awareness of patenting in the universities, research institutions and industry in Botswana;
- (2) Assess how patenting and research exemptions have impacted on the quality and quantity of research output and utilisation in the universities, research institutions and industry;
- (3) Examine the level of awareness of research exemption in Botswana; level of support given to research and research development in Botswana by both the public and private sectors; and the challenges researchers are facing as a result of the patent laws;
- (4) Make recommendations to the Government of Botswana, researchers and other stake holders based on the findings.

Limitations of the study

The results of this study are based on the opinions of a sample of 366 researchers in universities, research institutions or industry in Botswana. The study is exploratory and the nature of the questions demanded that the researchers express their opinions in terms of their personal knowledge, real experience or people who are interested in the subject matter. The authors' hope is that information provided by the researchers was accurate and related strongly to the researchers' real experiences.

Methods

The study targeted the researchers in all the higher educational institutions, the research institutions, companies and industries in Botswana. It involved a visit to the Department of Registrar of Companies where the records of all registered patents in Botswana, before and after independence in 1966 are kept. In addition, two Focus Group Discussions were conducted to gain more in-depth information on the responses to the quantitative research component of the study.

A total sample of 572 researchers was determined for the study using Raosoft (2004), a sample size calculator, with 99% confidence interval (allowing an error of plus or minus 5%) (See also, NCS Pearson, 2004). The proportionate stratified random sampling method was employed in this study. This sample was allocated to the different strata representing the various institutions, industries and companies using probability proportional to size. This method ensured better representation of all sub-groups of the population in the sample and more statistical precision than the simple random sampling.

The purposive sampling method (a non-probability sampling method), whereby only those possessing the particular and desired characteristics are selected, was employed in identifying members of the sample from the science-and engineering-based units of the population. This ensured that those to be captured would have been involved in some form of research that might lead to some type of inventions. The snow ball technique, whereby a researcher interviewed is also asked about his/her knowledge of any other researcher who has made some in-route into technology, was also employed in the study.

The study used three research approaches, namely: documentary analysis/evidence, questionnaire and focus group discussion (FGD) to collect data. The documentary analysis, a qualitative approach, reviewed existing literature on patent and research exemption as applicable to Botswana and internationally. Furthermore, it reviewed the records of reported cases to identify any cases dealing with the infringements of patents rights within the country since independence in 1966. The current law as contained in the Industrial Property Act 1996 and related documents were analysed in the light of provisions made to protect researchers from infringement on IP.

The questionnaire had 5 parts; Part 1 of the questionnaire solicited general information on the researchers including the type of organizations they

were working for. Part 2 contained 16 questions on patent awareness, patent applications, and types of inventions, how patent has affected research motivation and problems with patent application and processing. Part 3 contained 8 questions on IP rights management. Part 4 contained 17 questions on research exemptions: its awareness, procedure and reasons for invoking research exemptions, and effect of research exemptions on research capacity and utilizations. Part 5 contained open-ended questions which solicited from the researchers their opinions on best practices to prevent a drop in research motivation and the circumstances under which the negative impact of patent monopoly can be mitigated by research exemption.

The questionnaires were administered on the researchers by trained research assistants who ensured that all the relevant ethical considerations were taken into account. They ensured that all potential participants in the study were contacted at their work place. The nature of the study was explained and each individual had an opportunity to decline or participate in the study. For those who volunteered to participate, the research assistant administered a questionnaire in English. Confidentiality was maintained by assigning a code number to each questionnaire. The participants were informed that there was no payment for participation. At the end of the data collection, a total of 366 questionnaires were returned giving a response rate of 70.4 percent. This response rate is very much higher than those of Hansen et al (2004), in a similar study conducted on American Association for the Advancement of Science Community in United States of America.

The questionnaire was validated for content, ambiguity, clarity, data quality and time needed for the survey by testing it on a representative population, as those being studied and drawn from the University of Botswana, before being used for the main study.

Two focus group discussions (FGD) were organized, one at Maun in the northern part of Botswana and the other at the University of Botswana in the South Eastern part of the country. The FGD provided an in-depth understanding of answers to some of the questions in the questionnaire and a better understanding of why people were not making use of the available facilities to register their inventions and how the negative effects of patent monopolies on research can be reduced through invoking research exemption.

Data were captured and analysed using the SPSS programme while the qualitative data were captured through recorders, tapes and later reviewed. The data analyses used descriptive and inferential statistics.

Results

Characteristics of studied sample

Of the 366 researchers in the study, 48 percent was from academic institutions, 15 percent each were from government establishments and companies, and about seven percent were from research institutes. Only three percent were from industry (Figure 1).

Involvement in research

Sixty-six percent of the researchers have been involved in one form of research or another, while 24

percent have not taken part as key investigators in any research but work in research institutions and/or are affiliated to researchers. A majority of the researchers (70 percent) were involved in surveys, 45 percent in desk study and also consultancy, and 43 percent were involved in experimental researches (N=229).

Patent Awareness, Method of Acquisition and Problems

Sixty-seven percent of the studied sample was aware of the use of patent system to protect invention. Of

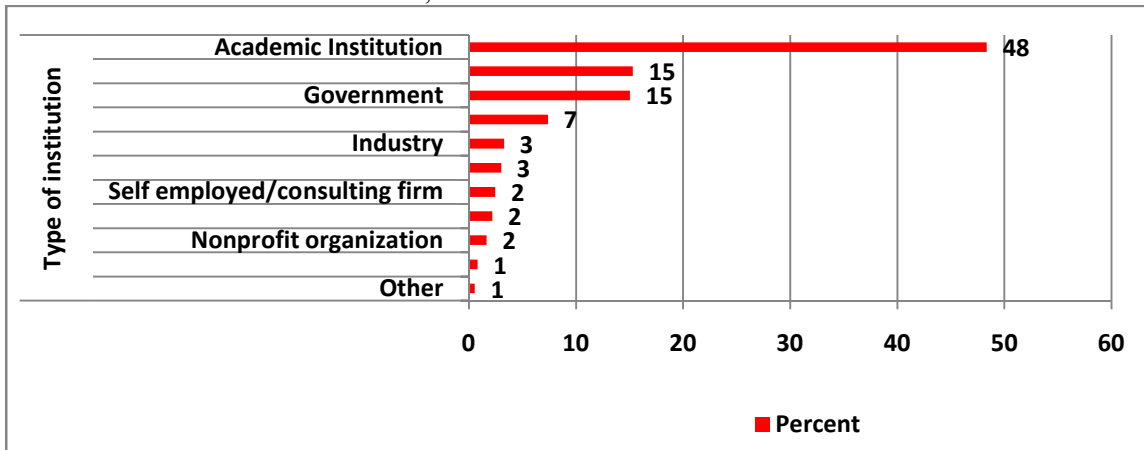


Figure 1: Percentage distributions of the respondent according to the type of institution.

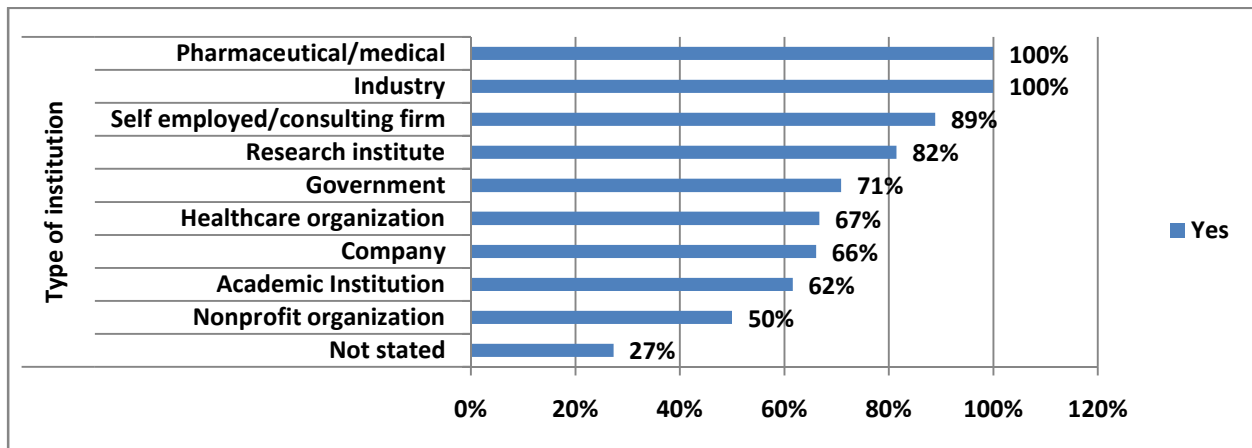


Figure 2: Percentage distribution of awareness of use of patent to protect invention among the institutions.

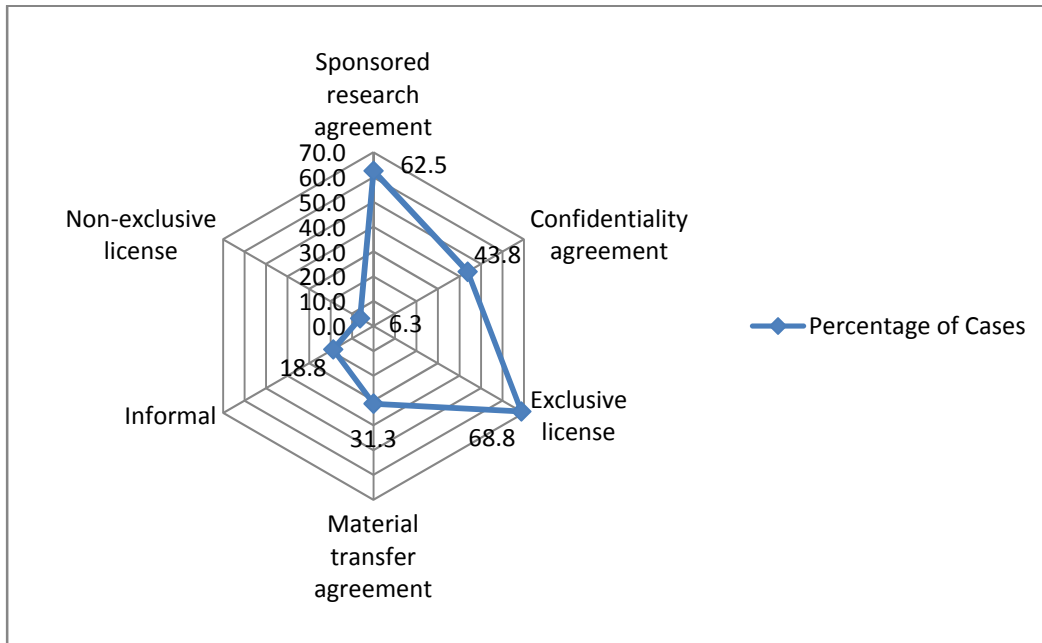


Figure 3: Methods used to acquire patent by the respondents

this percentage that indicated awareness, all the researchers from the pharmaceutical/medical companies and the industry were aware that patents can be used to protect invention. In addition 89 percent of those who were self employed or in consulting firms and 82 percent of those from research institutes were aware of patent use to protect invention. However, only 62 percent of researchers from academic institutions had the awareness (Figure 2).

