



**Southern African Research and Innovation Management
Association**

**Technology Transfer and Innovation Management:
A Guide for Southern African Technology Transfer Offices**

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Foreword

The Research and Innovation Management Guide has been developed by the Southern African Research and Innovation Management Association ([SARIMA](#)) to assist research and innovation managers and technology transfer professionals with their work within the region's Technology Transfer Offices.

SARIMA is a not-for-profit stakeholder organisation that provides a platform for the promotion and facilitation of best practices in research and innovation (R&I) management across Southern Africa. The organisation's purpose is to strengthen the research and innovation system to ensure social and economic development of the region.

In partnership with the [Department of Science and Innovation](#) (DSI) of South Africa, SARIMA has undertaken to strategically promote R&I management as an institutional, national, and regional priority through building capacity in R&I human resources and promoting enhanced networking, collaboration, and co-operation between research managers, technology transfer staff, and other role players within systems of innovation in South Africa and the SADC region. As such, one of SARIMA's initiatives has been to develop the Research and Innovation Management Guide consisting of two complementary modules, namely a module on Research Management (RM) and this module covering Technology Transfer/Innovation Management (TT/IM).

The module is structured as an e-resource that is current and relevant and guides respect to TT/IM best practices, together with a list of information resources and tools for TT/IM management in southern Africa. Each chapter includes a set of guiding notes which can be treated as stand-alone sections, but which are also conceptually linked.

The module consists of 8 main chapters covering the following:

- Overview of technology transfer and the role of the Technology Transfer Office (TTO) in higher education institutions (HEIs) and public research institutions (PRIs) (the two sets of institutions are referred to collectively as PRHEIs) ([Chapter One](#))
- Establishing and operationalising TTOs ([Chapter Two](#))
- Intellectual property management in PRHEIs ([Chapter Three](#))
- Valuation, marketing and licensing intellectual property ([Chapter Four](#))
- Seed and patent funds ([Chapter Five](#))
- Incubation and spin-out companies ([Chapter Six](#))
- Stakeholder management ([Chapter Seven](#))
- Portfolio management in PRHEIs ([Chapter Eight](#)).

In all 8 chapters, an attempt has been made to provide a regional rather than a South African focus. In places where the material applies specifically to South Africa, this has been indicated with clear text boxes and highlighting.

Reference materials are provided in the last chapter (Chapter Nine). Furthermore, Supplementary Material is available/downloadable via the SARIMA website.

DISCLAIMER

While SARIMA endeavours to make this Guide as practical and useful as possible, the outcome is somewhat constrained by the available resources. Despite SARIMA's efforts to be representative, the resources remain open to various interpretations. The inclusion of various sources does not entail an endorsement of such resources, their inherent policy positions, or the privileging of one source over another. The citation of the resources also does not represent an endorsement of specific organisations/individuals or that SARIMA is in a relationship with such organisations/individuals. The Guide therefore is not intended to be irretrievably conclusive or exhaustive. TT/I Management being such a dynamic and fast-changing profession will inevitably require a Guide that remains relevant and accurate through regular revision.

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Abbreviations

AUTM	Association of University Technology Managers
BBBEE	Broad-Based Black Economic Empowerment
CIPC	Companies and Intellectual Property Commission (South Africa)
CRADA	Collaborative Research and Development Agreement
EMTS	Electronic Management and Tracking System
EPO	European Patent Office
FTO	Freedom to Operate
GBP	Pounds sterling (currency of the United Kingdom)
GUI	Graphical User Interface
HEI	Higher Education Institution
IDR	Invention Disclosure Records
IIA	Inter-institutional Agreement
IPRPFDR Act	Intellectual Property Rights from Publicly Financed Research and Development Act (Act 51 of 2008) (South Africa)
IP	Intellectual Property
IT	Information Technology
LOI	Letter of Intent
MOU	Memorandum of Understanding
MTA	Material Transfer Agreement
NDA	Non-Disclosure Agreement
NIPMO	National Intellectual Property Management Office (South Africa)
OSS	Open Source Software
OTT	Office of Technology Transfer
PCT	Patent Cooperation Treaty
PBR	Plant Breeders Rights
PRI	Public Research Institution
PRHEI	Public Research and Higher Education Institution
SDK	Software Development Kit
SME	Small and Medium Enterprise
SOP	Standard Operating Procedure
TDD	Technology Due Diligence
TEA	Techno-Economic Assessment
TTO	Technology Transfer Office
UK	United Kingdom
US	United States
VSA	Visiting Scientist Agreement
WIPO	World Intellectual Property Organisation

Glossary

Claim	A claim defines the scope of exclusive protection provided by a patent. The claims are a written approximation of the abstract inventive concept created by the inventor and typically define the limits of patent protection. Claims are usually written as sets of sentences and appear in the patent specification.
Commercialisation	Commercialisation as defined in the Intellectual Property Rights from Publicly Financed Research and Development Act (Act 51 of 2008) (South Africa) (IPRPFRD Act) means the process by which any Intellectual Property is or may be adapted or used for any purpose that may provide any benefit to society or commercial use on reasonable terms, and "commercialise" shall have a corresponding meaning.
Copyright	A copyright is an exclusive right granted by law for a limited period to an author, designer, etc. for his/her original work. For a work to be eligible for copyright protection, it must be original and be reduced to material form. The following works are eligible for copyright in South Africa (in the Republic of South Africa). • Literary works e.g. books and written composition novels. • Musical works e.g. songs. • Artistic works e.g. paintings and drawings. • Cinematograph films e.g. programme-carrying signal that has been transmitted by satellite. • Sound recordings. • Broadcasts e.g. broadcasting of films or music. • Programme-carrying signals e.g. signals embodying a programme. • Published editions e.g. first print by whatever process. • Computer programmes.
Design	Essentially a " design " is about shape and features that appeal to the eye. Some designs are necessitated by function and others are aesthetic. Design is about the shape, form, appearance, pattern, ornamentation and configuration of a product or article. In South Africa, protection is afforded to aesthetic designs for a period of 15 years, and to functional designs for 10 years. Registered designs have to be renewed annually before the expiration of the third year, as from the date of lodgement.
Disclosure	Disclosure means the provision of full details of potential Intellectual Property by an employee of a PRHEI to the institution's TTO, as contemplated in section 5 of the IPRPFRD Act.
Field of Use & Field of Use Restriction	A specific area of use for which an exclusive license to a patent may be granted. A field-of-use limitation is a provision in, for example, a patent license that limits the scope of what the patent owner authorises a licensee to do in relation to the patent, by specifying a defined field of use - that is, a defined field of permissible operation by the licensee. In addition to affirmatively specifying the field of use, the license may negatively specify a field or fields, by specifying fields of use from which the licensee is excluded.

Geographical Indication	A geographical indication is a sign used on goods that have a specific geographical origin and often possess qualities or a reputation that are due to that place of origin, for example Port, Champagne etc.
Infringement	Infringement refers to the violation of a law or a right. The act of using, making, selling, or offering to sell an invention protected by an Intellectual Property right (e.g. a patent). To be considered an infringer, a party must generally practice all the limitations in at least one claim in a patent.
Innovation	Innovation is defined as the “the <i>implementation</i> of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations”, and where ‘new’ means new to the world, new to the country or new to the firm, the latter being defined as follows (OECD and Eurostat, 2005): • new to the world: when a firm is the first to introduce an innovation for all markets and industries, domestic and international • new to the market: when a firm is the first to introduce the innovation in its particular market • new to the firm: when a firm introduces a product, process or method that is new to that firm, or significantly improved by it, even if it has already been implemented by other firms.
Innovation Management	Innovation Management is defined in this document to those activities which are undertaken by a Technology Transfer Office relating to the capture, management and transfer of useful knowledge emanating from the research facilities of a public institution.
Institution	Institution means: - any higher education institution contemplated in the definition of "higher education institution" contained in section I of the Higher Education Act, 1997 (Act No. 101 of 1997). - any statutory institution listed in Schedule 1; and - any institution identified as such by the Minister under section 3(2).
Intellectual Property	Intellectual property according to the IPRPFRD Act means any creation of the mind that is capable of being protected by law from use by any other person, whether in terms of South African law or foreign Intellectual Property law, and includes any rights in such creation, but excludes copyrighted works such as a thesis, dissertation, article, guide or any other publication which, in the ordinary course or business, is associated with conventional academic work.
Intellectual Property Creator	Intellectual property creator according to the IPRPFRD Act means the person involved in the conception of Intellectual Property and identifiable as such for the purposes of obtaining statutory protection and enforcement of Intellectual Property rights, where applicable.

Intellectual Property Transaction	Intellectual property transaction according to the IPRPFRD Act means any agreement in respect of Intellectual Property emanating from publicly financed research and development, and includes licensing, assignment and any arrangement in which the Intellectual Property rights governed by the IPRPFRD Act (are transferred to a third party.
Invention	An invention in the context of patent law, is something which has technical character, solves a technical problem and has technical features. An invention with these features where it is novel, inventive and industrially applicable is patentable. (https://www.lexisnexis.co.uk/legal/glossary/invention)
Invention Disclosure Form	An invention disclosure form is a document used to collect initial information about an invention creation by an Intellectual Property creator. The forms can be used to report new inventions to the TTO and Intellectual Property attorney and may form the basis of the patent application.
Non-Disclosure Agreement	A non-disclosure agreement is an agreement between two or more parties to keep information, such as the technical specifications of an invention, secret. A non-disclosure agreement between parties may allow them to exchange information without creating a public disclosure that could void patent rights in some jurisdictions.
Novelty	An invention must be new or “ novel ”. In other words, the invention must not be in the public domain or known by others.
Patent	A patent 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. The patent provides protection for the owner, which gives him/her the right to exclude others from making, using, exercising, disposing, offering to dispose of, or importing the invention. The protection is granted for a limited period of 20 years (subject to renewal fees being paid).
Patent Cooperation Treaty	The Patent Cooperation Treaty (PCT) done at Washington 1970, (as amended and implemented in April 2002) assists applicants in seeking patent protection internationally for their inventions, helps patent offices with their patent granting decisions, and facilitates public access to a wealth of technical information relating to those inventions. By filing one international patent application under the PCT, applicants can simultaneously seek protection for an invention in 157 countries throughout the world, provided they file national phase applications in those countries at the end of the PCT phase.

Plant Breeders Rights; Plant Variety Protection (PVP)

The [International Union for the Protection of New Varieties of Plants](#), known as “UPOV” is an intergovernmental organization with legal personality and which has its headquarters in Geneva, Switzerland. UPOV was established by the International Convention for the Protection of New Varieties of Plants (hereinafter referred to as “the UPOV Convention”), which was adopted in Paris in 1961. This was the point at which there was recognition of the Intellectual Property rights of plant breeders in their varieties on an international basis. Plant variety protection, also called a “**plant breeder’s right**,” is a form of Intellectual Property right granted to the breeder of a new plant variety in relation to certain Acts concerning the exploitation of the protected variety which require the prior authorization of the breeder. As in the case of patents, trademarks and industrial designs, prior examination and granting by the relevant authority is required to establish the breeder’s right.

Priority Date

The **priority date** represents the date beyond which prior art will not apply, whether in a first-to-invent country or a first-to-file country. A patent applicant wants the earliest priority date. It often happens that more than one person is working at the same time to find solution(s) to a particular technical problem. However, only one of them can be granted a patent for the same invention and most countries (including South Africa) follow the so-called first-to-file-system by granting the patent to the one who filed the application first. When you are seeking patent protection for the same invention in several countries, the principle of priority is very useful since you do not have to file your application in several countries at the same time. The [Paris Convention for the Protection of Industrial Property](#) provides that once you file an application in one country party to the Convention, you are entitled to claim priority for a period of twelve months and the filing date of that first application is considered the “priority date.” Therefore, when you apply for protection in other member countries (of the Paris Convention) during those twelve months, the filing date of your first application is considered to have “priority” over other applications filed after that date. In such a case, you still succeed in being the first-to-file in other member countries, even if there are other applications filed before the filing date of your application in those countries.

Prior Art

All the publicly-available information that existed prior to the priority date of a patent application. The effective date for most patent applications is the application’s filing date. **Prior art** can include technical papers (including journal publications, whether or not these are peer-reviewed, conference abstracts, presentations and papers), scientific treaties, text books, theses, issued patents, all web content and other such materials. It is important to file a patent application before publicly disclosing the details of the invention. In general, any invention which is made public before an application is filed would be considered prior art (although the definition of the term “prior art” is not unified at the international level, in many countries, it consists of any information which has been made available to the public anywhere in the world by written or oral disclosure). In countries which apply the above definition of the term “prior art”, the applicant’s public disclosure of the invention prior to filing a patent application would prevent him/her from obtaining a valid patent for that invention, since such invention would not comply with the novelty requirement. Some countries, however, allow for a [grace period](#), which provides a safeguard for applicants who disclosed their inventions before filing a patent application,

and the novelty criteria may be interpreted differently depending on the applicable law. If it is inevitable to disclose your invention to, for example, a potential investor or a business partner, before filing a patent application, such a disclosure should be accompanied by a confidentiality agreement.