Patent acquisition

Despite the fact that about two in every three researchers were aware of the use of patent rights to protect inventions, only 29 of them (8 percent) had actually applied for patents in the areas of Manufacturing, Food Science, Design, Electrical Engineering/Solar and Publication. The researchers who or their company had patented an invention were asked to indicate how they obtained the patent. Figure 3 shows the respondents’ opinions on the licensing agreements that had to be overcome in other to obtain the patent. The figure reveals that 69 percent went through exclusive license agreement and 63 percent, sponsored research agreement while 44 percent went through confidentiality agreement. Use of non-exclusive license was the most unpopular method.

Motivating Factors to Acquisition of Patent (Number of cases = 29)

When the researchers were asked what motivated them or their organisation to obtain patent rights for their invention, 86 percent of them said that they were motivated by the desire to protect their own technology from imitation followed by prevention of competitor’s patenting and application activities (76 percent). The other motivating factors were: improving the technological portfolio of the company or institution (63 percent), improving research and development cooperation (61 percent), and improving organizational negotiations such as exclusive licensing and joint ventures (59 percent). The least motivating factor was the incentive to invest in inventive activities (29 percent) (Figure 4).

Major motivating factors of institutions

When the top five motivating factors to obtain patent rights were classified by the respondents’ institutions, the result of the analysis showed that for those in the academic institutions, their majors motivating factors were: protecting invention from competitors (100 percent) and to protect their technology from imitation (89 percent), whereas for those in research institutions protecting inventions from competitors (100 percent) and improving the organizations negotiation (100 percent) were their major motivating factors. Improving research and development (80 percent) and improving the technical portfolio of the company (67 percent) were the major motivating factors for the company or those working in the company.

Difficulties encountered in obtaining patent

Notwithstanding the awareness of use of patent rights to protect inventions and the motivation to patent inventions, the researchers were asked to state what difficulties they encountered in the process of obtaining the patent. Among the difficulties highlighted by the researchers were dealing with the overly complex licensing negotiations (21 percent), the high individual royalties (28 percent), necessary patent not licensable (10 percent) and breakdown in licensing negotiations (17 percent) (Figure 6). Others, 24 percent, encountered other difficulties including cost of patenting, fees for obtaining the patent and skepticism of anticipated maintenance costs.

Importance of Patents

To determine the researchers' perceptions of the importance of patent rights, they were asked to rate how important patent rights were to themselves, their institutions, companies or industry in some outlined contexts for Botswana (Figure 7). A four-scale rating was used as follows: 1= Not important; 2=modestly important; 3= important; 4 = very important.

Figure 7 shows that between 42 and 50 percent of the participants were of the opinion that patent rights were very important for assessing the level of innovation in Botswana (50 percent), for public funding of research (45 percent), co-operation with other companies/institutions (43 percent), but less important for commercialization of research output (50 percent) and the number of scientific publications (33 percent).

Ways in which Patenting has Affected Research Capacity

When asked in what ways patenting has affected research capacity, 59 percent of the researchers stated that in order to obtain patent rights scarce resources were diverted to inventions that can be patented and material acquisition for research had become increasingly difficult and costly. Forty-five percent of the researchers felt that patenting hinders progress because: (i) it provides disincentive for other persons to improve on patented inventions, (ii) the pace of research innovations slows down substantially because of the activities of patent holders and (iii) patenting increased the cost of downstream researches. In addition, 41 percent were of the view that innovations were affected because researchers were now restricted to areas without patent rights; transaction costs become unaffordable to researchers;

researches infringing on patent rights attract damage costs as well as licence fees, and in some cases researches have been abandoned because of difficulties in arranging overlapping patents (N=22), (Figure 8).

Challenges of Patent to Research

The opinions of the researchers were solicited on what they considered were the challenges they were facing in their various researches as a result of patenting of certain inventions. The responses are summarized in Figure 9. This figure shows that the most pressing challenges to the researchers were unawareness of conventions/laws governing patent practices (25 percent), inadequate information on the patents, ownership of patent rights or desired rates for application of patent (24 percent), restricted access to patent information (22 percent) and delay in processing research exemptions to use patented inventions which slows down research (16 percent).

When prompted on how these challenges can be overcome, the researchers indicated that institutions or organisation including industry should sponsor or fund the process of patent exemption; institutions or organizations should provide information as well as train researchers on patent procedures; and the time and procedure to invoke exemption should be reduced.

Research Exemptions

Awareness of research exemptions

The researchers were asked if they were aware that they, their institution, or company could conduct their researches or experiments on patented inventions without infringing on the rights of patentee to their inventions. The responses which were based on "Yes" or "No" showed that 54 percent of the researchers were unaware while only 36 percent indicated that they were aware.

On whether they know the procedure for invoking research exemption, only 9 percent stated that they knew the procedure while an overwhelming majority (82 percent) did not know the procedure for invoking the exemption.

A further investigation on the reasons for invoking research exemption for use of patented invention revealed that 73 percent wanted to be free to use every desired tool for their research on the patented inventions, while 65 percent of the researchers did

not want to infringe on the rights of the patentee. The other reasons given by over half of the researchers were the desire to avoid putting their company to ridicule (54 percent) and the fact that their researches involved patented inventions (51 percent) (Figure 10).

4.2 Universities, research institutions and research exemptions

The researchers were asked whether in their opinions, universities and research institutions should be granted research exemptions statutorily. The responses show that while 77 percent were in support of granting universities and research institutions statutory research exemptions, 9 percent felt it was not necessary. The reasons given for granting statutory research exemptions were: (i) That research helps to verify the truthfulness and accuracy of patent claims (91 percent); (ii) Research is used for comparison to a new technology (88 percent); (iii) Research is used for classroom teaching (81 percent); (iv) Research is used to develop new research tools donated to the public (80 percent) and (v) Research is used to gain scientific knowledge with no foreseeable commercial application (75 percent) (Figure 11) (N=267).

Since many of the researchers advocated for the statutory granting of research exemptions to universities and research institutions in Botswana, they were further asked what issues that could arise in formulation of statutory research exemptions. Their responses are shown in Figure 12. The figure shows that 74 percent of the researchers, considered as the most important issue, the nature of the patented invention and whether the research is to be used to test for the validity of the patent. Other issues considered important included the motivation of the researcher to invent (73 percent), the type of use of the research (to experiment on or experiment with) (69 percent), development of effective competition (67 percent), the legal framework of the patent (whether there is option for compulsory or statutory license) (67 percent), whether the research is to invent around the patented invention (67 percent), and whether the research is for profit or not-for-profit (67%) (N=301).

Ways in which research exemption can affect research capacity and utilization

On the bases of the responses of the participants in the previous section, it is clear that for research exemptions (statutory or non-statutory) to be granted certain considerations need to be given to the issues at stake. These issues affect the magnitude or way the researches are conducted, namely, to investigate the

objectives of the invention to determine whether it is to, improve upon it, or to create a new product or process.

Research capacity (N= 289)

The researchers were asked their perceptions on how the granting of research exemptions could affect research capacity in the institutions, companies and industries in Botswana. Their responses are shown in Figure 13. The responses showed that 79 percent felt that with the granting of research exemptions, transaction costs involved in multiple licensing will be removed from research costs making it easier to fund researches; certain studies with high potential for PhD and Masters degrees will be undertaken (78 percent); researches which had been abandoned because of difficulty in arranging overlapping licenses will be resuscitated (75%); many researchers will undertake researches of their own interests in certain topical areas (73 percent), and researchers will no longer be secretive with information from their studies (69 percent). Other views on the direct impact of granting research exemption are that because of the absence of damage costs as well as ongoing license fee for future use of inventions which are usually paid when patent rights are infringed, researches will cost less (66 percent). In addition, researches will be conducted irrespective of uncertainties in the output (65 percent).

Research utilization (N= 292)

Figure 14 shows the perceptions of the researchers on how research exemption can affect research utilization in the universities, research institutions, companies and industry in Botswana. An overwhelming number of the researchers (85 percent), were of the view that invoking of research exemption would facilitate the ready availability of research outputs for scientists to improve on or extend, while 77 percent felt that knowledge will be expanded to users more generally and 72 percent believed that the rights attached to a patent will be restricted to specific classes of action rather than the

more general “use” or “exploit” where those classes do not include research uses. The other ways identified by the researchers in which research exemption can affect research utilization include: improvement of application and adaption of inventions in a different technological area (67 percent), the ease to subsidize the process of inventing around the patent (64 percent), and providing information to assist in prosecuting a patentee who had acquired an invalid patent (63%).

Incentive to invest (N=275)

When asked how the invoking of research exemption can affect the incentive to invest in research, 78 percent of the researchers were of the opinion that consumers will prefer to go for the new and improved competing technology when it becomes available, thereby leading people or organisations to invest more in the new technology or process. Between 70 and 73 percent considered that free use of patented technology would increase the probability of developing new or improved competing technology with subsequent losses on the old technology (73 percent) and increase research output in terms of quality and quantity (70 percent) (Figure 15)

Extent of Support to Research in Botswana

In order to understand the extent of support given to research by the different institutions, organizations and industries, the researchers were asked to indicate the type of research they conducted and the type of support they received (that is, whether the research was externally funded, internally funded, or received out of pocket support). The responses are shown in Figure 16.

Funding of research

Figure 16 shows that 70 percent of the researchers were involved in surveys, 45% in consultancies and desk study, 43 percent in experimental research and only 2 percent in collaborative researches. With respect to funding, 62 percent of those doing consultancies and 50 percent of those involved in collaborative and applied researches were externally funded; 50 percent of researchers doing collaborative, academic quantitative, applied research, and 46 percent of those doing surveys, were internally funded (Figure 17).

6.2 Level of support to research

Furthermore, the researchers were asked to rate the level of support given to research by the Government of Botswana, their respective institutions or organizations and collaborating agencies or external funding agencies. The responses have been shown in Figure 18. Figure 18 shows that an overwhelming majority of the researchers (over 80 percent), felt that support given to research was very inadequate, while about 19 percent of them thought that it was inadequate.

The researchers were mostly dissatisfied with the level of support coming from private donors followed

by that from the Government of Botswana, its collaborating agencies and their institutions.

How to make research attractive in a patent regime

When asked how research can be made more attractive, a small majority of the researchers (39%) were of the opinion that funding of research should be increased and incentives should be given to researchers for publishing their research reports or articles generated from those reports (24 percent). The other expressed views were that all stake-holders should be involved in encouraging research (10%), workload, especially in the academic institutions, should be reduced to allow staff more time to get involved in research (7.6 percent), and that researchers should be granted access to data-base or support materials for research (7.6 percent) (Figure 19) (N= 224).

Summary and conclusions

The study showed that about 67 percent of the studied sample was aware of the use of patent rights to protect invention, while 69 percent of research staff was unaware of patent system. This level of awareness of patent is quite low and points to the need to continue to raise awareness of the patent regime and its utilization. It calls for awareness training in the uses of patents and invoking of IP rights during the entire research and innovation process and to raise awareness among academics about the commercial potential of their research.

The study revealed that only 8 percent (n=29) of the sample had applied for patents. This low percentage is also reflected in the registered patents in Botswana which showed that only 0.5 percent of all registered patents from 1951 to 2008 were from Botswana. This result is in line with Republic of Botswana (2005) which showed that only 10 patents were registered internationally between 1994 and 2004. As indicated by participants during the Focus Group Discussion (FGD), many of the applications submitted by locals (residents of Botswana) were rejected because of lack of clarity in presenting their applications and not necessarily because they lacked content. The need for assistance of a patent attorney or agent who will represent their interests during the application process was therefore recommended so as to improve acceptability of local patent applications.

Although there are very many reasons why individuals, research institutions and industries apply for patent but this study has shown that the desire to protect one's technology from imitation and to prevent competitors from patenting the products ranked highest among the participants. This view is also supported by Thumm (2003), who showed that the classical, defensive motive of protecting one's technology from imitation and preventing competitors' patenting and application activities were the most motives for the Swiss scientists.

The participants placed higher value on patents in the context of scientific innovations and as a major determining factor in the funding of research than as a means of creating cooperation with other companies and institutions and commercialization of research output. This result is not surprising because funds for research are not easy to come by and for those who have funds their emphasis will be on innovativeness of the research output which will provide opportunities for further funding. The results run contrary to findings by Thumm (2003) who found that funding research and development were less important. It however, shows differences in priorities attached to different concerns in the research process.

A little less than half of the participants in the study had indicated that, notwithstanding its importance in advancing research innovativeness and attraction of research funds, patenting hinders research progress by (i) providing disincentive for other persons to improve on patented inventions, (ii) slowing down substantially the pace of research innovations because of the activities of patent holders and (iii) increasing the cost of downstream researches. It is in this regard that statutory research exemptions need to be considered in Botswana so that it can open up the possibilities of researchers delving into patented products for not-for profit researches, create incentives for downstream researches and research innovations. As Dent (2006) puts it, "Optimal public innovation policies are designed to achieve the optimal balance between the incentive to invest in inventive activity on the one hand, and the unfettered diffusion of knowledge on the other."

The major difficulties encountered by the researchers in applying for patenting their inventions were because the patent involved overly complex licensing negotiations (47%), high individual royalties (47%) and breakdown in licensing negotiations (29 percent). It is worth noting that for many research grants, no budgets are provided for the payment of royalties or license fees to owners of patents. Thus the issue of

additional cost involved through payments of the license merely adds costs to doing research and prolong the time for the research as so much time is lost in negotiating for complex licensing fees. All these add to the frustration of conducting research and affects efficiency. However, it further strengthens the case for research exemptions in academic and research institutions in Botswana where researches are mostly for knowledge case and not for commercialization.

About three in every five researchers indicated that in the bid to obtain patent rights researchers divert scarce resources to inventions that can be patented, making it more difficult to acquire materials for research whose costs are exorbitant. In addition, close to half of the researchers felt respectively, that patenting hinders research capacity by (i) providing disincentive for other persons to improve on patented inventions, (ii) reducing the pace of research innovations because of the activities of patent holders and (iii) increasing the cost of downstream researches. These findings are not to the advantage of the developing countries' research institutions and researchers and calls for policies that would enhance the research process while ensuring that patent owners enjoy the fruits of their efforts and innovativeness, and do not have a damaging effect on the incentive to invest.

Research exemption for patented inventions allows researchers to use an invention without infringing the rights of the patent holder of the invention. Such exemption reduces the impact of the losses associated with the grant of monopoly rights over the inventions by the government of the country. Without an exemption, scientists, researchers and universities can be sued for patent infringement if they make use of patented invention in the course of their research. Awareness of research exemptions, its utility, and method of invoking it was poor as over 80 percent of the researchers lacked knowledge of the procedure for invoking research exemptions. This calls for training of researchers and a public awareness creation on research exemptions, and the provisions made in Article 30 of the TRIPS Agreement and the three-step test including the "Bolar exceptions".

The study showed that over seventy-five percent of the researchers were convinced on the need for universities and research institutions to enjoy statutory research exemptions and reasoned that research exemptions will help researcher to verify the truthfulness and accuracy of patent claims, aid in the comparison of old and new technologies, teach new areas of study and develop new research tools in

addition to gaining scientific knowledge with no foreseeable commercial application. These results agree with the list of permitted experimental uses provided by Canada (WTO, 2000) in its argument before the World Trade Organisation (WTO) in a dispute with European Union (EU) on the protection of Pharmaceutical products, namely: (a) testing an invention to determine its sufficiency or to compare it to prior art; (b) tests to determine how the patented invention worked; (c) experimentation on a patented invention for the purpose of improving on it or developing a further patentable invention; (d) experimentation for the purpose of “designing around” a patented invention; (e) testing to determine whether the invention met the tester’s purposes in anticipation of requesting a licence; and (f) academic instructional experimentation with the invention. Merton (1973) argued that basic research should not be guided by economic and commercial instrument but should include: (a) the immediate publication of findings for use by all, and (b) the pursuit of truth rather than self-interest.

Building research capacity through utilization and expansion of existing research information in the academic and research institutions represent some of the key goals of these institutions. As was found in this study many researchers saw the existence of patents as impediment to achieving these goals and research exemptions as a measure to minimize the effect of patent system. In particular over three in every four participants believed that research exemptions will drastically eliminate transaction costs involved in multiple licensing from research costs making it easier to fund researches. Certain studies with high potential for PhD and Masters degree will be undertaken, and researches which had been abandoned because of difficulty in arranging overlapping licenses will be resuscitated. The number of research activities will drastically increase. Ready research outputs will be made available for scientists to improve on or extend, while knowledge will be expanded to users more generally and the rights attached to a patent will be restricted to specific classes of action rather than the more general “use” or “exploit” where those classes do not include research uses. In a continent like ours where government support for researches is minimal and research discipline in terms of fact finding to improve the life of people is minimal, the introduction of patent system in its strictest sense, without research exemption will be detrimental to research incentive. However, invoking research exemptions by institutions will free use of patented technology and increase the probability of developing new or improved competing technology with subsequent

losses on the old technology in addition to increasing research output in terms of quality and quantity.

The most pressing challenges of the patent system to the researchers as indicated in this study were unawareness of conventions/laws governing patent practices, inadequate information on the patents, ownership of patent rights or desired rates for application of patent, restricted access to patent information and delay in processing research exemptions to use patented inventions which slows down research. These findings which were also expressed by participants during the Focus Group Discussions, particularly representatives of Department of Registrar of Companies, calls for immediate intervention measures by academic and research institutions, and the Government of Botswana for training on the patent system, its utilization and implications for research.

Recommendations

Based on the results of the study it is recommended as follows:

First, the IP Unit in the relevant ministry needs to adopt a more proactive role by sensitizing people, especially those whose activities may result in inventions, about their IP rights, how these can be protected, the advantages of doing this and the procedure for doing this. Information literature contained in leaflets and other types of flyers should be widely used. The Tertiary Education Council, which is the supervisory body for tertiary education in the country needs to formulate an IP policy which should guide all the tertiary institutions in the country.

Second, whilst it is clear that the existing legal framework recognised and protects patents, the nature and scope for encouraging research use of patented inventions through research exemption is less clear.

A wide variety of options are available for addressing the problems associated with experimenting with patented products. It is strongly recommended that legislation introducing an experimental use exemption should be introduced to encourage research and innovation with respect to patented products. The aspect of the Intellectual Property Act dealing with research exemption should be more explicit and define in concrete terms specific exceptions for “experimental purposes”. This is particularly important not only because the present legislation is vague on the issue but also because it is

uncertain whether there are any relevant and applicable common law rules. This recommendation corroborates the Botswana National Research, Science and Technology Plan to provide a comprehensive support to S&T institutions to encourage institutions to exploit the results of their work and to ensure that they receive recognition and reward for doing so. Such support includes developing an Intellectual Property (IP) Policy to provide guidance for the management and exploitation of IP and establishing a legislative and/or regulatory framework to ensure better practice and returns from IP (Republic of Botswana, 2005). Third, even in those instances where people were aware of patents, there appears to be no incentives to innovate because of a number of constraints. Some of

these constraints can be addressed by the following measures:

- i) The Government, tertiary institutions and industry must be compelled to allocate funds for research and innovation. This might

actually require specific research and development departments to be created.