Prosecution Process	Patent prosecution describes the interaction between applicants and their representatives (law firm and their associate who is appointed in the particular country in which the application is proceeding), and a patent office (usually the patent examiner) with regard to a patent, or an application for a patent. Broadly, patent prosecution can be split into pre-grant prosecution, which involves negotiation with a patent office for the grant of a patent, and post-grant prosecution, which involves issues such as post-grant amendment and opposition. Patent prosecution is distinct from patent litigation, which describes legal action relating to the infringement of patents.
Provisional Patent Application	A provisional patent application is an interim patent application that establishes the priority date and expires after twelve months (as per the Paris Convention). It allows the term “Patent Pending” to be attached to the invention. If a Provisional Patent Application is submitted, the assistance of a patent attorney is not compulsory. It is important that the provisional fairly describe the invention, and where applicable, drawings must be attached. When filing in a country that does not provide for a provisional application, this application may also be referred to as a “priority founding” application.
Public Research Institution	A Public Research Institution is an organisation created through legislation with the purpose of undertaking research on areas relevant to its mandate, in the public interest and in support of public goods (e.g. the environment). It can also undertake research of specific commercial value, which is then transferred to a commercial partner. In South Africa, public research institutions are known as Science Councils.
Publicly Financed Research & Development	Publicly financed research and development according to the IPRPFRD Act means research and development undertaken using any funds allocated by a funding agency but excludes funds allocated for scholarships and bursaries. For a definition of what is regarded as research and development see Guideline 1 of 2012 (available at www.nipmo.org.za).
Recipient	Recipient according to the IPRPFRD Act means any person, juristic or non-juristic, that undertakes research and development using funding from a funding agency and includes an institution.
Revenue	Revenue according to the IPRPFRD Act means all income and benefits, including non-monetary benefits, emanating from Intellectual Property transactions, and includes all actual, non-refundable royalties, other grant of rights and other payments made to the institution or any other entity owned wholly or in part by an institution as a consideration in respect of an Intellectual Property transaction , but excludes a donation and gross revenues shall have a corresponding meaning.
Technology Transfer	Technology transfer is defined to be the process, with all its associated steps, by which knowledge, facilities, or capabilities developed under research and

development (R&D) funding are transferred from a research laboratory or similar setting to a commercial or other public entity in order to fulfil public and private needs. In this Guide, technology transfer and innovation management are treated as synonymous i.e. innovation is considered within an institutional context where the institution is a public research or higher education institution, and part of its mandate is to manage the innovations as they arise and transfer these to a commercial context.

Technology Transfer Office / Office of Technology Transfer

The **Technology Transfer Office** is generally a department within a higher education or public research institution which is responsible for knowledge exchange or the transfer of technology from the institution to its partners. The office consists of staff with specialised expertise in patenting, licensing, marketing and other relevant areas.

Trademark

A **trademark** identifies the services or goods of one person and distinguishes it from the goods and services of another. It can include a word, name, symbol, expression, smell, hologram or design.

Trade Secret/ Confidential Information

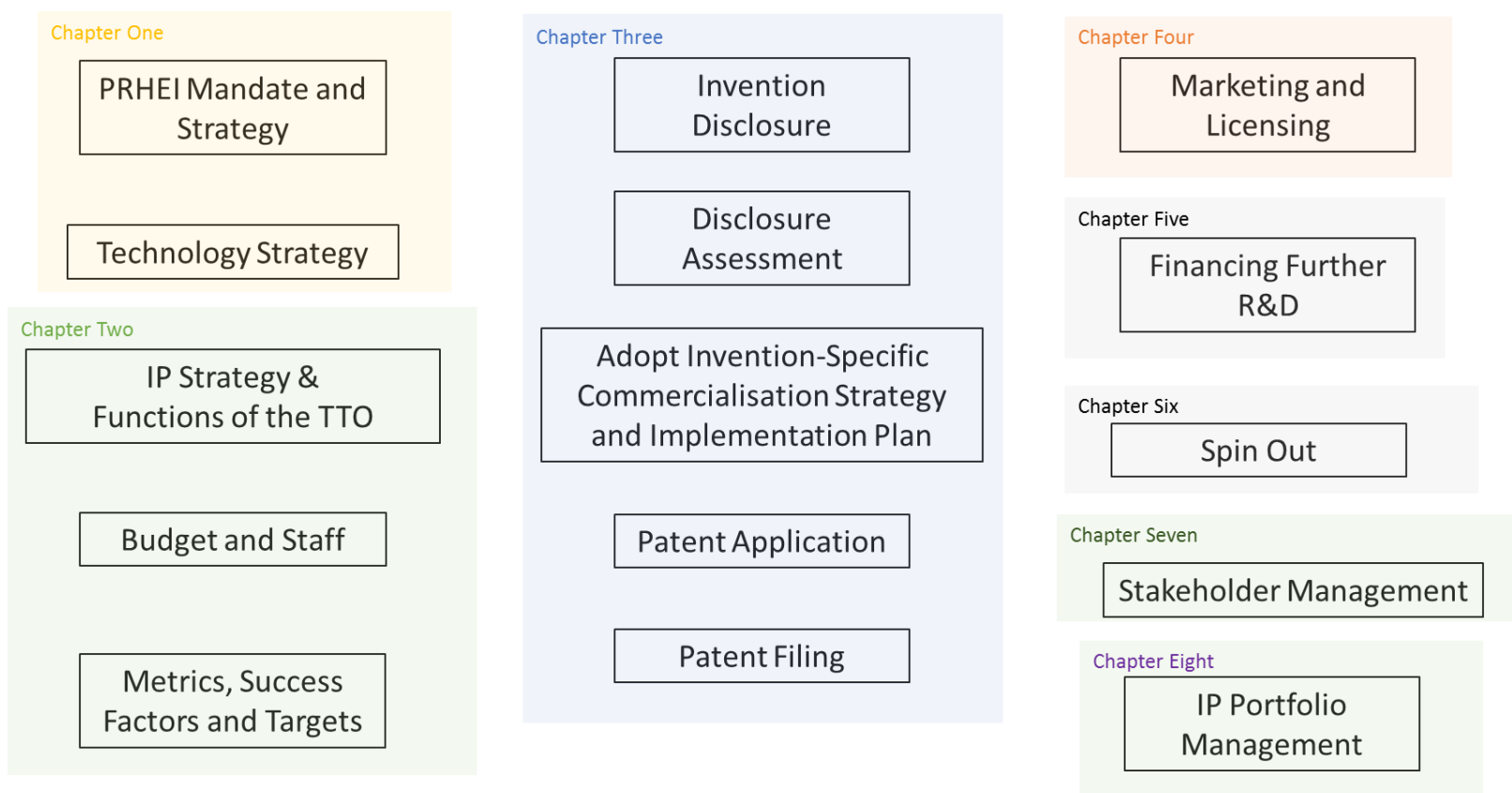
Broadly speaking, any confidential business information which provides an enterprise a competitive edge may be considered a trade secret. **Trade secrets** encompass manufacturing or industrial secrets and commercial secrets. The unauthorized use of such information by persons other than the holder is regarded as an unfair practice and a violation of the trade secret. Depending on the legal system, the protection of trade secrets forms part of the general concept of protection against unfair competition or is based on specific provisions or case law on the protection of confidential information. The subject matter of trade secrets is usually defined in broad terms and includes sales methods, distribution methods, consumer profiles, advertising strategies, lists of suppliers and clients, and manufacturing processes. While a final determination of what information constitutes a trade secret will depend on the circumstances of each individual case, clearly unfair practices in respect of secret information include industrial or commercial espionage, breach of contract and breach of confidence.

Definition References:

IPRPFRD Act WIPO (<http://www.wipo.int/about-ip/en/> and relevant WIPO leaflets) CIPC¹
NIPMO (2014)

¹<http://www.cipc.co.za/Default.aspx>

General Arrangement of Chapters



Chapter 1. Overview of Technology Transfer and Innovation Management

In this chapter, relevant background material relating to Technology Transfer and Innovation Management (TT/IM) is presented. The content covers the typical functions of a Technology Transfer Office (TTO), the difference between research management and innovation management, funding streams, impact pathways and the theory of TT/IM.

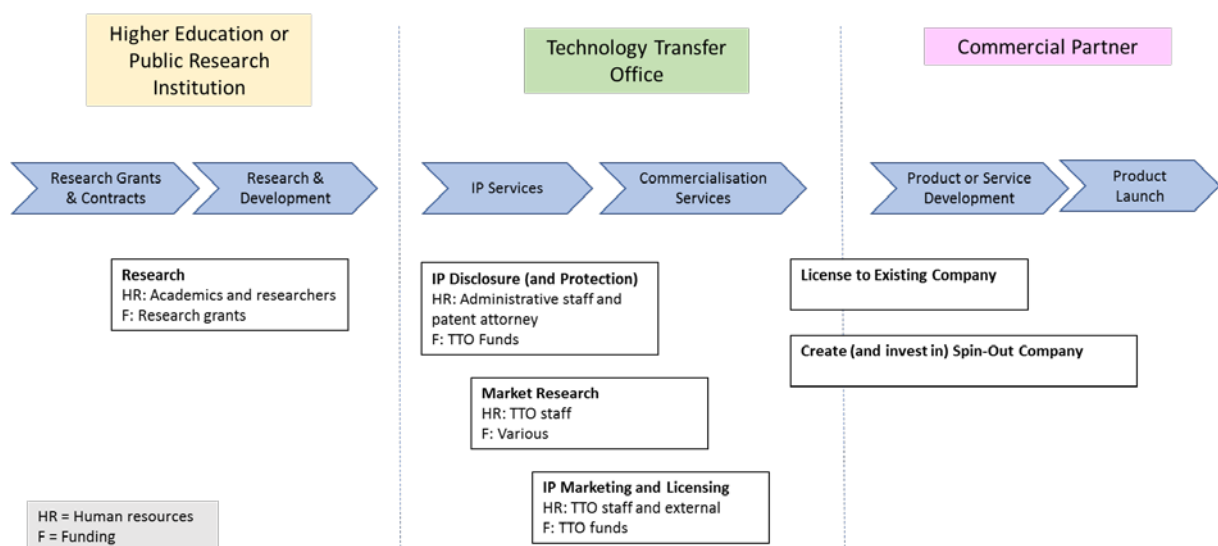
1.1 General Steps in Technology Transfer

In this manual, technology transfer is defined as the process, with all its associate steps, by which knowledge, facilities, or capabilities developed under research and development (R&D) funding are transferred from a research laboratory or similar setting to a commercial or other public entity in order to fulfil public and private needs (NIPMO, 2014). The process typically involves a number of discrete steps as follows:

- Invention disclosure by the researcher (to the TTO)
- Development of a commercialisation strategy including an assessment of the technology's commercial potential
- Patenting and licensing to an existing company (if appropriate)
- Seed funding to support the commercialisation of the technology
- Market Validation and Proof of Concept
- Strategic Partner Identification and Collaboration
- Regulatory Compliance advice and Intellectual Property Management
- Incubation and spin-out of new company (if appropriate)

The steps are illustrated graphically in Figure 1.

Figure 1. Role of the TTO in knowledge exchange and transfer



Source: adapted from Hughes and Kitson (2012)

Figure 1 also provides a useful framework for understanding the distinction between technology transfer and research management. The latter covers the management and

support functions of the activities within 'Research Grants and Contracts' and 'Research & Development'. The associated Research Management module, which has been produced

alongside this publication as part of the overall Guide, covers the definition of research management, planning, development, funding, collaboration, ethics, and data collection/information management (see Section 1.4). It is important that there should be a high level of coordination between the TTO and the Research Management Office, given that it is the research system (and by implication a research management/support function) which delivers the knowledge and disclosures that form the core of the TTO's work.

1.2 Legislative Requirements for the Technology Transfer Office

The regulatory framework for the licensing and transfer of Intellectual Property from public research institutions to private organisations varies from one country to another, with some countries having no regulation and others having a comprehensive set of procedures detailed within a statute of law.