- ii) Financial incentives, possibly through a 50/50 sharing of royalties from patents should be introduced.

- iii) Academic institutions should device well-publicised schemes to recognise and reward innovative initiatives by staff.

Finally, the process for registration of patents is fairly standard and complex. Nevertheless, it could be simplified and the Registrar should be ready to assist those who need assistance.

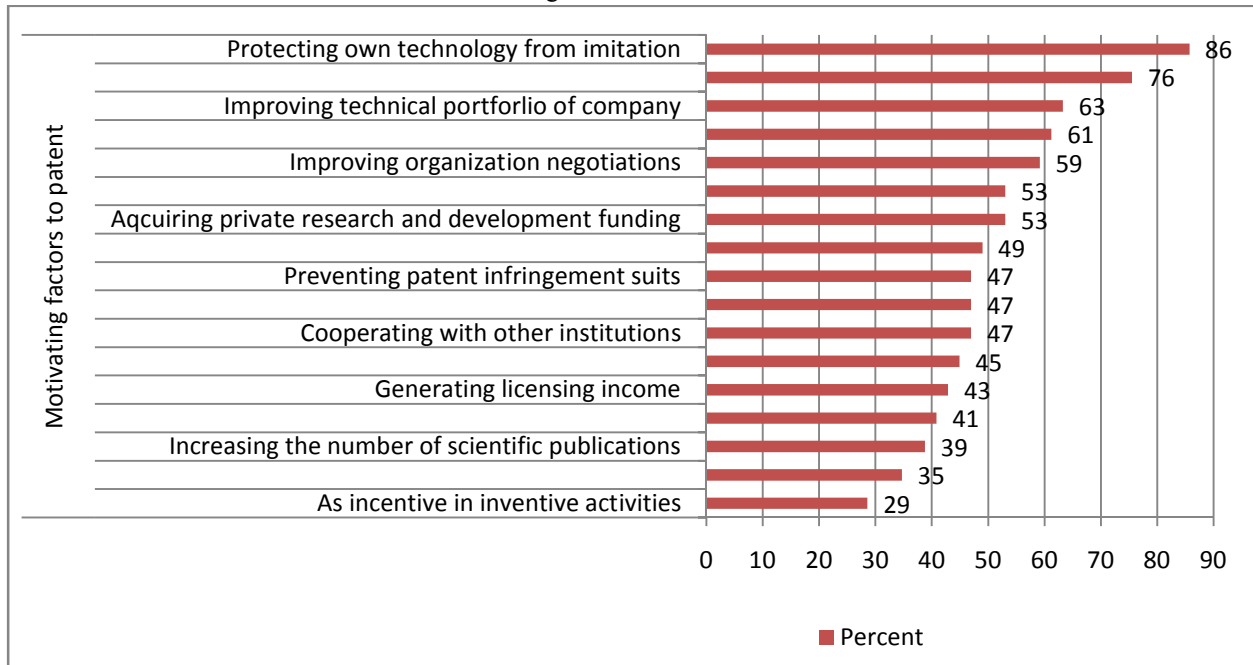


Figure 4: Respondents' motivations for patenting inventions

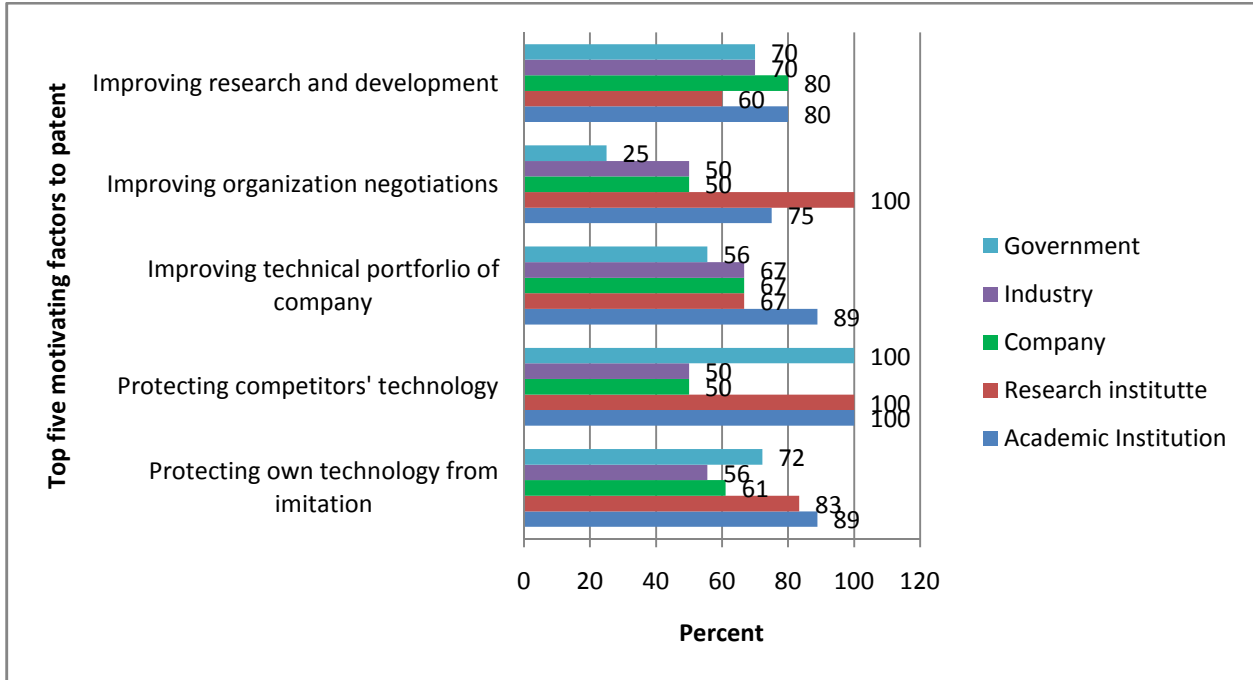


Figure 5: Respondents' views on motivating factors to their institutions' acquisition of patent

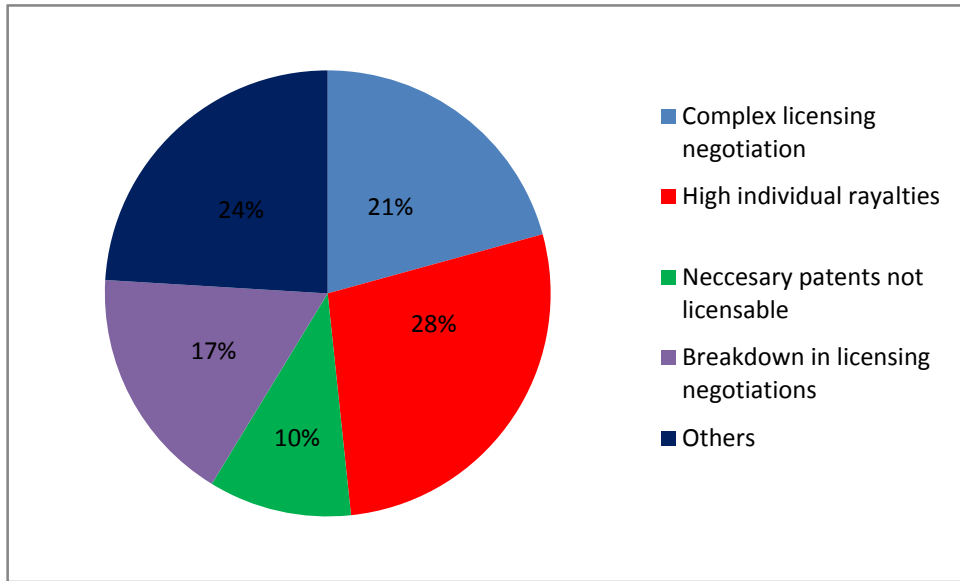


Figure 6: Difficulties encountered by patent applicants

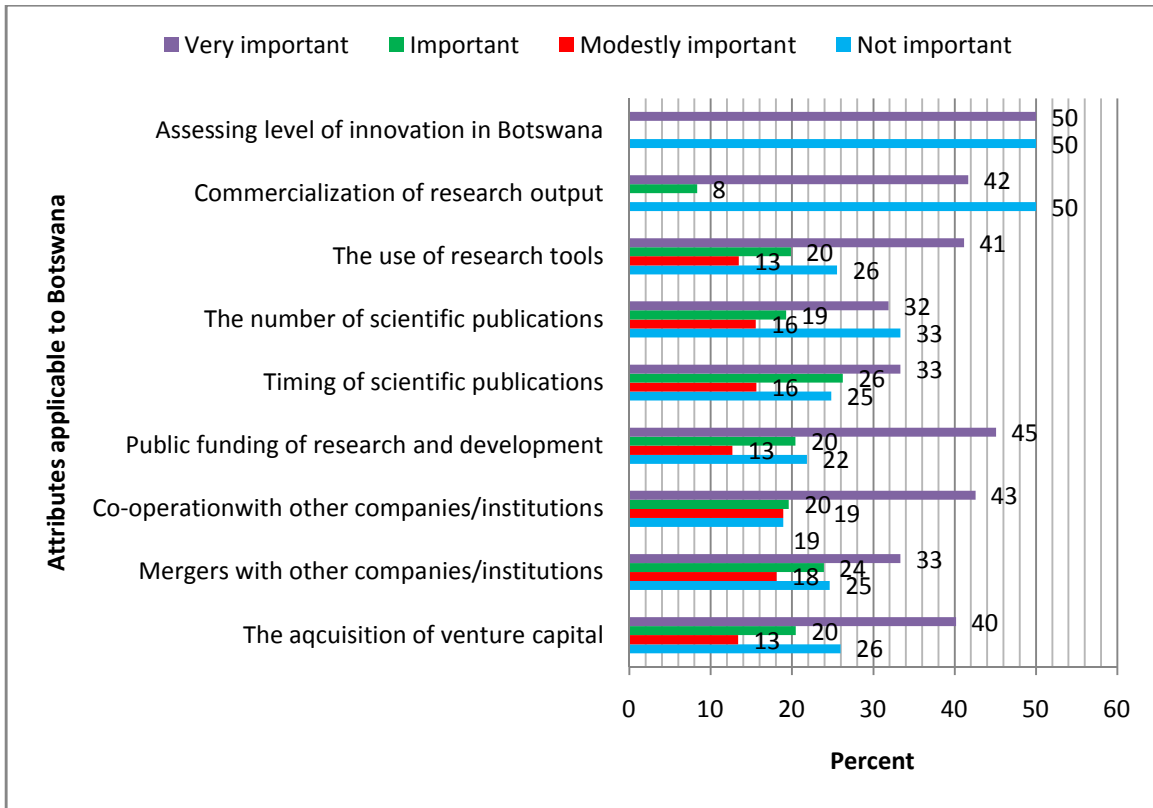


Figure 7: Participants' assessment of the importance of patents in different contexts

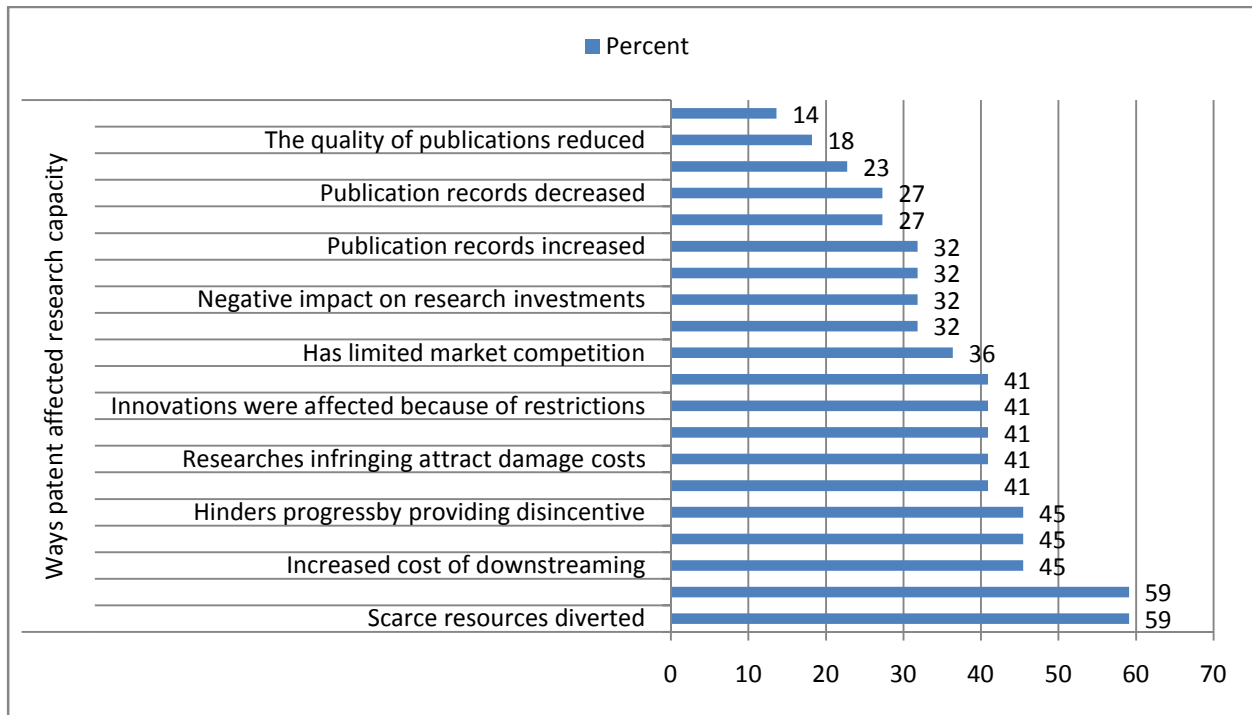


Figure 8: Respondents' views on how patenting can affect research capacity

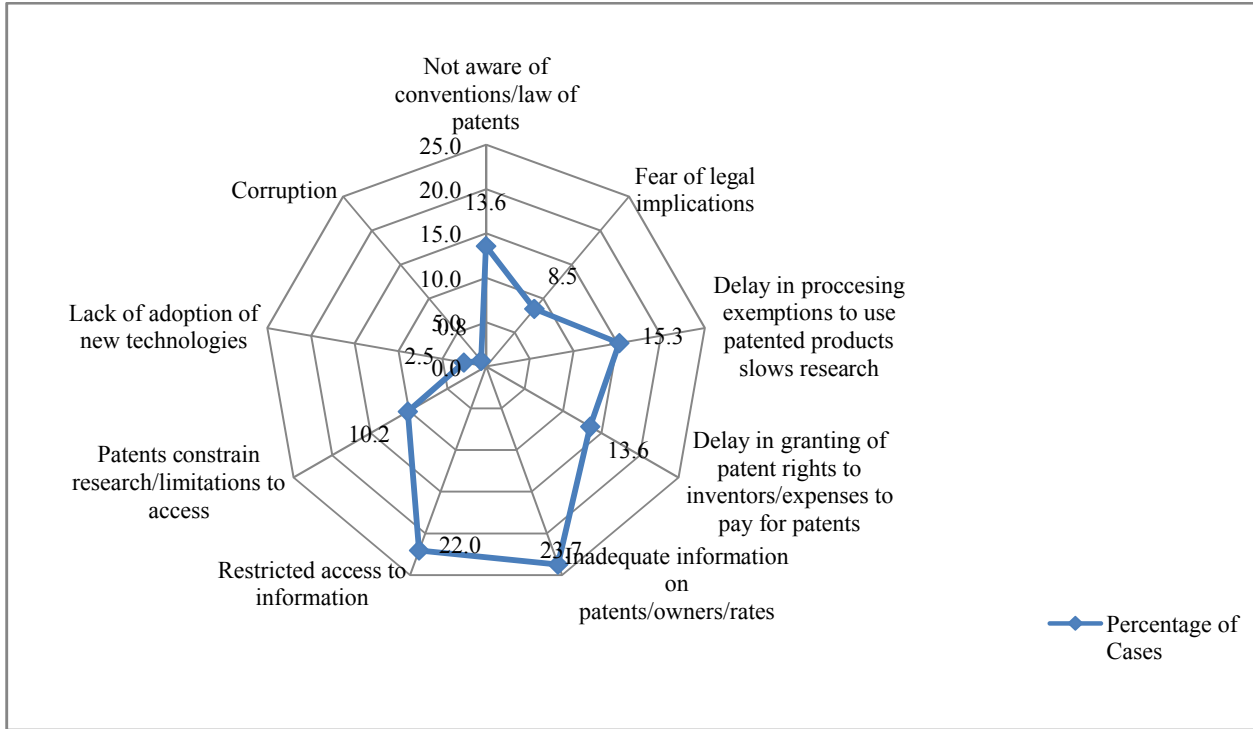


Figure 9: Respondents' perceived challenges to advancing research as a result of patented inventions.