In South Africa, the establishment of a TTO is a legislative requirement, as stipulated by the Intellectual Property Rights from Publicly Financed Research and Development Act, Act 51 of 2008 (IPRPFRD Act). The Act is administered by the National Intellectual Property Management Office (NIPMO) and requires all PRHEIs to identify, protect, manage and commercialise Intellectual Property (IP) arising from publicly-funded research. It outlines the role of the TTO as being responsible for undertaking the obligations of the institution in terms of the Act, and elaborates as follows:

“the functions of the TTO must be performed by appropriately qualified personnel with interdisciplinary knowledge, qualifications and expertise in the identification, management and commercialisation of Intellectual Property and Intellectual Property transactions. The TTO must, in respect of publicly financed research and development:

- develop and implement, on behalf of the institution or region, policies for disclosure, identification, protection, development, commercialisation and benefit-sharing arrangements
- receive disclosures of potential Intellectual Property emanating from publicly financed research and development
- analyse the disclosure for any commercial potential, the likely success of such commercialisation, the existence and form of the IPR, the stage of development and the appropriate form for protecting those rights
- attend to all aspects of statutory protection of the Intellectual Property
- refer disclosures to NIPMO on behalf of an institution
- attend to all aspects of Intellectual Property transactions and the commercialisation of the Intellectual Property
- conduct evaluations on the scope of statutory protection of the Intellectual Property in all geographic territories subject to commercialisation potential of the Intellectual Property, and
- liaise with NIPMO as provided for in this Act.”
-

1.3 Commercialisation and Impact Pathways

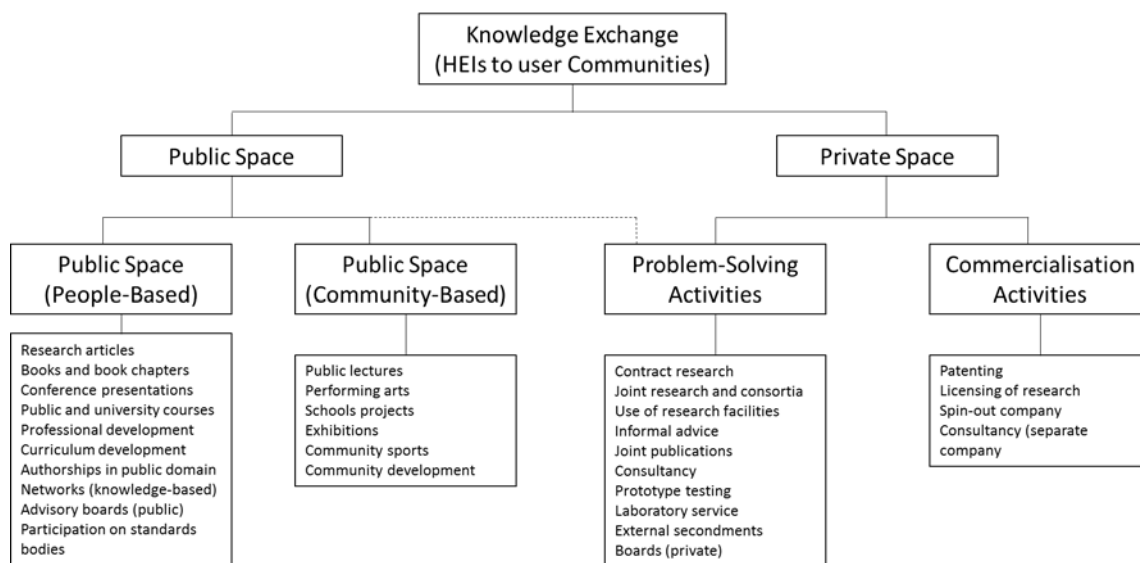
1.3.1 Knowledge Exchange in Higher Education and Public Research Institutions

The core mandate of Higher Education Institutions (HEIs) covers the dual functions of teaching and research. However, HEIs follow a multitude of pathways in order to facilitate knowledge exchange between the university and its associated communities (see Figure 2). Typically, knowledge exchange or transfer mechanisms between HEIs and the public space are not remunerated; academics engage in these processes as part of their commitment to generation and growth of public goods and the support of scholarship within broader society.

On the other hand, knowledge or technology transfer with the private space generally involves a financial transaction in exchange for a well-defined scope of services or provision of knowledge. Such arrangements include licensing of Intellectual Property, contract research, technical services, consultancy, participation on advisory boards and the testing of prototypes.

TTOs are often responsible for many of the commercialisation activities, where the latter are a subset of the various pathways through which universities engage with the private space, as shown in Figure 2.

Figure 2. Knowledge exchange pathways followed by HEIs



Source: McMillan Group (2016)

Public Research Institutions (PRIs), which carry the single mandate of research, adopt a similar set of pathways to HEIs, with the obvious exception being that teaching is either unimportant or of much-reduced importance. The other main difference is that PRIs, and particularly those institutions focussed on industrial research, place greater emphasis on private space pathways including contract research and licensing.

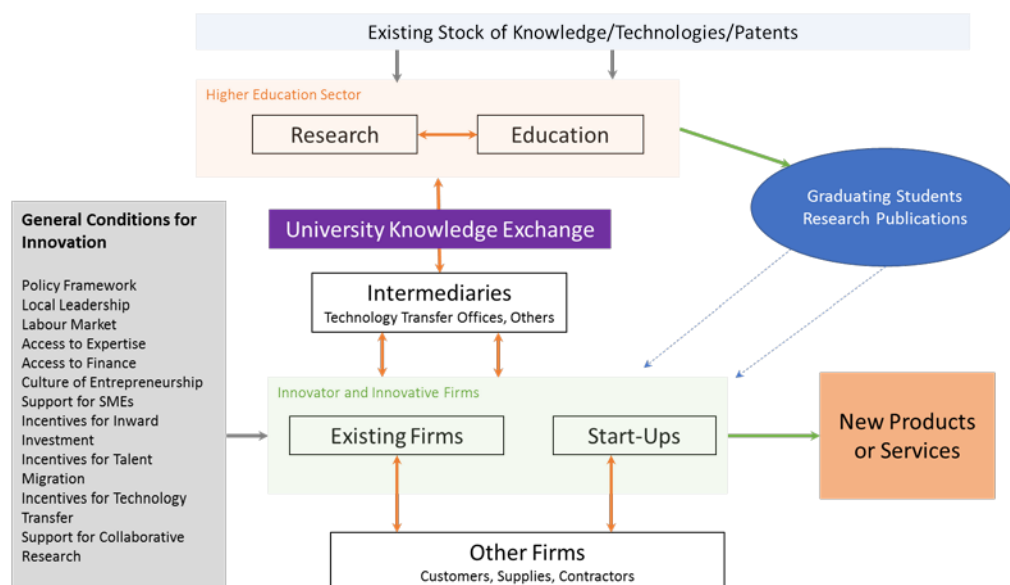
The financial value of the private-space knowledge exchange activities for the United Kingdom's HEIs is shown in Table 1; income from Intellectual Property-related activities, which includes the sale of spin-out companies is a small proportion, accounts for less than 3% of the overall non-grant income (McMillan Group, 2016).

1.3.2 Models for Knowledge Exchange and Commercialisation

Innovation, mostly in firms but increasingly in the public sector, is supported by a wide range of factors including the existing policy framework, organisational culture, management attitudes, availability and accessibility of finance and human resources, and the diffusion of new knowledge (see Figure 3). The scope of this Guide relates mainly to the latter aspect, which we broadly categorise as knowledge exchange between PRHEIs and innovative firms/innovators.

A model for this relationship is shown in Figure 3. Historically the knowledge bases of private firms and HEIs were considered to be separate; university research was perceived and described to be academic and unrelated to the needs of the 'real world'. Over the last four decades, this distinction between the academic and the applied domains has been narrowed, driven by public policy which has increasingly insisted on the use of public research funding as a means of addressing important socio-economic needs. Although there are a number of factors which led to the promulgation of the Bayh–Dole Act in the USA and similar legislation in other countries, the imperative of ensuring a more productive outcome from public-funded research in public institutions was paramount. As shown in Figure 3, TTOs have become central, but not exclusive, to this process, providing the appropriate institutional environment and structure to the commercialisation of new knowledge from the PHEIs.

Figure 3. Relationships between the knowledge exchange and innovation



1.4 Synergies and Overlaps with Research Management

This module is accompanied by a companion SARIMA publication on research management (RM) which covers RM best practices including its function, the development and support of research in PRHEIs, research partnerships, funding, ethics, managing a research portfolio, research information systems and research uptake (SARIMA, 2017).

The last section on research uptake, utilisation and impact overlaps and is purposively synergistic with this Guide. As discussed in Section 1.3.1, there are multiple impact pathways for research institutions in addition to the conventional commercialisation activities, where the latter form the core of this Guide. In the RM Guide, details are provided on the broader means by which knowledge is exchanged, and research results are disseminated, to the public and private spheres. The Guide provides guidance on the most effective communication channels between research institutions and the various user communities including publication in research journals, books, book chapters, open access articles, public lectures, and creative works.

Research is clearly the antecedent for knowledge exchange and more specifically technology transfer. The adoption of best practices in RM is vital to ensure that knowledge generation takes place and research institutions produce knowledge which has the potential for commercialisation through the process of invention disclosure, protection, marketing and licensing (or similar). The two portfolios of RM and TT/IM need to be closely aligned and synergistic for their objectives to be simultaneously achieved. This mutual dependence is further discussed in Section 2.4, where it is noted that a key success factor for the TTO is a strong applied research culture within the parent institution that delivers a consistent output of publications and other forms of research outputs.

1.5 Funding Streams

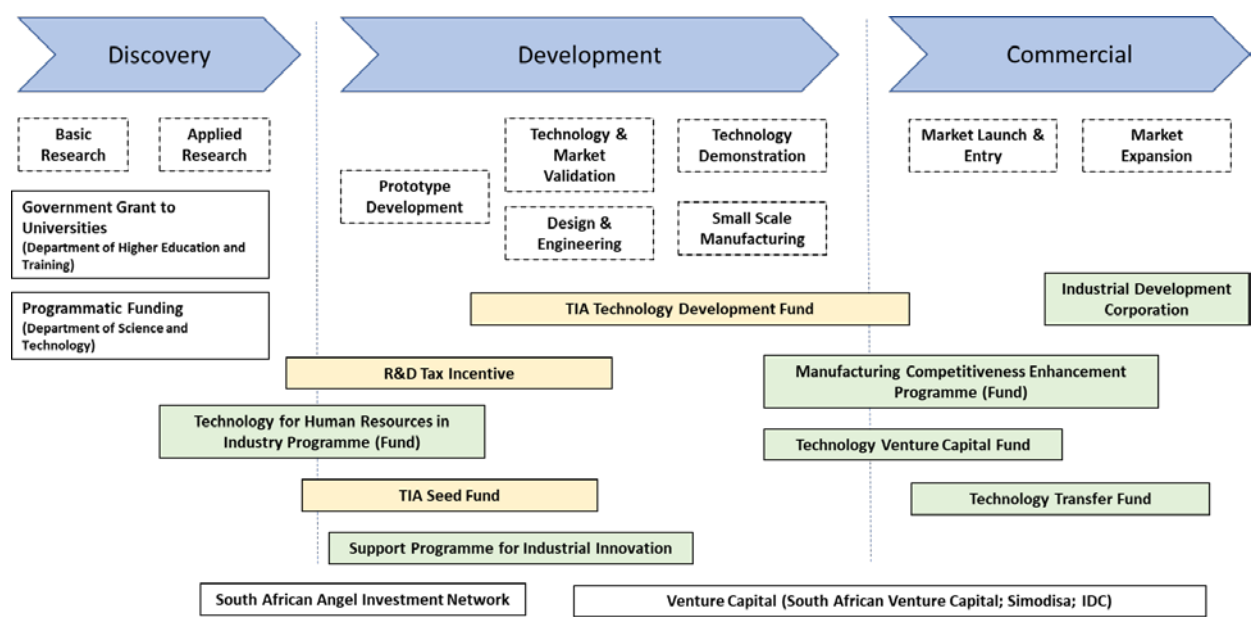


An overview of the various instruments which are available to support research, development and innovation is given in Figure 4.

A more comprehensive list of funding instruments can be accessed from the website of the Department of Trade and Industry ([Department of Trade and Industry, 2016](#)). In terms of venture capital and private equity, there are a number of companies listed through the local association, the [South African Venture Capital Association](#). Several universities also provide in-house pre-seed funding. More details on the scope and operations of these funds can be obtained from the individual institutions.

In addition to the funding instruments as shown in Figure 4, there are also a number of incubators and support programmes for small firms which are attempting to commercialise a new product or process such as the [SEDA Technology Programme](#) which runs more than 24 incubation centres across South Africa, and the [Botswana Innovation Hub](#). Several universities also operate in-house incubators as a means of supporting spin-off companies using university Intellectual Property, such as [LaunchLab](#) at the [Stellenbosch University](#).

Figure 4. Overview of public and private funding for R&D in South Africa



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Chapter 2. Incubating, Establishing and Operationalising a Technology Transfer Office

In this chapter, guidance on the process for operationalising a TTO is provided, with details on the following questions:

- What are the essential functions of a TTO?
- Given that models for cost accounting and sourcing of expertise may vary, what is the typical size and cost for a TTO?
- What are the steps in establishing a TTO?
- What are the types and size of typical TTO revenue streams?
- What are the typical outputs of TTOs based on levels of research within universities/science councils?
- What is the 'best practice' balance between sourcing inventions, patenting and licensing inventions (ratio of respective items)?