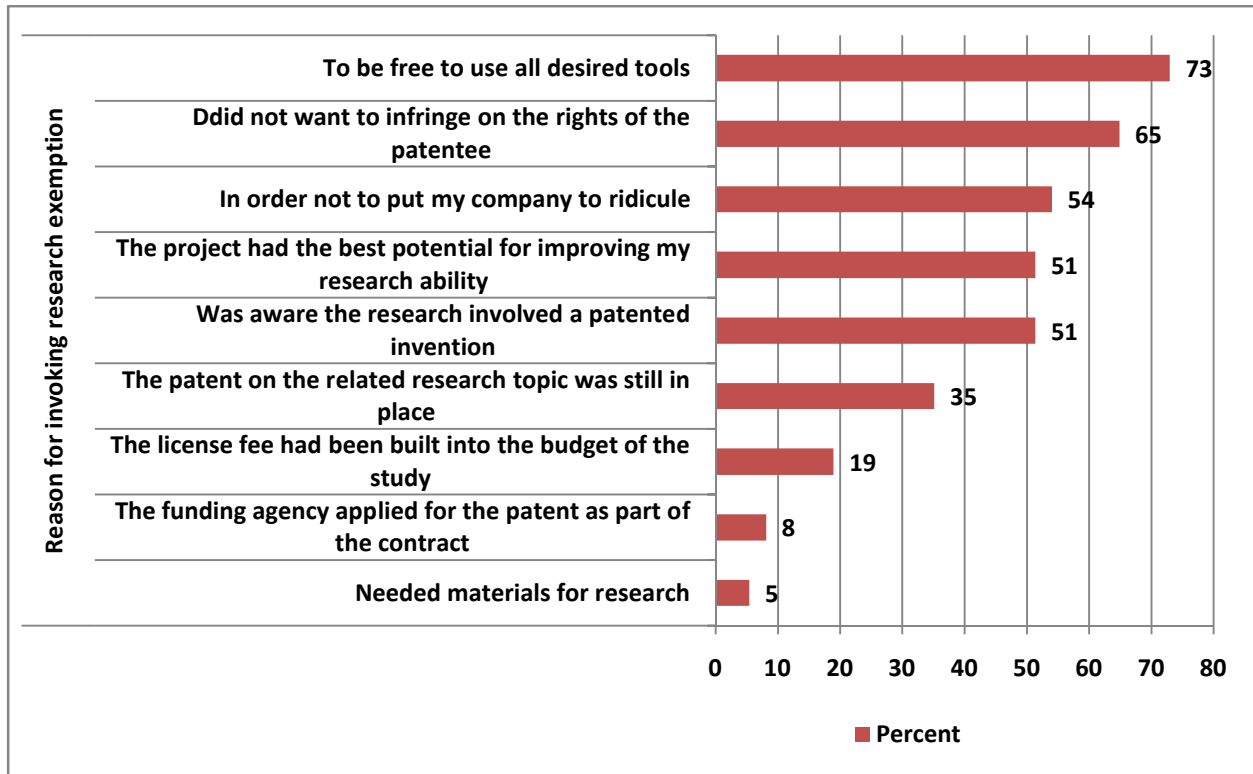


Figure 10: Reasons given by researchers for invoking research exemption

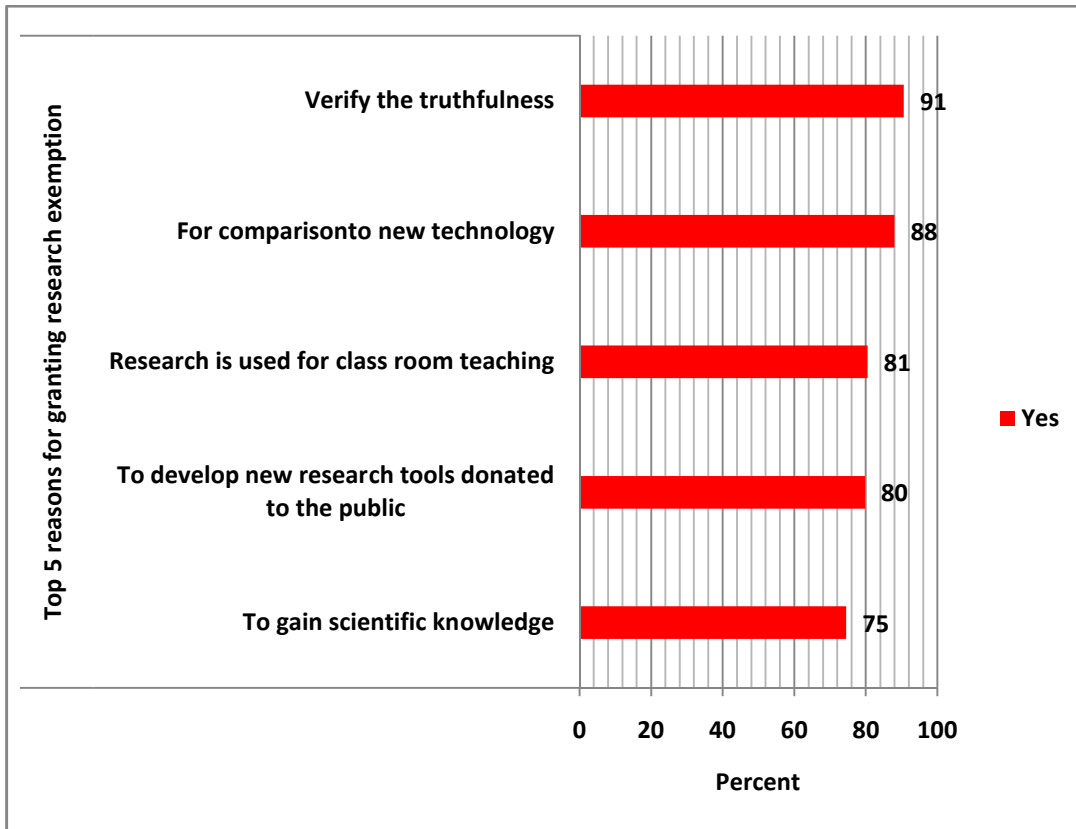


Figure 11: Reasons given by researchers why universities and research institutions should be granted research exemptions

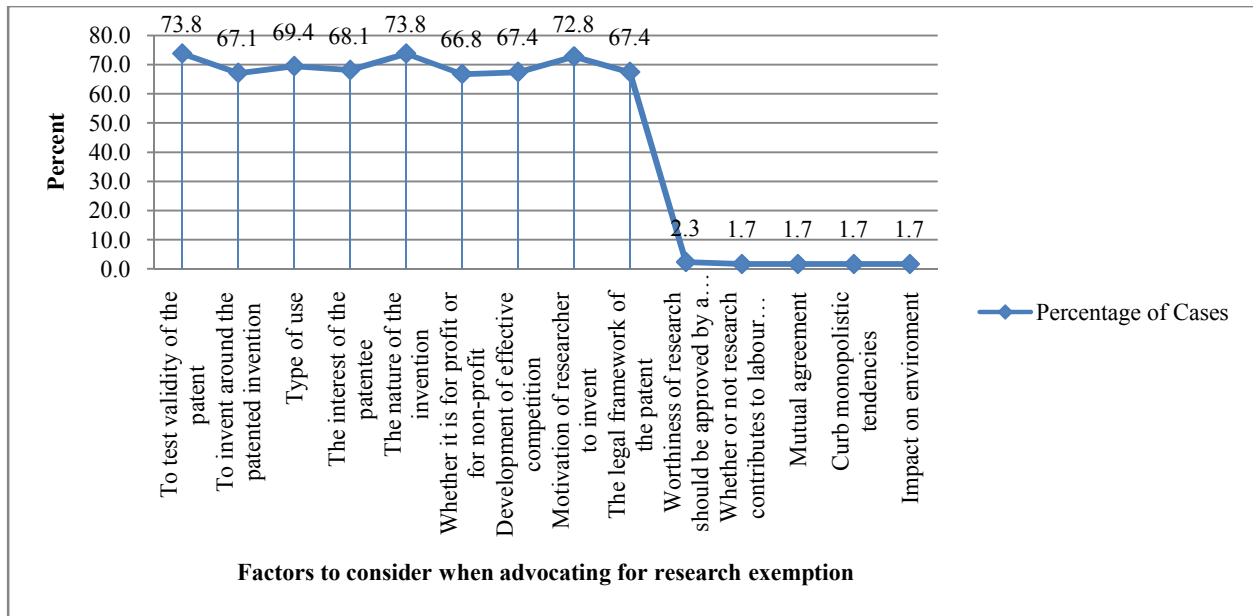


Figure 12: Factors that the researchers considered before advocating for research exemptions.

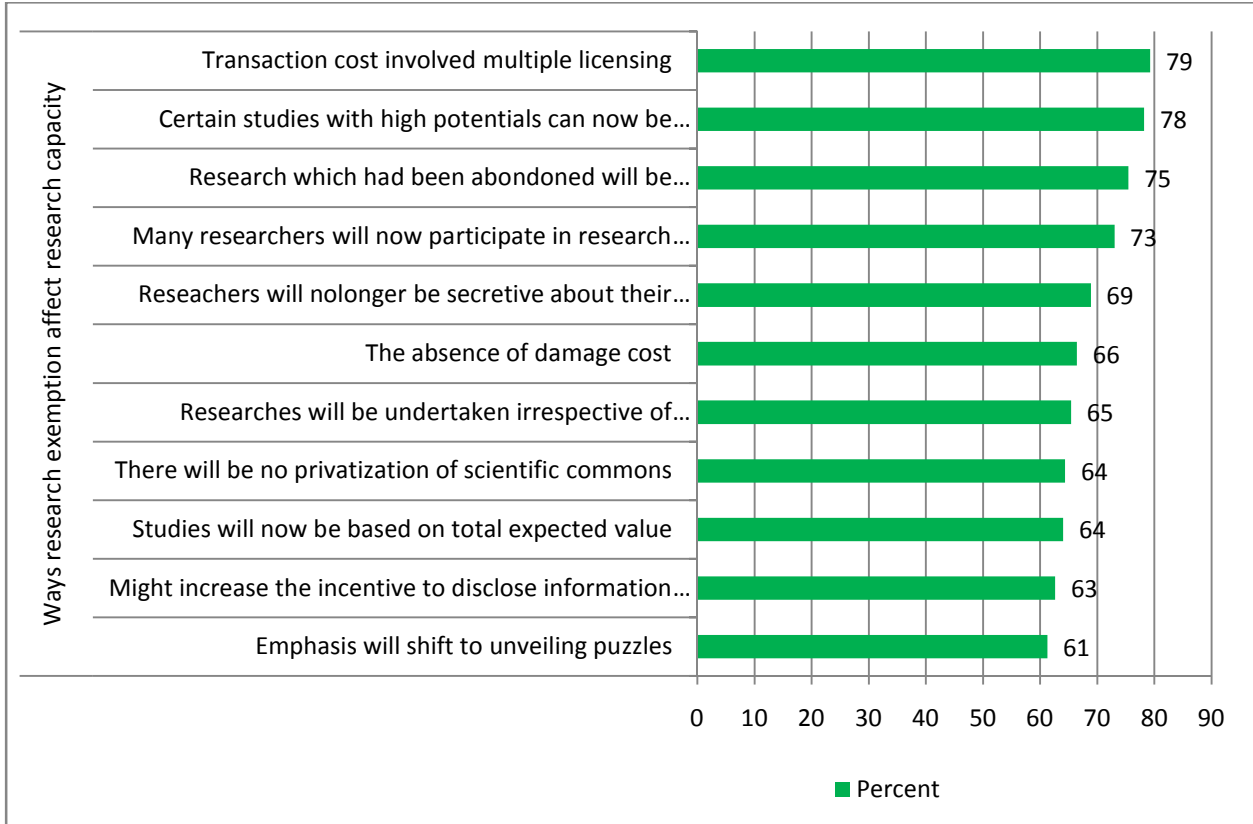


Figure 13: Researchers’ perceptions of the ways in which research exemption can impact on research capacity.