2.1 Functions of Technology Transfer Offices

The legal requirements for a TTO, in the case of South Africa in terms of the IPRPFRD Act, have been described in Section 1.2. Although specific to South Africa, these requirements are universal and can be used as relevant guidelines for TTOs in all countries. In summary, the main functions should include the following:

- develop and implement, on behalf of the parent institution, policies for disclosure, identification, protection, development, commercialisation and benefit-sharing arrangements, all relating to IP
- receive disclosures of potential IP
- analyse the disclosure for any commercial potential, the likely success of such commercialisation, the existence and form of the IPR, the stage of development and the appropriate form for protecting those rights
- Attend to regulatory requirements (e.g. IPRPFRD Act and associated referrals to NIPMO) on behalf of the parent institution
- conduct evaluations on the scope of statutory protection of the Intellectual Property in all geographic territories subject to commercialisation potential of the IP
- attend to all aspects of statutory Intellectual Property protection, transactions and

commercialisation.

In addition, the TTO could adopt other functions including (Capart and Sandelin, 2004):

- facilitate the transfer of institution-based creations into new products and services for public use and benefit
- promote regional economic growth and job creation
- provide the best return on investment in research and development
- transfer technology for public benefit
- reward, retain and recruit suitable staff and graduate students
- create and expand relationships with industry and to negotiate Intellectual Property

transactions

- fulfil the legal functions related to research contracts and Intellectual Property transactions

- generate royalty income for the TTO, Intellectual Property creators and the institution
- generate new R&D funding support for the institution and/or its staff from sponsored research funding, consulting opportunities and donations of funds or equipment
- operate as a service centre to the institution, its staff and students on all areas related to Intellectual Property, including providing seminars and consulting services when requested
- actively facilitate entrepreneurship and foster the formation of start-up companies.
- Provide training programs and workshops to researchers, faculty, and students on intellectual property, technology transfer processes, and entrepreneurship.
- Implement strategies to assess and manage the risks associated with technology transfer, including legal, financial, and reputational risks.
- Establish key performance indicators (KPIs) to measure the success and impact of the TTO's activities
- Develop mechanisms for resolving conflicts of interest that may arise in the course of technology transfer, especially in cases involving multiple stakeholders.

2.2 Revenue Streams and Expectations

TTOs are able to earn revenue from a number of activities related to technology transfer and service, including license income (milestone payments), royalty income, technical services, sale of equity in start-up companies, and materials transfer agreements (this is unusual, however). In addition to these commercial revenues, TTOs are also able to raise research funds or funds for the incubation of emerging technologies, mostly on behalf of the research performers within their institutions. For instance, a TTO might be able to raise funds from the Department of Science and Technology or the Technology Innovation Agency (South Africa) to support the ongoing development of a particular product or service whose commercialisation would otherwise not have been possible. Additionally, TTOs may be supported through a share of the revenue received from administering short courses, consulting activities or a 'top slice' off the value of a research contract concluded.

Average revenues from TTO activities in the USA, UK and Japan, expressed as a percentage of research expenditure, have been given in Table 1; this pattern of income is similar in other countries (McMillan Group, 2016; Abrams et al., 2009; Heher et al., 2007) with many institutions indicating that their TTOs are loss-making entities. In a comprehensive review of USA-based TTOs, Abrams et al. (2009) reported that only the very large research universities are able to run self-sustaining or profitable TTOs. More than 75% of the small/very small universities (classified as having research budgets less than \$100 million which is the case for the average Southern African HEI) reported loss-making TTOs and in general less than 16% of university-based TTOs in the US were self-sustaining. In the small/very small cohort, none of the TTOs were self-sustaining. Abrams et al. (2009) concluded that "this leads to the surprising conclusion that the Bayh-Dole Act has been an unfunded mandate on academic institutions, and that academic institutions need to invest in their technology transfer operations in order to bring the benefits of their research to society".

There are two important aspects to this discussion on revenue expectations. Firstly, the likelihood of being profitable as a TTO is an unlikely, even random event, which has been described as "[winning the lottery](#)". Revenues from patent portfolios are on average lower

than the costs of developing a patent portfolio, although some TTOs have been able to cover their costs many times over as a consequence of the licensing of perhaps only one or two successful patents. In other words, highly profitable licensing and venturing is a process with an uncertain outcome, and the extent of return cannot be reliably predicted. The success rate of patents can be improved with skilled patent management, but it remains what is called a stochastic event, much like winning the lottery, as has already been mentioned.

Several factors contribute to the revenue stream of TTO's: The extended time-to-market is a significant hurdle, with the process of transferring technology from research to market often taking years. This extended timeline encompasses the development, patenting, and successful commercialization of a technology, during which the TTO may incur expenses without immediate returns. Additionally, establishing and operating a TTO involves substantial upfront costs, including expenses for hiring specialized staff, legal fees associated with patenting, and administrative expenditures. These initial costs may outweigh the revenues generated during the early stages of technology transfer.

High failure rates among start-ups created through technology transfer activities present another challenge. Start-ups, especially in their early stages, are prone to facing high failure rates. If a considerable portion of the TTO's activities involves start-ups that do not succeed, the office may experience financial losses. Limited funding for technology development poses a constraint, as universities may face budget limitations for investing in the development and proof-of-concept stages of technologies, impeding the TTO's ability to advance technologies closer to market readiness.

Furthermore, not all technologies developed by universities may experience immediate or widespread commercial demand, resulting in a slow uptake by industry partners or investors and delaying revenue generation. Challenges in valuing Intellectual Property add complexity, making it challenging for TTOs to negotiate favourable licensing deals or attract external investment. Complex licensing negotiations, often involving royalty payments, equity shares, or other intricate arrangements, can be time-consuming.

Secondly, the motivation for establishing a TTO should not be linked to institutional return; although some offices are able to cover their costs with licensing and other revenues, this is more the exception than the rule (Rasor and Heller, 2006). As noted in many articles, the financial benefits of HEI-based technology transfer are located mainly at the national level in the form of new economic activities, and not at the institutional level (Public and Corporate Economic Consultants (PACEC), 2012; Heher et al., 2007). In particular the PACEC study (2012) of funding for innovation activities in the UK's HEIs concluded that for every £1 of funds invested, £6 was returned in the form of additional income to the university and the total benefit to the economy and society considerably exceeded this level (Public and Corporate Economic Consultants (PACEC), 2012). As a consequence, it is argued that the use of public funds to support TTOs in addition to HEI-based research, is fully justified.

Table 1. HEI TTO activity for the USA, UK and Japan (2013/14)

Item	US (AUTM)	UK (HE-BCI Survey)	Japan (UNITT)
Total Research Resource, A (GBP million)	35,722	7,043	14,715
Intellectual Property Income (including sales of shares in spin-offs; GBP)	1,290	131	18
Intellectual Property Income (% of A)	3.6%	1.9%	0.12%
Spin-Off Companies Formed	747	147	18
Research Resource per Spin-Off (GBP)	47.8	47.9	818
Patents Granted	5,163	976	4,776
Research Resource per Patent (GBP)	6.9	7.2	3.1
Industrial Contribution to Research (GBP)	2,330	508	64
Fraction Industrial Research of A	6.5%	7.2%	0.4%
Cashed-In Equity (USA) or Sale of Spin-Off Share (UK) B(GBP)	20	49	3.6
B as % of A	0.06%	0.70%	0.02%

Source: McMillan Group (2016)

2.3 Steps for Incubation and Establishment of a Technology Transfer Office

There are different approaches to the establishment of a TTO depending on the size of the institution and the expected level of disclosures. In most cases, it is recommended that an institution should start at a small scale, then grow the scope and size of the office as the Intellectual Property portfolio expands. This process is referred to as TTO incubation and is covered in the next section. Thereafter, the steps for the establishment of a TTO as a formal structure are outlined.

2.3.1 Incubating the Office

Even on a limited budget, it is possible to perform at least some of the important functions of the TTO office, including developing the institutional policies for invention disclosure, assessment, Intellectual Property management and benefit sharing. Although it is important

to appoint at least one or two core staff, a number of creative approaches can be followed to reduce the costs of the TTO's functions including:

- using volunteers, alumni, students or interns to establish the office's administrative functions
- sharing overhead costs with other departments such as the Research Management Office
- building support with the faculty staff using clear and regular communication strategies
- carefully managing patent costs using more limited patent filings but comprehensive approaches to patent applications
- outsourcing those functions where the use of full-time personnel is not yet justified
- adopting cost-effective approaches to interacting with the potential licensee community (broadly defined as the local absorptive capacity).
- Digital Automation and Technology Tools: Implement digital tools and automation to streamline administrative processes, reducing the need for manual interventions and lowering operational costs.
- Flexible Work Arrangements: Utilize flexible work arrangements, such as remote work or part-time positions, to optimize workforce management and reduce office space requirements.

2.3.2 Establishment of the Office as a Separate Structure

The main steps in the establishment of a TTO are outlined in the NIPMO publication on "Office of Technology Transfer: Best Practices Manual" (NIPMO, 2014). The following steps are suggested:

- organisation-wide consultation and agreement on the mission statement
- formation of Advisory Committees: Establish advisory committees comprising internal and external experts to provide guidance on technology transfer strategies, industry trends, and best practices.
- outline of the TTO scope of services including its role in the innovation value chain of the institution and its responsibilities under the IPRPFRD Act
- definition of the income (business) model
- identification and appointment of qualified personnel
- securing of the initial budget and facilities
- development of a register of professional services as may be required.

The identification and appointment of personnel is a critical item. According to the NIPMO manual (NIPMO, 2014: p 25):

"Technology transfer is essentially a human talent-based business. This implies that the staff comprising the OTT is the greatest asset in the overall process. The staff structure and functions of an OTT should be strongly influenced by the size, range of activities and budget of the OTT ...

Some of the key skills include: technology literacy, business development expertise, Intellectual Property law including patent law (although this skill is generally sourced

externally), companies law, legal and contract management, financial management, Intellectual Property management, marketing strategies, negotiation and deal brokering, licensing knowledge, ability to deal with multiple constituencies, problem solving skills and outstanding written/verbal communication skills.”

However, the literature is divided on which skills should be core (in-house) and which skills can be outsourced. The NIPMO manual further elaborates on this question:

“An OTT can typically have an OTT Director/Technology Transfer Manager, an administrative assistant, a licensing specialist, an attorney (either in-house or contracted from outside), and in some cases student workers. Because an OTT’s daily operations relate

to a number of different technology fields, an OTT should have access to internal and/or external specialists for advice (technical and non-technical), an advisory panel, hired consultants, Intellectual Property attorneys, licensing specialists, marketing specialists, database specialists and drawing and design specialists. An OTT team should thus consist of problem solvers with excellent communication skills, who are good negotiators”

There are a number of possible TTO structures although the conventional structure defines two separate departments, Intellectual Property (case) management and commercialisation, where the former includes invention disclosure assessment, patent applications, prosecution and maintenance, and the latter includes market research, valuation, licensing, seed funding and business plan review.

2.4 Key Success Factors for Technology Transfer Offices

The key success factors for TTOs and more broadly, for technology transfer from institutions to industry, have been extensively investigated and reported in the literature. The most important factors include the following:

- A highly productive research system in the parent entity which delivers a broad spectrum of new knowledge containing significant breakthroughs in key areas
- Clear mission statement and support from top management
- Effective policies and sufficient authority/autonomy
- Talented and motivated staff
- Sufficient budget to build an Intellectual Property portfolio; specifically, to fund patent attorneys on matters relating to Intellectual Property registration, and provide seed investment to understand markets, build prototypes, conduct techno-economic studies, and position Intellectual Property for innovation funding
- Strong administrative support.

In a comprehensive quantitative study of the efficiency of Portuguese TTOs using a well-defined performance framework, Teixeira and Monteiro (2016) observed that TTOs are more successful if they are located within an appropriate university culture, where the latter includes a tradition of applied research, patenting and publication. Other important factors include strong ties with local industry and the existence of regional science parks. The study concludes that the most important factor is to promote further “the interaction between universities and industry so as to increase the flow of real, productive, market value technology transfer deals and venture creation” (Teixeira and Monteiro, 2016).

Similar sentiments have been expressed in earlier studies including the involvement of, and higher royalty shares for, faculty in the licensing process, a decentralised management style, a university-wide emphasis on knowledge dissemination and well-funded TTOs (Siegel et al., 2007; Wright, 2007; Phan and Siegel, 2006). In the opinion of Siegel et al. (2007), the three key players in the technology transfer process (academics, TTO employees and commercial partners) have wide disparities in the motives, perspectives and cultures relating to technology transfer, and understanding how to manage the disparities is key to the success of the overall process. Apart from managing the communication issues, being sensitive to the cultural differences, and having an appropriate royalty distribution formula, it is important to

avoid significant government constraints on licensing practices and to find the optimum TTO organisation structure for a given context. In terms of an ability to launch start-ups, the literature considers that the three key determinants are TTO resources, the strength of university/industry networks, competency in identifying licensees and the participation of faculty in the licensing process.

Siegel et al. (2007) conclude that success of TTOs is led by the adoption, within the institutions' management, of a strategic approach to the commercialisation of IP, including the definition of stages of development, modes of commercialisation, technology fields of emphasis, strategies for collaboration, patent strategies and the appropriate promotion and remuneration systems which values the contribution of academics to the commercialisation activities of their institutions.

2.5 Key Metrics for Managing Technology Transfer Offices

TT activities incur costs and as a result need to be managed or at least monitored in order to report to stakeholders and ensure, as far as this is possible, that TTO services are effective and efficient. A number of key metrics have been developed in this regard, including the research resource per patent, or per spin-off, or per invention disclosure (see Table 1 for indicative values of these indicators).

Table 2. AUTM metrics for licensing survey

Metric	Units	Average Value (2014)
Total Research Expenditure	\$ million	62,800
Total License Income	\$ million	2,729
Running Royalties	\$ million	1,694
Cashed-In Equity	\$ million	108
Legal Fees	\$ million	368
Sales from Licensed Products	\$ million	26,100
Number of Institutions	No	191
Number of Disclosures	No	24,066
Number of Patents	No	6,300
Number of Licenses	No	6,900
Number of Active Licenses	No	42,015
Start-Ups Formed	No	914
Average Research Expenditure	\$ million/institution	329
Number of Disclosures	\$ million/disclosure	2.6
USA New Patent Applications	\$ million/application	4.5
USA Patents Issued	\$ million/patent	10.0
Licenses Executed	No/no patents	1.1
Active Licenses (Cumulative)	No/\$ million license income	15
Spin-Off Companies	\$ million/start-up	69
License Income/Research Expenditure	%	4.3%
Sales/Research Expenditure	%	42%

The annual survey of the Association of University Technology Managers (AUTM) is a leading publication in this regard (for instance see the Association of University Technology Managers (2015)). The survey uses a number of metrics, some of which are listed in Table 2.

Key metrics not listed in Table 2 include the number of TTO staff and the TTO expenditure. These values can be used to normalise the institutional outputs and hence derive additional metrics of TTO productivity e.g. number of disclosures per TTO full-time equivalent or number of license deals per TTO expenditure. Using data from a collection of sources, this comparative information has been generated and is shown in Table 3. Although the comparison indicates a lower unit throughput for South African institutions (disclosures/ full-time equivalent), it must be remembered that many of these institutions are still at the very initial stages of their operations, and have yet to build operational TTOs. As a result, the comparison is not yet a valid process and is included in this manual only as an initial benchmarking for local institutions.

Table 3. Comparison of South African and USA TTO metrics (2016)

Metric	RSA	USA	Ratio
R&D Expenditure (USD million)	507	46,439	1.1%
Cost TT (USD million)	5	372	1.3%
Fraction of R&D Expenditure	1%	1%	
FTE Cost (USD/FTE)	71,429	150,000	
TT (FTEs)	66	2,477	2.7%
Disclosures	310	25,000	1.2%
Disclosures/FTE	5	10.1	
Unit Cost (\$1,000s/disclosure)	16.1	14.9	108%

Nazeem Mustapha and Gerard Ralph produced a critical review of national indicators and implications for future measurement in the study “Effectiveness of technology transfer in public research institutions in South Africa: A critical review of national indicators and implications for future measurement” published in the [African Journal of Science, Technology, Innovation and Development](#), 2024.

These national indicators have not been formally implemented, should they be mentioned here?

Interestingly the McMillan Group (2016) study concluded that HEIs that do more research do more technology transfer. Beyond this, it considered that “metrics are insufficiently sensitive to identify the right policies to achieve high performance”. In particular, focussing on spin-outs or any other single metric as a measure of success in knowledge exchange gives a distorted picture as universities need to pursue the most appropriate route to impact for the particular research/technology (McMillan Group, 2016).

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Chapter 3. Intellectual Property Management

This chapter covers the overall process of Intellectual Property management in the TTO, including the steps of developing an initial Intellectual Property strategy, invention disclosure, patent applications, patent registration and licensing. Much of the content has been reproduced from the NIPMO Manual (NIPMO, 2014), with additional material sourced where indicated. Readers are referred to the original material for more detail if required.

It is important to appreciate that the commercialisation of the knowledge within an invention disclosure can take place through means other than the conventional registration and licensing of Intellectual Property. As indicated in Figure 5, commercialisation can take place through the sale of know-how (as a technology package), or the establishment of a spin-out company with or without the formal registration of IP. Indeed, the use of the Intellectual Property route is often avoided due to its high cost and the danger of the information being made publicly available without any recourse to prosecution. The latter would apply particularly to the development of know-how whose use would not be evident from the final product or service as delivered to a market.

Figure 5. Commercialisation options

Low Strategic Fit	Sell as Technology Package	Register Intellectual Property and License to Existing Company
High Strategic Fit	Retain as a PRHEI-Based Service (e.g. Consultancy or Analytical Service)	Spin Out Company with (Partial) PRHEI Ownership
	Low Net Present Value	High Net Present Value

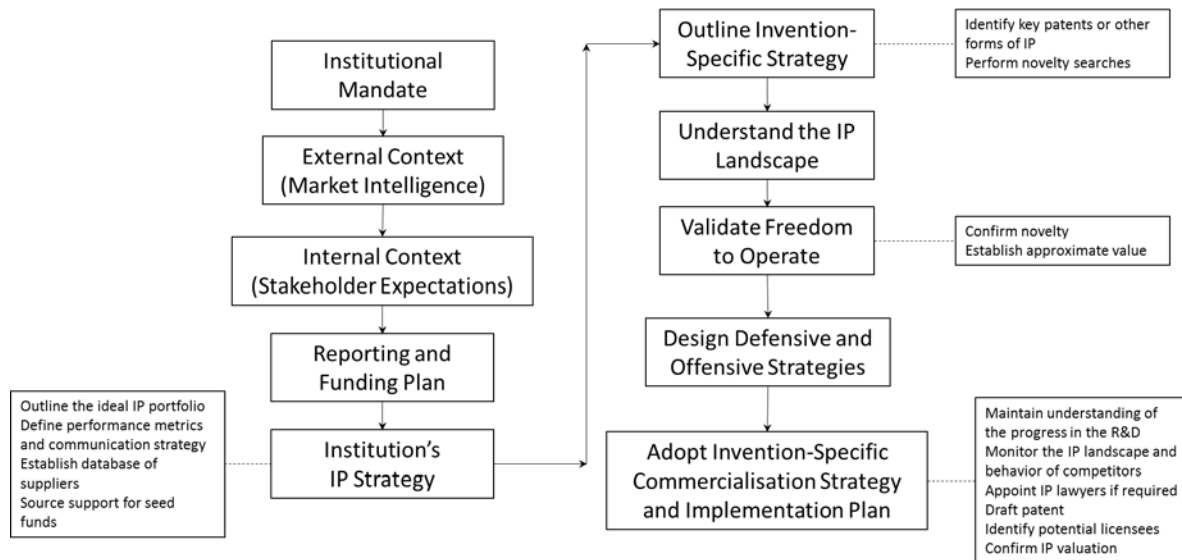
In summary, an invention-specific commercialisation strategy should be considered as a necessary antecedent to the Intellectual Property strategy as covered in the next section. Furthermore, this commercialisation strategy is not a static perspective but should be continuously updated as more information on the invention becomes available. Intellectual Property registration and licensing is a relatively expensive and highly time-consuming route to the commercialisation of new knowledge. Although it carries potential higher returns, due diligence of the available options should be undertaken before this route is chosen.

3.1 Intellectual Property Strategy

The Intellectual Property strategy forms the core of the TTO's approach to its overall management of IP arising in the parent institution. The strategy needs to be formulated at two distinct levels, namely the organisational level (the general approach of the institution to Intellectual Property management) and on

an invention-specific basis (the strategy for the protection and exploitation of the intellectual assets of a specific invention). The relationship between the two stages, and the overall process for the invention-specific case is shown in Figure 6.

Figure 6. Developing the Intellectual Property strategy



The institutional strategy must cover the following aspects:

- Outline of the ideal Intellectual Property portfolio; the profile should cover number of patents, areas of specialisation, location of licensees, license income, annual patent expenditure, sources of income, policies in respect of spin-outs and institutional ownership, risk profile, management of institutional liability and preferred service providers.
- Definition of the performance metrics; preferably the metrics should cover both institutional needs and the requirements of stakeholders (government/NIPMO/SARIMA) including the need for national benchmarking.
- Database of suppliers; the supplier list, to be used for the implementation of the invention-specific strategies, needs to include Intellectual Property lawyers, market researchers, valuation experts, strategy consultants and domain experts.
- Seed funding; resources to support the initial commercialisation or product development of PRHEs will be required and it is important that the strategy indicates how these funds could be sourced.

Once the guidance of an institutional strategy is available, it is easier to develop invention-specific strategies, the process for which is covered in Figure 6 and described in the next sections of this chapter.

A core consideration of all patent strategies is to decide whether to pursue a defensive or offensive approach (or both). An offensive patent strategy is designed to build barriers to block competitors from gaining entry to the proprietary technologies. This strategy demands filing patents as soon as is practicably possible. If the TTO decides to file a large number of patent applications (thereby trying to create a patent thicket to keep competitors away) it may lead to high costs of patent maintenance. However, this offensive patent strategy may

potentially also derive large licensing incomes, so this must be weighed against the costs of maintenance. These offensive strategies tend to be more important in highly competitive fields such as bio-pharmaceuticals.

A defensive patent strategy, on the other hand, requires that patents are filed primarily to ensure that innovations can be practically used, for example in research, without competitors also entering the field of study, which may also then be published. With a defensive strategy, filing and maintenance fees will be small, but the patent owner will not gain royalties from licensing the patents.

An institution can also choose to adopt a strategy that falls in between offensive and defensive, a hybrid strategy, depending on the field and the type of the technology in question. A defensive patent strategy can be combined with a strong trade-secret portfolio, or a large number of in-licensed technologies. An offensive patent strategy can be used to demonstrate innovations to industries and markets.

3.2 Building and Managing the Intellectual Property Portfolio

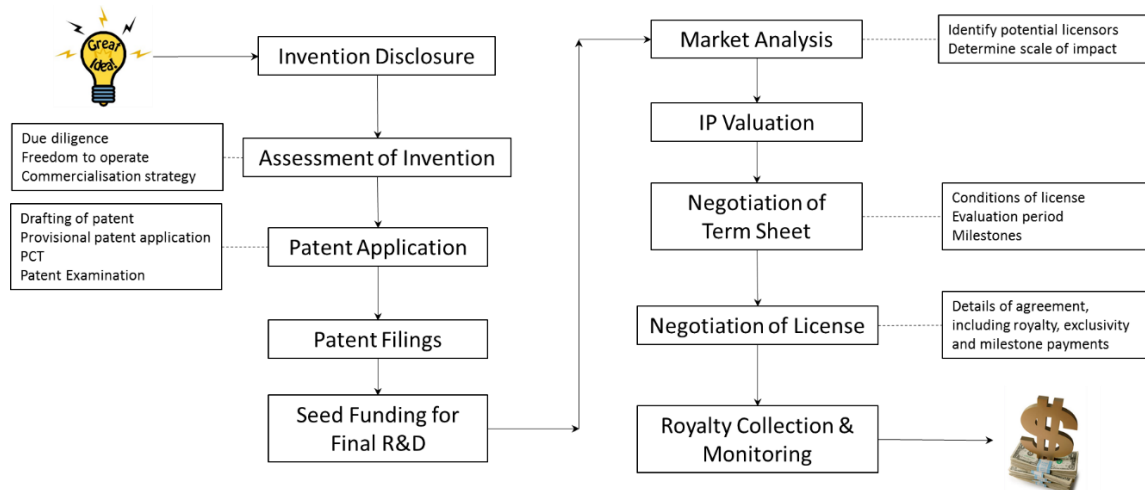
Once an Intellectual Property strategy has been defined, it is vital to establish a strong Intellectual Property portfolio consisting of the collection of selected invention disclosures (after an appropriate assessment, evaluation and selection process), patent drafting and prosecution tactics, licensing and commercialisation strategies that support the desired end use of the Intellectual Property assets.

Although the establishment of the Intellectual Property portfolio is undertaken by the TTO, it cannot be done in isolation and requires the cooperation of and contribution from members of Faculty or the research performance units of a PRI. Means of encouraging this input is covered in more detail in 7.1 of this Guide, but at this point, we note that a proactive approach will increase the likelihood of receiving high quality invention disclosures. In this regard, the following possible initiatives are suggested:

- Host regular and frequent information seminars at Faculty and Department level
- Provide Intellectual Property creators with training on typical Intellectual Property rights in their field (what can be protected); how to screen their work for protectable IP; how to handle inventions in order to fully capture the value of their Intellectual Property rights
- Guide the Intellectual Property creator by explaining the invention disclosure process, questions, evaluation criteria
- Share information obtained from industry contacts on their challenges and needs for innovation.

The process of technology transfer through invention disclosure, patent protection, marketing, licensing and royalty collection is now discussed. It is noted that this route is only one of several approaches to technology transfer, where the latter may include transfer as a trade secret, formation of a spin-out company and licensing of know-how, and full public disclosure. The overall process for the patent-based route is shown in Figure 7.