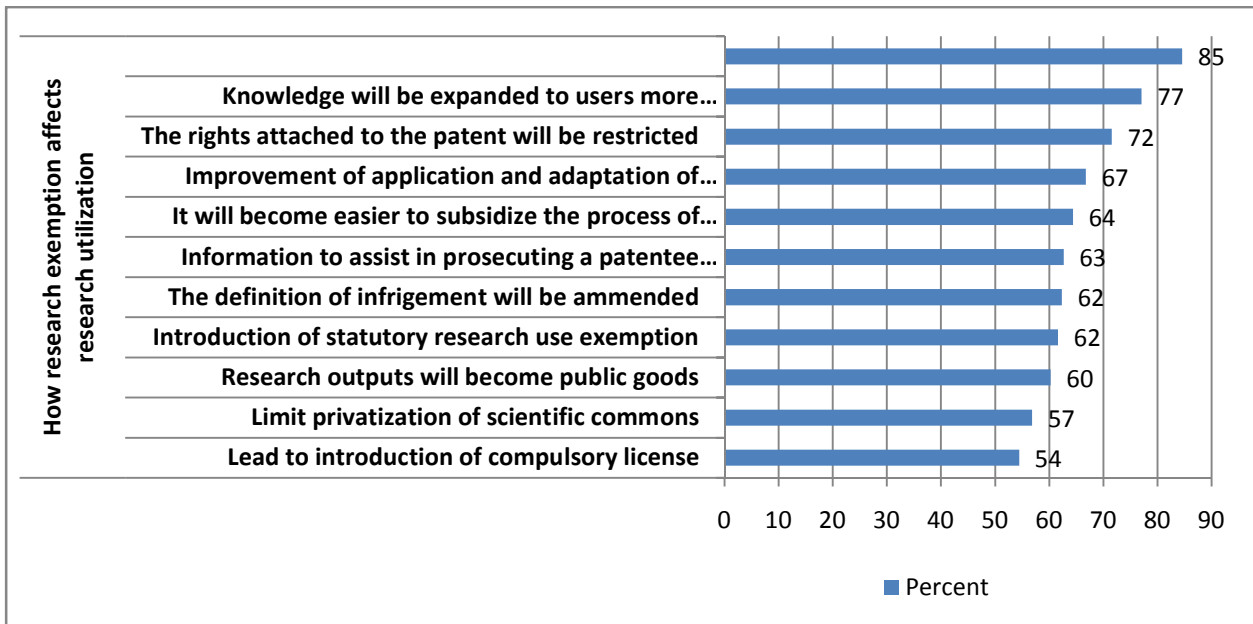


Figure 14: Researchers’ perceptions on how research exemption can affect research utilization

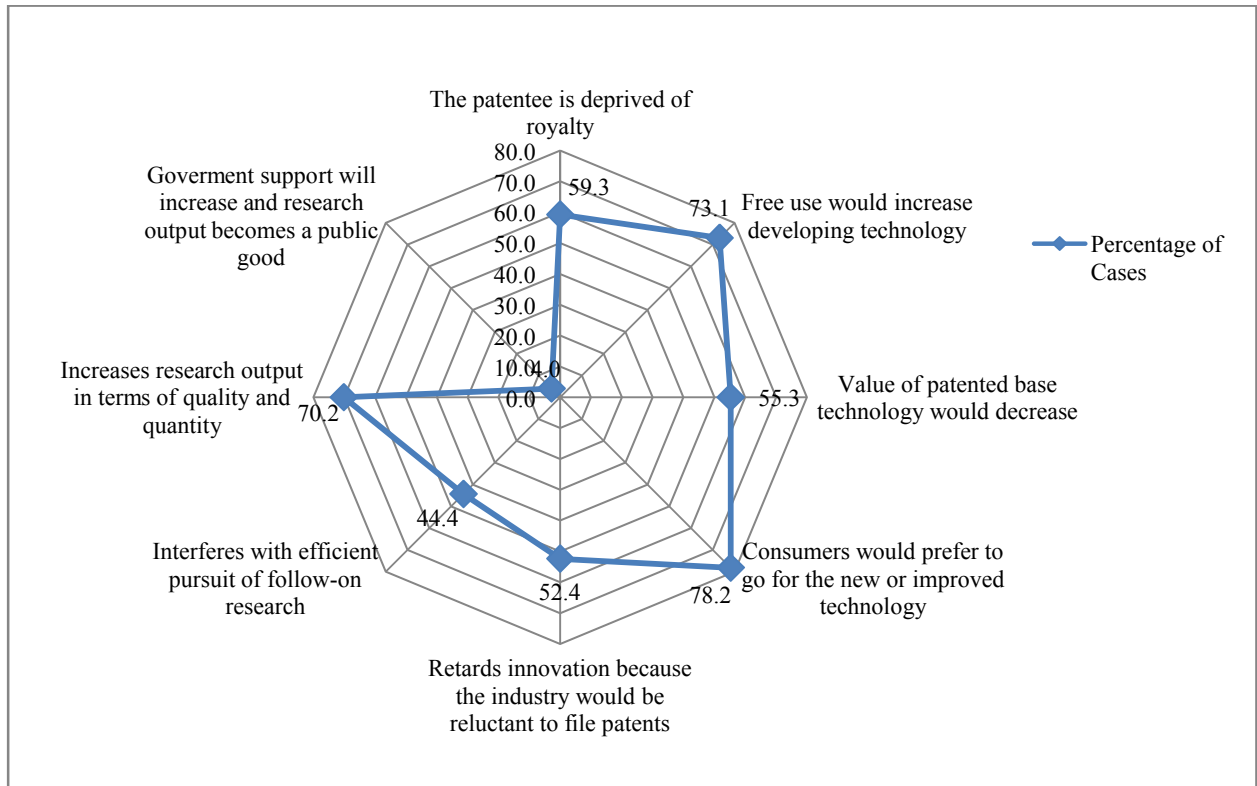


Figure 15: Researchers' perceptions on the effects of research exemption on the incentive to invest in research.

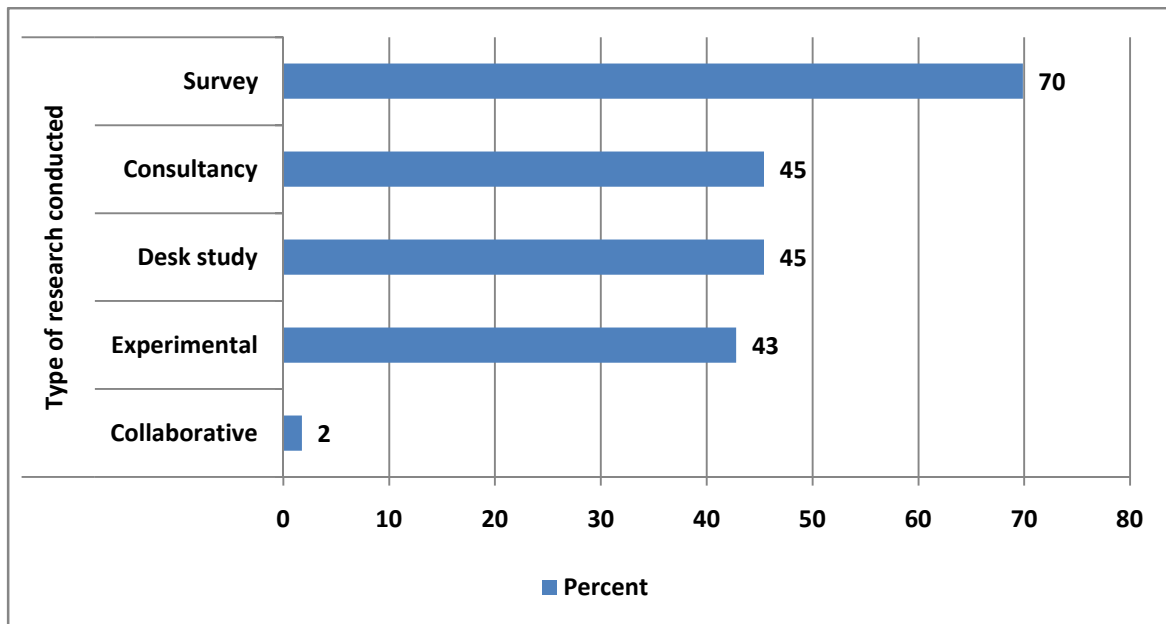


Figure 16: Type of research conducted by respondents

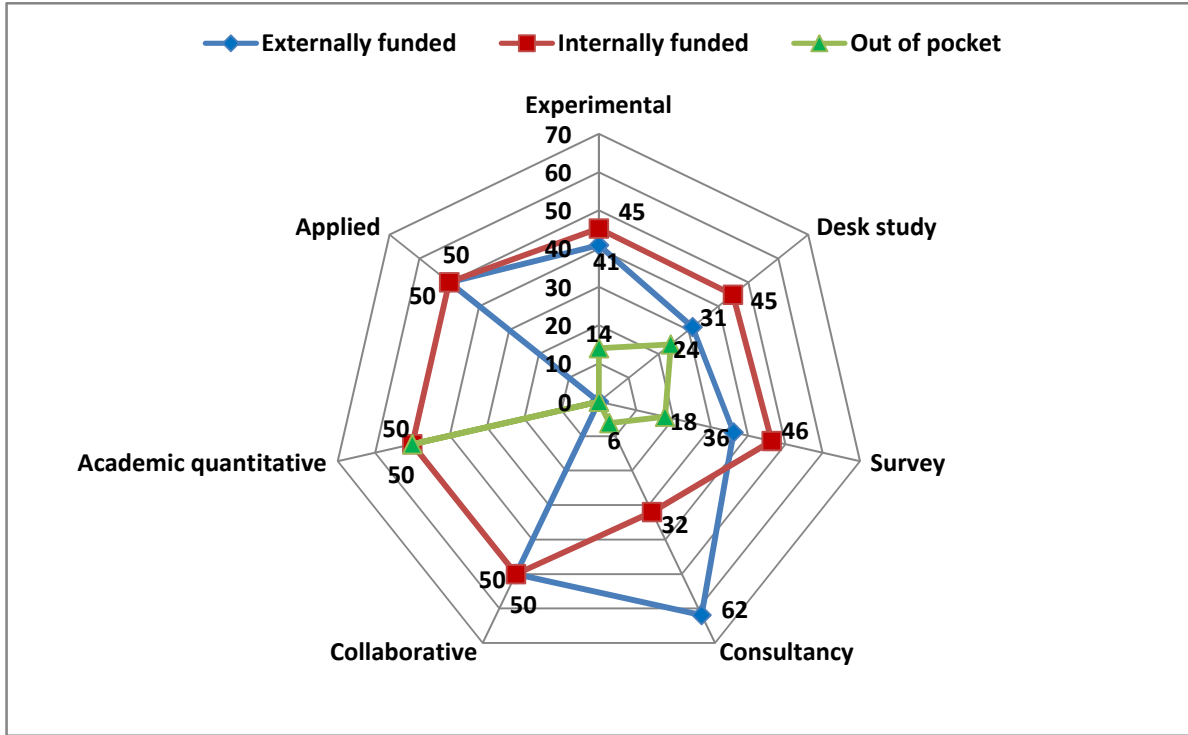


Figure 17: Percentage of researchers who indicated the type of research they conducted and sources of support for the research