Figure 7. Patent-based technology transfer



Although Figure 7 depicts patent-based technology transfer as a sequence of distinct steps, it is advisable to allow for a number of decision points between the steps, thereby introducing a process which is analogous to the Stage/Gate methodology of research management. For instance, it is advisable to have a gate following the invention assessment, at which point a decision can be made as to whether the patent application should be pursued. Other points for gate review could be at the conclusion of the patent application, and the outcome of the Patent Cooperation Treaty (PCT) prior to national filings.

3.3 Invention Disclosure

The Invention Disclosure, also known as a Technology Disclosure or Innovation Disclosure, is a written notice of invention to the TTO and initiates the formal technology transfer process. It is a confidential document which should describe as fully as possible the invention to allow the TTO to make the correct assessment and decision on the various commercialisation options to be evaluated and pursued.

In terms of Section 5(1)c of the IPRPFRD Act:

“a recipient of public funds for R&D must ensure that personnel involved with the research and development make a disclosure to it within 90 days or such longer period as may be prescribed, of identification by such personnel of possible Intellectual Property and before any Intellectual Property is made public.”

Questions in the disclosure should typically address the technical, contractual and commercial aspects of the invention as well as any issues that may impact its legal protection. The disclosure should also list all sponsors of the research, public disclosures of the invention and any other information necessary to begin pursuing protection and commercialisation activities.

The basic information that should be contained in an invention disclosure includes:

- Technology Description

- Technical description of the invention
- Is there a prototype?
- Detailed description of the prior art and inadequacies of the same. (It may be necessary to do a prior art search)
- Market
 - Typical end-users?
 - Potential licensees?
 - Potential competitors?
 - What problem it proposes to solve and/or need it intends to fulfil?
 - Estimation of market size and share the new technology could attain.
- Public Disclosure
 - Past and Future
 - Technical papers, posters, meetings, reports to funding agencies, etc.
- Funding
 - Who financed the research?
 - Are there any agreements governing the funding?
 - Are there statutory requirements (e.g. IPRPFRD Act)
 - Plans for upcoming funding?
- Contribution
 - Identify all inventors and their relative percentage contributions
 - Contact details of each inventor.

An invention disclosure should be submitted well in advance of the invention being made public through publications, poster sessions, conferences, press releases, or other communications. Once publicly disclosed (i.e. published or presented without cover of a non-disclosure agreement), an invention may have restricted or minimal potential for patent protection, registration of a design, or obtaining a plant breeder's right.

Once a disclosure has been submitted, the TTO must arrange to interview the inventor and discuss in detail the invention, including issues such as competitors, commercial applications and markets, future work and useful references that may assist with additional information. The TTO must then review the disclosure, coordinate the disclosure review process and assign an individual to serve as the inventor's main point of contact throughout the technology transfer process. The following guidelines are suggested for this process:

- Simple, online forms (approximately one or two pages when printed) with concise and clear questions are more likely to encourage inventors to submit disclosures for review
- It is advisable for an TTO to have a standard operating procedure (SOP) in place to ensure the immediate review of such disclosures as soon as they are received and to contact the inventor should disclosure reveal that a public disclosure is imminent
- Protocols for innovators, who may not have the time to complete the disclosure forms, may help avoid the loss of commercially viable inventions and/or the business of good innovators.

A template for an Invention Disclosure Form is provided in the Supplementary Material to this Guide.

3.4 Assessment of the Disclosure

The next step in the technology transfer process is the assessment of the Invention Disclosure. It is a critical part of the overall procedure; a thorough and accurate assessment may prevent, on the one hand, subsequent unnecessary expenditure on patent fees and the associated time-consuming processes of marketing and licensing, and on the other hand, it will reduce the likelihood of overlooking the significant economic potential of an apparently spurious disclosure.

The key actions in the assessment are as follows:

- Understand the Intellectual Property landscape in the field of invention
- Perform novelty searches to help in this understanding and assess the general freedom to operate (can the Intellectual Property be protected?)
- Assess all public disclosures of the invention (if any) to determine their potential impact on protectability
- Assess whether the Intellectual Property will be of benefit and contribute to the socio-economic needs/competitiveness of your country (is there a market for the Intellectual Property?)
- Alternatively, estimate the extent to which failure to seek such Intellectual Property protection will undermine the socio-economic needs of your country
- Identify the forms of Intellectual Property protection, statutory or otherwise, that are most appropriate for the Intellectual Property in question
- Decide on the most appropriate commercialisation strategy for the Intellectual Property
- Assess the costs and advantages of the various possibilities for protection
- Determine the extent of readiness of the Intellectual Property for protection and whether any additional R&D needs to be undertaken before Intellectual Property protection can be obtained
- Decide whether the Intellectual Property should be placed in the public domain.



It is noted that in the event that the assessment concludes that protection of publicly-funded Intellectual Property generated from an R&D activity will not be pursued, the releasing of this Intellectual Property to the public domain requires prior NIPMO approval, which can be processed through the submission of the IP1 form entitled “Referral of Intellectual Property and Release Form”.

A template for an Invention Disclosure Assessment Form is provided in the Supplementary Material to this Guide.

More details on Freedom to Operate searches are provided in Appendix Two.

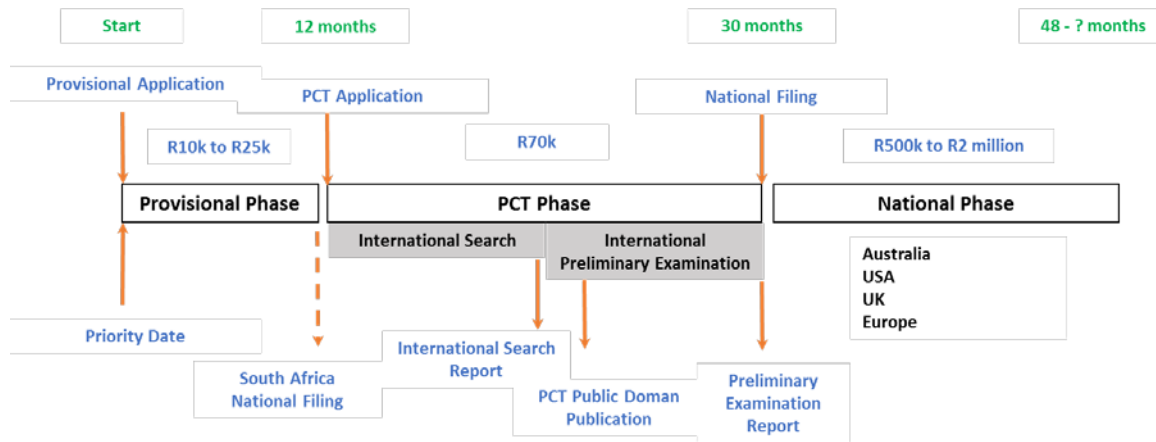
3.5 Patent Applications

Once the invention disclosure has been assessed and it has been decided to pursue the registration of a patent, the patent needs to be drafted and submitted as a patent application.

In most cases, these important activities need to be undertaken by a qualified patent attorney, mostly an outsourced agent appointed by the TTO.

This application is only the starting point of a number of steps as outlined in Figure 8.

Figure 8. Patenting application steps, timelines and costs



In approaching the first step, namely the patent application, the TTO/ patent attorney should firstly determine how soon the application needs to be filed. This is a critical decision; patent laws have different and strict requirements regarding when an application must be filed with respect to various events such as the first date of attempted commercial exploitation or the first date of public disclosure, such a scientific journal publication.

In preparing the application, the patent attorney will need to obtain the following information from the TTO:

- Details on the invention itself including laboratory notes where relevant
- Jurisdiction (countries) in which the TTO wishes to protect the invention
- Any information (such as public disclosure) that would impair the inventor's ability to protect the invention in the desired countries
- Any information on the intentions of the inventor to do something (e.g. publish the research findings) that may jeopardise patentability in the desired countries.
- Information on inventors and / or collaborators from other institutions.

The provisional patent must contain sufficient information and data concerning the invention to be able to serve as fair basis for a later, complete patent application. These applications are not examined by a patent office; they are checked to see that formalities are met and then an official filing number and date are issued. The filing date of the provisional application is referred to as the priority date.

A provisional application remains under lock and seal at the South African Patent Office and is not published. Within one year a decision must be made on whether to advance to the next stage², which is to seek patent protection in various countries by filing a complete patent

² If the patent applicant is not ready to proceed with their patenting program at the end of the one-year period and the invention is still confidential, i.e. not known to the public, then the provisional application may be

document (called a “complete specification”) accompanied by claims which define the invention and the monopoly sought (equivalent to the property description in the Title Deed for land).

The patent attorney will then proceed to draft the patent. A complete patent application includes two components:

- the first part, known as the “specification,” describes the invention (where necessary with reference to drawings). It is similar to the text of a journal article but also includes a summary of the invention comprising single-sentence paragraphs called consistory clauses;
- the second part, known as the “claims” provides the legal description of the inventive property right sought to be patented. The wording of the claims often corresponds directly to the consistory clauses.

Further details now follow.

3.5.1 Patent Specification

A patent specification is a document describing the invention for which a patent is being sought and sets out the scope of the protection of the invention. A complete specification typically contains a title, an abstract, a section detailing the background and overview of the invention, a description of the invention and embodiments of the invention and claims, which set out the scope of the protection. A specification may include figures to aid the description of the invention. Each patent office has rules relating to the form of the specification, defining such things as paper size, font, layout, section ordering and headings. Such requirements vary between offices.

3.5.2 Patent Claims

A patent’s claims determine its scope and all aspects of an invention that are not covered by the claims are not considered to be patented and could be exploited with no legal risks.

The Section 32 of the South African Patents Act (Act 57 of 1978) requires that a patent specification contain the following:

1. *Every specification shall indicate whether it is a provisional or a complete specification, and shall commence with a title sufficiently indicating the subject-matter of the relevant invention.*
2. *A provisional specification shall fairly describe the invention.*
3. *A complete specification shall:*
 - a. *Have an abstract as prescribed;*

allowed to lapse and be re-filed; however, in this case the original priority date will be lost and a new priority date – the date of re-filing of the provisional application - will come into play.

- b. Sufficiently describe, ascertain and, where necessary, illustrate or exemplify the invention and the manner in which it is to be performed in order to enable the invention to be performed by a person skilled in the art of such invention; and*
 - c. End with a claim or claims defining the invention for which protection is claimed.*
- 4. *The claim or claims of a complete specification shall relate to a single invention, shall be clear, and shall be fairly based on the matter disclosed in the specification.*
- 5. *Drawings and illustrations, if any, shall be as prescribed in the Section 32 (5) of the Patents Act.*
- 6. *If a complete specification claims as an invention a micro-biological process or a product thereof and requires for the performance of the invention the use of a micro-organism which is not available to the public on the date of lodging of the application and which cannot be made or obtained on the basis of the description in the specification, the micro-organism shall be dealt with in the prescribed manner (Section 2 (1) of the Patents Amendment Act, Act 44 of 1986).*

In order to be patentable in South Africa, a “claimed” invention must be novel and inventive (non-obvious) useful. In plain English: novelty means that the exact invention was not previously known to exist in the public domain anywhere in the world and inventiveness means that the invention would not have been obvious to the average skilled worker in your technological field having regard to the state of the art existing immediately before the priority date. Another way of saying this is that an invention is non-obvious if the gap between what pre-existed in the public domain (known as the “prior art”) and your claimed invention would not have been bridged by the average skilled worker in your technological field with a reasonable expectation of success employing existing technology. Utility means that the invention has a real-world application, i.e. function, e.g. treating disease.

Novelty does not imply that a wholly new product, process or branch of technology has to have been developed. Often inventions consist of small, incremental improvements over what has gone before (providing the above three requirements of novelty, inventiveness and utility are met).

3.5.3 Claiming Priority

A patent application may claim priority from another previously filed application in order to take advantage of the filing date of information disclosed in that earlier application. Claiming priority is advantageous because the earlier effective filing date reduces the number of prior art disclosures, increasing the likelihood of obtaining a patent.

In terms of the Section 33 of the South African Patents Act (Act 57 of 1978):

- 1. *The priority date of an invention to which an application for a patent relates, and also that of any matter contained in any such application, whether or not such matter is the same as the invention shall, except as otherwise provided in this Act, be the date of the lodging of the application.”*
- 2. *Where priority is claimed in an application from one or more prior applications, or one or more prior applications in a convention country or countries, or both, and the invention claimed in the application is fairly based on matter disclosed in one or more*

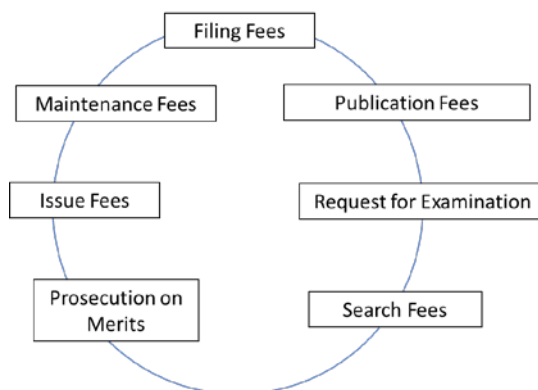
of any such prior applications, the priority date of the invention shall be the date of lodging of the earliest of such prior applications.

3. *Any invention claimed in an application may have one or more priority dates.*
4. *Until the contrary is proved, the priority date of an invention shall be the earliest priority date claimed in an application per Section 33 (5) - In determining whether an invention claimed in an application is fairly based on the matter disclosed in a prior application or a prior application in a convention country, regard shall be had to the disclosures contained in all documents lodged at the same time as and in support of that prior application or prior application in a convention country. Section 33 (6) - The priority date of new matter introduced by way of a supplementary disclosure in terms of section 51 (8) shall be the date of lodging of the supplementary disclosure.*

3.5.4 Costs of Patenting

Filing a patent application incurs cost and in some cases, these costs can be appreciable. In all cases, the TTO should consult beforehand with its patent attorneys to establish the costs, and thus be able to budget for the fees and costs involved. The actual cost of filing a patent application at the South African Patent Office is relatively minor (about R10,000 to R25,000, as shown in Figure 8). However, the costs of preparing a country filing are considerable and it is important that the TTO should budget accordingly. The fees that may be associated with the application, examination and prosecution lifecycle are highlighted in Figure 9.

Figure 9. Typical stages of the patent prosecution and associated fees



Each of the fees may have an associated cost for professional services (e.g. patent attorney fees), and in some instances the professional service fees will be higher than the government filing fees. Some of these fees, such as request for examination fees, are not charged in every country. In many jurisdictions, there are no specific government fees for prosecution on merit. Nevertheless, prosecution on merit may incur significant professional fees as this is the phase where the patent attorney is performing tasks such as reviewing prior art cited by the patent examiner and amending the claims to overcome the cited prior art. In certain instances, applicants may need to translate their priority application into the language of countries where protection is being sought. Given the technicality of such documents, translation costs can be high. These can be substantial if protection is being sought in several countries which require translation.

3.6 Patent Examination and Filings

Before the patent application (the first step of the process as shown in Figure 8) has expired, a decision needs to be taken on how to progress national filings. This step is referred to as ‘patent prosecution’ and covers the process of writing and filing the patent and then pursuing protection for the patent with the Patent Office. Prosecution may include indicating to a patent examiner distinctions between the claimed invention and the prior art cited by the patent examiner, as well as amending the pending claims in the application to further highlight distinctions over the prior art. During prosecution, the patent examiner looks for reasons not to allow the claims of the patent in light of what is available as prior art.

Patent prosecution is distinct from patent litigation, which describes legal action relating to the infringement of patents. The date of issue of a patent effectively terminates prosecution of a specific application, after which continuing applications cannot be filed, and establishes the date upon which infringement may be charged.

One option in respect of patent prosecution is to proceed with a national filing in South Africa. However, the South African Patent Office does not substantively examine patent applications, which means that patents filed in the office have little international standing. As long as the administrative requirements are met, patents are usually granted. The responsibility thus rests on the patentee to ensure that they have an enforceable right following the patenting process. Lack of a substantive examination system places a responsibility on the TTO to ensure that the patented invention will have the required rights for the commercialisation strategy selected.

In order to provide protection internationally, it is generally essential that the patent is examined and granted within the jurisdiction of an examining office. For this reason, South African inventors generally follow the PCT route, which involves submitting a PCT application and then requesting an International Search Report and a Preliminary Examination Report (see Figure 8). More details on the PCT process now follow.

3.6.1 Patent Cooperation Treaty

The Patent Cooperation Treaty (PCT) is an international treaty that is administered by the World Intellectual Property Office (WIPO)³. The PCT has the advantage of allowing one to simultaneously file for patent protection in a large number of countries by filing a single “international” patent application in one language. During the PCT phase (18 months) a search is conducted by the International Searching Authority (ISA) and forms the basis of a written opinion as to the patentability of an invention (this is useful as it can indicate the value, in terms of likely strength of the application, to investors or commercial partners). There is also an opportunity to amend the claims appropriately before proceeding to the PCT Preliminary Examination, performed by the International Preliminary Examining Authority (IPEA). Thereafter, a formal PCT Examination Report will issue, which is another useful indicator of the likelihood of a

³ The source of the material in this section is gratefully acknowledged (University of Cape Town. 2015. Inventors Guide. University of Cape Town (Cape Town).

patent application being eventually granted. This examination process has a number of advantages:

- It gives one a good idea of how strong the claims are and which ones are likely to attract objections.
- By selecting the European Receiving Office, one often finds that the same examiner is appointed for the ensuing European patent application, so it speeds up the process as one already knows their opinion/stance.
- One is also dealing with a single office during this 'refinement' process rather than a multitude of national offices.

Due to the cost and timing issues (backlogs at the patent offices) PCT Examination is seldom pursued at present. The PCT process does not in itself grant patents and there is no such thing as an 'international' patent, but the PCT is a precursor to national filing.

ARIPO

The ARIPO (African Regional Intellectual Property Organization) route offers a streamlined process for patent protection in multiple African countries. By filing a single application through ARIPO, applicants can seek patent protection in member states, including Botswana, Eswatini, Lesotho, Liberia, Malawi, Namibia, Rwanda, São Tomé and Príncipe, Sierra Leone, Sudan, Tanzania, Uganda, Zambia, and Zimbabwe. This route can be cost-effective and efficient, especially for those seeking patent protection in several African countries. A successful ARIPO application results in the issuance of a single patent, which can then be validated in the selected member states, reducing administrative burdens and costs compared to filing individual applications in each country.

OAPI

The OAPI (African Intellectual Property Organization) route provides a simplified process for obtaining patent protection in 17 French-speaking African countries. By filing a single application through OAPI, which is located in Cameroon, applicants can seek patent protection in member states such as Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Comoros, Congo, Côte d'Ivoire, Gabon, Guinea, Guinea-Bissau, Equatorial Guinea, Mali, Mauritania, Niger, Senegal, and Togo. This approach offers advantages in terms of cost savings and administrative efficiency, as it allows for the issuance of a single patent that is effective across multiple countries, rather than having to file separate applications in each jurisdiction.

3.6.2 National Filing

The final stage of the patenting process is the national filing (and prosecution), which results hopefully in the granting of a patent in a specific geographic jurisdiction, such as the USA or UK. National Phase filings are ideally steered by a commercial partner and are selected based on whether the country represents a significant market, or location for manufacture. This is a once-off opportunity, as once the deadline has passed, additional national phase applications cannot be made at a later date.

Prosecution of the national phase is a lengthy process, usually taking 2-5 years. Once the examination process has successfully concluded, there is an opportunity to file divisional applications for any claims that may have been set aside due to so-called "multiple invention"

findings of the Examiner. In the US, a national phase or divisional application may also be taken further in the form of a “continuation-in-part” application.

3.6.3 Office Actions

Communications from a patent office examiner to the TTO’s patent agent/attorney are called office actions or examination reports or official actions. The office action may address almost any aspect of the patent application from its title to the length of its abstract. Some office actions address the patentability of the application. They may reject all of the claims in the application, reject some and allow some, or allow all claims in the application. Sometimes claims are allowed with conditions.

The office action is essentially the Patent Office’s official position on the pending patent application which then requires a reasonable and comprehensive response from the patent attorney. Responses are developed in collaboration with the inventor and the TTO and usually subject to specific deadlines. Extensions to the stipulated deadlines are possible, at a fee, which escalates as the extension period increases. The patent agent/attorney may, in the response to the patent examiner, propose to limit the scope of some of the claims to overcome the objections made by the patent examiner.

Upon receiving the response, the patent examiner will assess the arguments provided and amendments proposed and may issue a second office action should he/she be of the opinion that the patent application does not satisfy all the requirements to obtain a granted right. The process of issuing an office action and providing a response may be repeated until either the patent examiner agrees to allow the applicant's pending claims or until the applicant decides that no meaningful claim coverage can be obtained and abandons the application. For financial/administration reasons many patent offices do not allow the office action/response cycle to continue too many times before payment of additional fees is required. If the patent examiner does not find the response to the final office satisfactory and consequently disallows some or all of the proposed claims, the TTO in conjunction with the patent attorney has a further option either to file for an appeal against the decision of the patent examiner or to file for part of the patent application to proceed with the patent prosecution also known as a continuation application. The option of filing a continuation application is not available to the applicant in all jurisdictions. The specific procedures followed in appeals vary from country to country.

3.7 Patent Assignments

There are three broad channels for commercialisation of IP:

- a. Selling or assigning ownership of the Intellectual Property related to the technology to an existing company. This requires NIPMO approval in cases where the Intellectual Property has been derived from publicly financed R&D activity
- b. Licensing the IP/technology to an existing company
- c. Starting a new company, or spin-out (and assigning or licensing the Intellectual Property to the new company/spin-out).

Each option is now covered in more detail.

3.7.1 Selling or Assigning Ownership of the IP/Technology

This commercialisation channel could be a viable solution in the following situations:

- When there are major companies who control the market and who may make starting a competitive business very difficult.
- When the technology could offer a competitive advantage to one of these major companies, who may offer to buy it in order to improve their products and services.
- When there is only one market in which the technology could be commercialised, or when one company in particular is an ideal target for the technology.

A key disadvantage to selling the technology is that, once sold, the TTO and inventor will no longer have any influence in how the technology is used or commercialised. The inventor may lose the right to use the IP, even for research or teaching purposes, unless it is part of the assignment agreement. In active R&D fields the TTO should always try and retain the right to use the Intellectual Property for continued R&D activity in the institution, and possibly also to secure contract R&D opportunities from the assignee.



It should further be borne in mind that NIPMO approval is required for assignment of all Intellectual Property generated from publicly financed R&D. An IP4 entitled “Local Assignment of Intellectual Property” or an IP5 form entitled “Off-Shore Assignment of Intellectual Property” should be sent to NIPMO for approval prior to the assignment taking place. The TTO must further indicate the following on the Intellectual Property forms:

- IP4 – Local Assignment: reasons why the assignment is in the public interest⁴, or why the Intellectual Property cannot be commercialised through other means.
- IP5 – Off-Shore Assignment: reasons why there is insufficient capacity in the South Africa to develop or commercialise the Intellectual Property, or why the Intellectual Property cannot be commercialised through other means.

Furthermore note that offshore assignment of Intellectual Property from South Africa is subject to the regulations of the South African Reserve Bank (SARB) regarding exchange control. This means that any transfer of Intellectual Property rights, such as patents, trademarks, or copyrights, from South Africa to a foreign entity must comply with the SARB's rules and procedures. These regulations are designed to ensure that the transfer of Intellectual Property does not have a negative impact on South Africa's balance of payments or its ability to manage its currency. Entities seeking to assign Intellectual Property offshore must obtain approval from the SARB, which may involve providing documentation and demonstrating that the transaction is in accordance with the exchange control regulations.

3.7.2 Licensing a Technology to an Existing Company

Licensing a technology could be a practical solution in the following circumstances:

- When the technology applies to a variety of different markets, it can be licensed to different partners who will commercialise in each of these markets and potentially create multiple revenue streams.
- Unlike selling or assigning the technology, the licensee can be granted only specific rights.
- When the inventor wants to commercialise, but does not have the resources or interest to develop a new business.
- When the market opportunity is too small to warrant the creation of a new company.



It should be noted that NIPMO approval is required prior to entering into any licence (local and off-shore) in the following instances:

- a. the consideration payable by a licensee to a recipient is not determined on an arms-length basis;
- b. a recipient grants a licensee rights to commercialise its Intellectual Property on a royalty-free basis; or
- c. the licensee falls into the categories referred to in paragraphs (a) and (b), and is granted a right to sub-licence on a consideration determined on an arms-length

basis in the case of paragraph (a) or for a royalty in the case of paragraph (b).

A motivation must be provided on an IP8 form as to why a royalty-free licence is to be granted to a collaborator or third party or why the Intellectual Property in question will not be commercialised.

Prior to an exclusive licence being entered into NIPMO approval must be obtained by the submission of an IP6 form entitled: “Off-Shore Exclusive Licence of Intellectual Property”. The

⁴Including motivation that the assignee will commercialise in the Republic and the products will be readily available for the people of the Republic; what remedies are in place should the Intellectual Property fail to be commercialised, and that the assignee will assume the reporting obligations under the IPRPFRD Act.

applicant must further indicate why there is insufficient capacity in the Republic to develop or commercialise the IP; or why the Intellectual Property cannot be commercialised through other means.