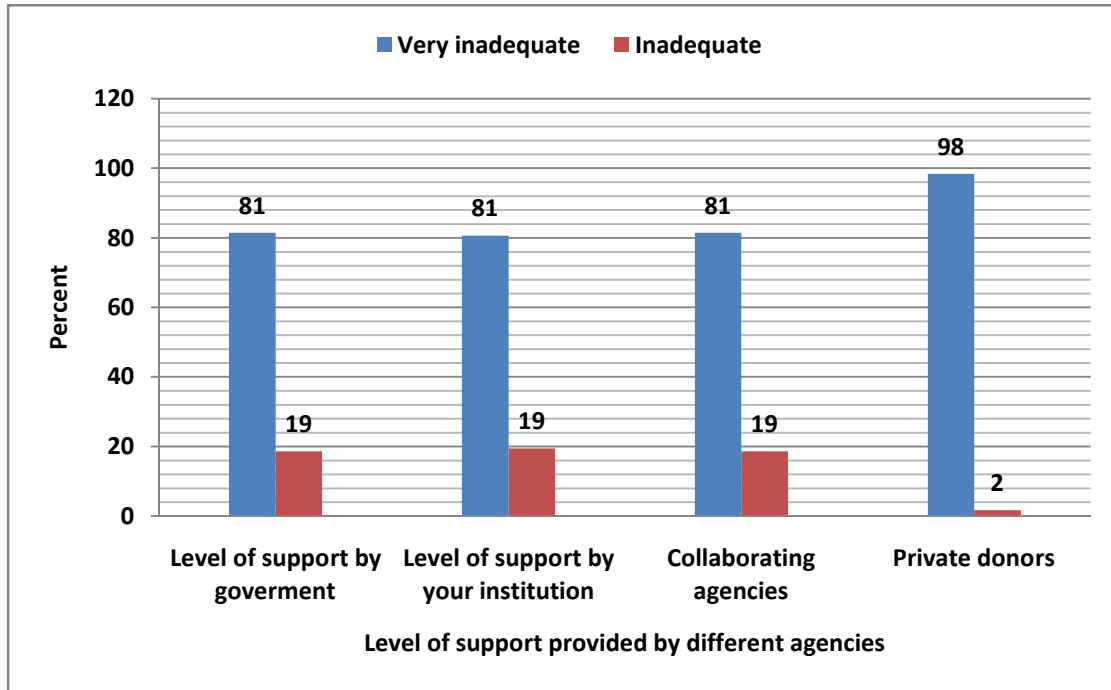


Figure 18: The researchers' perceptions of level of support given to research by various agencies

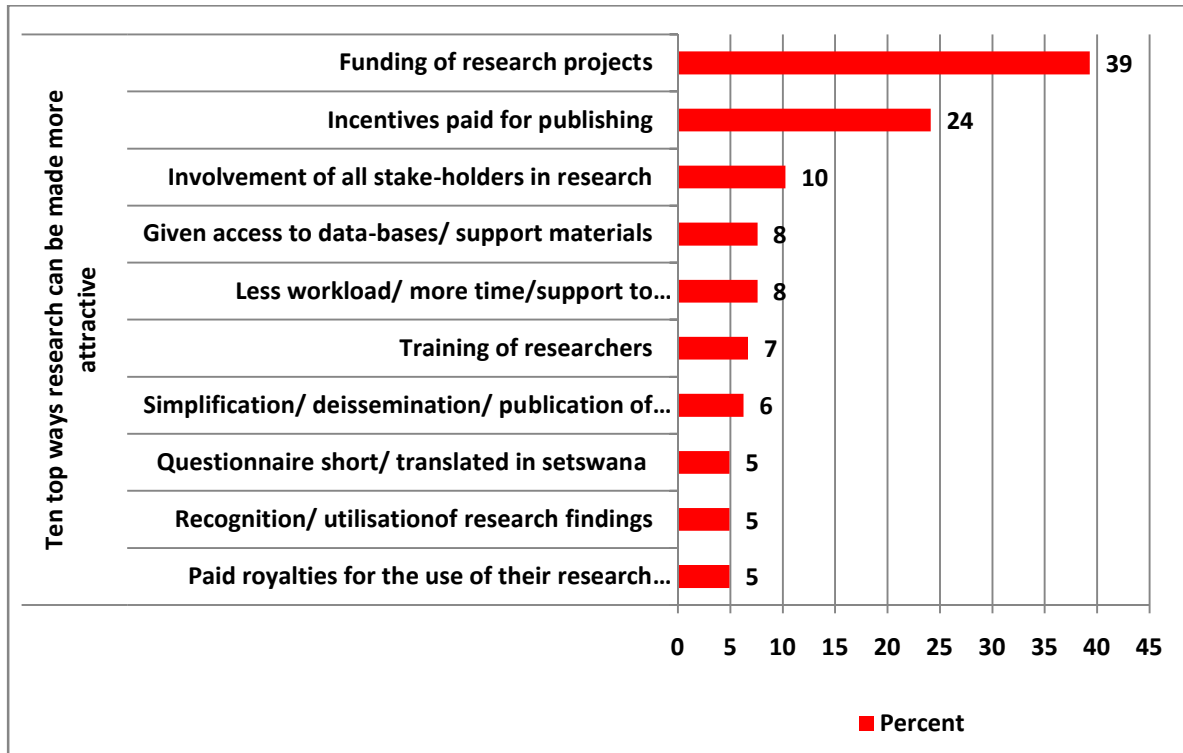


Figure 19: Researchers’ views on how research can be made more attractive

References

Australian Government (2009) Exemptions to Patent Infringement: Toward a Stronger and More Efficient IP Rights System IP Australia Consultation Paper March 2009

Central Statistics Office (2004a) Health Statistics. Available at [HTUhttp://www.cso.gov.bwUTH](http://www.cso.gov.bwUTH).

Central Statistics Office (2005) Education statistics. Available at [HTUhttp://www.cso.gov.bwUTH](http://www.cso.gov.bwUTH).

CSIR (2005) Botswana National Research, Science and Technology Plan: Inventory and Assessment Report, CSIR, Stellenbosch

Cohen, W.M. (2005) Patent and appropriation: Concerns and evidence. *Journal of Technology Transfer*, 30 (1/2):57-71. The Netherlands.

Correa. C.M (2004) The International Dimension of the Research Exception. *Science and Intellectual Property in the Public Interest*. Available at <http://www.sippi.aaas.org/intlexemptionpaper.shtml>

Democratic Governance and Rights Unit, UCT, The Judicial Institution in Southern Africa. A Comparative Study of Common Law Jurisdictions, Cape Town, SiberInk (2006), pp.14-33. Dent, C., Jensen, P.,

Department of Research, Science & Technology, Botswana Patents, Utility Models and Industrial Designs Manual, Government Printer, Gaborone (2006), pp.7-8.

Government of Botswana (2008) The 2008 Budget Speech. Available at <http://www.bankofbotswana.bw/files/attachments/preliminaries,%20statutory%20report%20and%20botswana%20economy%20in%202007.pdf>

Geuna, A., & Nesta, L. (2004) University Patenting and its Effects on Academic Research: The Emerging European Evidence. SPRU- University of Sussex Freeman Centre, Brighton. Forthcoming in *Research Policy*.

Hansen, S., Brewster, A., Asher, J., and Kisielewski, M. (2006) The Effects of Patenting in the AAAS Scientific Community. Directorate of

Science and Policy Programme, New York, Washington, DC, 20005

Intellectual Property Right Helpdesk (IPR Helpdesk) (2006) Patenting and Research Exemption. Sixth Framework Programme of the European Union, Espana. Available at http://www.ipr-helpdesk.org/documents/BP-Patenting-and-the-research-Exemptio_000000. Accessed on 08/03/2010

Kalyan C and Nandan P (2004) "Research Exemptions in Patent Law" Journal of Intellectual Property Rights, pp. 332-341.

Merton, Robert K (1973) The Sociology of Science. Chicago:University of Chicago Press.

Morolong, S.T. The Protection of Trade Marks under Botswana Law. In C.F. Fombad (ed.), Essays on the Law of Botswana, Juta & Co Ltd, Cape Town (2007), pp. 212-213.

MyNet Research (n.d). Research in Africa: Botswana. Available at <http://www.mynetresearch.com/Resources.aspx?id=+20>

NCS Pearson, (2004) Sample Size and Confidence Interval Calculator

Raosoft (2004) Sample Size Calculator. Raosoft, Inc. Available at: <http://www.raosoft.com/samplesize.html>

Republic of Botswana (1990a) *Tourism Policy*: Government paper No. 2 of 1990, Government Printer, Gaborone.

Republic of Botswana (1990b) National Policy on Natural Resources Conservation and Development: Government Paper No. 1 of 1990, Government Printer, Gaborone.

Republic of Botswana (2003) National Development Plan 9, Ministry of Finance and Development Planning, Gaborone.

Republic of Botswana (2005) Botswana National Research, Science and Technology Plan *Final report*. Ministry of Communications, Science and Technology Gaborone, Botswana

Republic of Botswana (2006) Botswana patents, utility models and industrial design manual. Government of Botswana.

Senftleben, M. (2004) Copyright limitations and the three-step test. An analysis of the three-step test in international and EC COPYRIGHT LAW, Kluwer Law International, The Hague.

United Nations (2007) Country profile: Botswana. Available at http://news.bbb.co.uk/1/hi/world/africa/country_profiles/1068674.stm

Waller, S., & Webster, B. (2006) Research Use of Patented Knowledge- A Review. OECD Science, Technology and Industry Working Papers, 2006/2, OECD Publishing, doi:10.1787/6837/5055704, pp. 8-10.

Walsh J.P., Cho, C., & Cohen, W.M. (2005) Roadblocks to accessing Biomedical research tools: patents, commercial activity or scientific completion? Available at <http://www.smith.umd.edu/seminars/Papers/COHEN%20Walsh%Cho%20051102.doc>. Accessed 21 April 2008

WIPO. Proposal to WIPO General Assembly (31st Session) by Argentina and Brazil for the establishment of a development agenda for WIPO. Geneva, WO/GA/31/11, August 2004