3.7.3 Commercialisation via a Start-Up Company

The Intellectual Property can either be licensed or assigned to a start-up company. This commercialisation channel could be a feasible solution in the following circumstances:

- The market potential for the opportunity is worth the added risk.
- The inventor(s) has the desire to participate in maximising the value of the technology.
- The inventor(s) wishes to consult with an experienced business person who can lead the company.
- The inventor(s) has contacts to work with a business team established by the TTO to commercialise the Intellectual Property and access to other support and resources.
- Attempts to license the technology have been unsuccessful. In some instances, the decision to establish a start-up is based upon the stage of the technology or in instances where it is radical innovation.

Licensing is preferable as should the start-up company fail, the Intellectual Property remains owned by the institution and can be licensed to a new party. Sometimes investors want the Intellectual Property to be assigned to the company to a) have the Intellectual Property recognised as an asset within the company and b) for the licensor-assignor to also share in the risk by taking equity, rather than obtaining an assured royalty via a license.

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Chapter 4. Valuation, Marketing, Licensing and Revenue

4.1 Patent Valuation and Royalty Calculations

The value of a patent which has not yet been licensed is usually estimated following an assessment of its commercial potential, where the latter consists of the three elements of technological viability, market viability and legal viability (NIPMO, 2014). The two aspects of technology and market are often combined into a single techno-economic assessment (TEA) which provides an estimated net present value for the Intellectual Property based on the calculation of future cash flows.

Methodologies for TEA are specialised and beyond the scope of this Guide. However, there is general information available at the following sources:

- World Intellectual Property Organisation's [List of Documents on Intellectual Property Valuation](#); there are multiple documents on this site, all of which are useful documents although there is much duplication (WIPO, 2018)
- Park, CS. 2004. *Fundamentals of Engineering Economics*, 3rd ed. New York: Pearson/Prentice Hall
- Hartman, J.C. 2007. *Techno-Economics and the Decision-Making Process*. Upper Saddle River, NJ: Prentice Hall
- Newman, D.G. et al. 2009. *Engineering Economic Analysis*. 10th ed. Oxford: Oxford University Press
- Walwyn, D. R., Huddy, S. M. & Rybicki, E. P. 2015. Techno-economic analysis of horseradish peroxidase production using a transient expression system in *Nicotiana benthamiana*. *Applied Biochemistry and Biotechnology*, 175(2), pp 841-854
- Triki, Z., Bouaziz, M. & Boumaza, M. 2014. Techno-economic feasibility of wind-powered reverse osmosis brackish water desalination systems in southern Algeria. *Desalination and Water Treatment*, 52(7-9), pp 1745-1760
- Kaldellis, J., Vlachou, D. & Korbakis, G. 2005. Techno-economic evaluation of small hydro power plants in Greece: a complete sensitivity analysis. *Energy Policy*, 33(15), pp 1969-1985.

In developing the necessary background material to inform such a study, it is important that the TTO assembles information on the sources of economic advantage which may be offered by the invention. These could include:

- Offering lower costs
- Avoiding hazardous manufacturing conditions
- Enhancing product differentiation
- Delivering a sustained technology lead
- Offering a pioneering product with first-to-market advantages
- Adding value to other IP
- Delivering a new industry standard
- Offering a direct substitute for other successful products
- Stretching existing market boundaries

Another advantage of the TEA is the use thereof in directing further R&D. The TEA can identify the critical parameters of an invention that require further improvement or definition in order to derive full economic benefit. For instance, the yield of a biological product in a new biotechnology-based process may need to exceed a certain minimum before the product can compete successfully in the pharmaceutical market. Such information is vital in being able to attract investors and licensees to the IP.

4.2 Market Research in Support of IP

The goal of this research is to determine the market strength of the invention and determine to whom the registered Intellectual Property could be licensed. The TTO, with the cooperation of the inventor, should carry out an initial assessment of the market before investing any funds in Intellectual Property protection. Once a decision has been made to proceed with the invention, an in-depth market analysis and marketing plan should be developed.

The main items in this plan should include:

- Review the advantages and disadvantages of the invention as compared to existing products/services in the marketplace.
- Determine the market size and the ability to capture market share, including unexpected or unlikely uses and markets for the invention.
- Package the invention, target it to the market, design the value proposition for the technology and prepare an opportunity prospectus or non-confidential marketing summary for potential licensees.
- Identify, with the inventor's input, potential licensees.
- Contact potential licensees to determine their interest in taking a license to the invention.
- Investigate issues that may affect the value of the technology to a potential licensee, such as development needs and the associated costs.
- Determine the best way to commercialise the technology, i.e. license to an existing company or to a start-up. Only certain inventions may justify the formation of a start-up; the TTO can determine whether a start-up is the best option by analysing a variety of factors including:
 - The potential of the technology to provide a platform for multiple market/product opportunities
 - The competitive environment
 - Limited interest of existing companies in licensing the technology
 - Availability of venture capital, together with the interest and track record of likely investors
 - Level of commitment of the inventor(s) to the commercialisation process
 - The presence of a true business "champion" for both the technology and the new venture
 - The management team of the proposed start-up.

Important questions to answer in the development of this plan, and which should be answered by the market research, include the following:

- Is the technology unique in the market or is it one of many similar technologies? How

easily can the technology be reproduced?

- What are the strengths and weaknesses of the technology and how does this

compare with alternatives in the market?

- Are there any limiting factors which may affect the technology's effectiveness?
- What are the adaptability and adoptability aspects of the technology?
- Are alternative technologies being developed, and, if so, how soon are they likely to come to market?
- Will scaling up the technology be feasible, or will it lead to serious problems, when operation levels increase?
- Does the technology allow for the development of next generation products based on market demands or will the next major product revision require a complete technology alteration?
- How much time and money is necessary to transfer the technology and put it into operation?
- Does the technology require particular production equipment, maintenance capabilities and specially prepared personnel to meet targeted objectives?

The development of a marketing plan is one of the most critical elements in deriving revenue or economic benefit from the invention (in the form of licensing income) or attracting additional funding for the ongoing R&D. A good marketing plan and particularly a positive valuation for the Intellectual Property will be helpful in securing both licensees and funding. Furthermore, the involvement of the inventor during the marketing phase can increase the efficacy of the process, as companies are often very interested in the inventor's vision of the discovery, its details and its applications.

The TTO does not need to wait for protection to be granted to begin promoting a technology to prospective licensees. For instance, it is possible and acceptable to license a patent application to a company (so marketing efforts can begin immediately) after the application is filed if certain precautions (e.g. confidentiality agreements) are put in place.

4.3 Commercialisation Strategy

Following the market research, the TTO, with the assistance of the inventor, should develop a strategy for the commercialisation of the IP. This will require:

- A comprehensive assessment of the potential market
- Development of a marketing plan:
 - Urgency: How immediate is the need for the product? (e.g., old movie rentals vs. new movie premieres)
 - Market Size: How large is the potential customer base? (e.g., niche hobbies vs. widespread needs like cancer treatments)
 - Pricing Potential: What is the maximum price customers are likely to pay? (e.g., lollipops vs. aircraft carriers)
 - Cost of Customer Acquisition: How much effort and cost does it take to gain one customer? (e.g., restaurants on highways vs. government contractors)
 - Cost of Value-Delivery: What are the costs associated with delivering the product or service? (e.g., digital files vs. manufacturing physical products)
 - Uniqueness of Offer: How distinctive is your offer compared to competitors, and how easily can it be replicated? (e.g., common services like hair salons vs. rare services like

- private space travel)
- Speed to Market: How quickly can the product or service be available to sell? (e.g., lawn mowing vs. opening a bank)
- Up-Front Investment: How much initial investment is required? (e.g., housekeeping vs. gold mining)
- Up-Sell Potential: Are there additional products or services you could sell to the same customers? (e.g., razors and shaving accessories vs. Frisbees)
- Evergreen Potential: How much ongoing effort is needed to keep selling the product? (e.g., business consulting vs. selling a book)
- Financial calculations including the budget required for technology development and commercialisation and projected income from the IP
- Development of the preferred business model (start-up, license to existing company, etc.)
- Risk assessments
- Commercialisation routes, actions and funding sources.

A decision on the most suitable commercialisation path for a particular invention will require consideration of several key aspects including the financial returns, the financial and technical risk, the availability of potential licensees, the predicted value of the business and the level of resources/expertise which will be required to complete the final stages of development. In a useful publication on commercialisation, the Department of Trade and Technology (South Africa) provides the following advantages and disadvantages of the various options (see Table 4).

Table 4. Advantages and disadvantages of commercialisation options

Option	Advantages	Disadvantages
Exclusive Licensing to Established Company	- Instant availability of required resources - Understanding of regulatory and other market requirements - Access to well-established network of potential partners for innovation - Established client base - Able to raise funds and access debt financing - Generous milestone payments can be negotiated - Claw-back clauses can be negotiated in the event of non-performance	- Established companies can be inflexible and slow to respond - There may be conflict with an existing part of the company's business with the result that the technology is not commercialised - Loss of control over the technology and involvement by the inventor - Less lucrative than inventor-led commercialisation - Potential for leakage of Intellectual Property due to vulnerability over employees of other companies - Royalty-based payments which depend on revenue from product sales - Licensee may insist on expensive further development
Spinout (with partial ownership)	- Allows the commercialisation of Intellectual Property for which there are high potential returns when there are no available licensees, or when there are multiple applications, or when competition is limited. - Allows the incubation of the IP/company in order to increase the chance of success - Greater control over the future of the IP - Flexible nature of small company allows quick response and changes - Greater return if successful due to equity ownership - Can strengthen the parent research institution and allow new platforms	- High uncertainty regarding market absorption and acceptance (lack of track record) - Need to source the skills for commercialisation and market development - Need to raise financing without underlying assets - National and international regulatory requirements can be difficult to navigate and establish compliance - Longer time to commercialisation and profitability - Revenue depends on profitability and not revenues
Non-Exclusive License	- Allows for multiple applications and hence multiple royalty streams - Diversifies risk (not depends on the prospects of a single licensor) - Can retain geographic exclusivity and access to most lucrative markets - More compliant with IPR Act (Act No 51 of 2008) - Retains ongoing institutional involvement due to possibility of further licensing	- Lower royalty as a percentage of revenue - Less attractive to licensee
Sale of Techn	- Instant payment for IP - No further product development	- Limited option to benefit from unforeseen revenues - No claw-back possibility

Option	Advantages	Disadvantages
	No patent registration fees	Limited protection; if the sale falls through the confidentiality can be lost
	No commercialisation risk	

Source: adapted from Department of Trade and Industry (2016)

4.4 Marketing IP

Once the market research and commercialisation strategy have been considered, the actual marketing of the Intellectual Property can commence. This step has been described as the 'rate-limiting step of the technology-transfer process' (Patent Foundation, 2004), although in reality it is the securing of an Intellectual Property buyer, following a successful marketing campaign, that is probably more rate-limiting. Marketing is generally undertaken by direct contact with prospective licensees although there are some web-based sites which offer marketing to a range of clients (such as www.yet2.com). There are three important steps in this process:

- A non-confidential disclosure or summary of the invention must be shared with the client.
- If there is sufficient interest, this information must be followed by the signature of a confidentiality agreement, also called a confidential disclosure agreement or a non-disclosure agreement (NDA)
- Once the NDA is signed, full details on the invention can be provided together with a draft term sheet indicating the requirements of the licensor. The latter documents form the basis of the licensing negotiations which are covered in the next section.

4.5 Licensing IP

4.5.1 Aims and Context

Technologies, products and processes can generally be licensed out at various stages of development. The aim of the licensing process is to ensure that:

- the technology is developed to completion and put into commercial practice
- there is a fair return to the inventor and other parties
- the technology is returned to the TTO should the licensee not pay the minimum license fees or achieve the specified performance milestones.

The objective when negotiating a technology licensing agreement is to set the basis for a mutually satisfactory and ultimately rewarding future relationship. That is, a 'win-win' outcome as opposed to a 'win-lose' outcome. Some important guidelines to consider include:

- Aim for a 'win-win' outcome - License agreements invariably involve long-term technical, commercial and personal relationships. Hence, for the arrangement to be successful all parties need to be satisfied with the agreement reached. A dissatisfied party will often go to great lengths to rectify a perceived injustice and, when this happens, the grief, for one if not both parties, is likely to surpass all the previous benefits.

- Establish the maximum (or best) position, and the minimum (or worst) position in respect of each issue - This is part of preparing for the negotiation and identifying and ranking the issues of importance to oneself, as well as anticipating those likely to be important to the other. It requires the negotiator to be satisfied that, in agreeing to a position that is less than the minimum, there are good reasons.
- Aim high, but protect your credibility - It is possible to accept a lesser position whereas the converse (to increase an offer) is usually impossible. It is all very well to aim high, but not so high that the offer is not realistic. Generate variables or create alternatives to achieve a better deal. Trade variables that are cheap for you but valuable to the other party; this is the best outcome.
- Everything is negotiable - Nothing is cast in stone. Identify a cut-off point where you are prepared to walk away from the deal.

It is considered that the greater the amount of development done on a technology before licensing, the higher the income that can be commanded from licensing fees and royalties. The major advantage of licensing is that the responsibility (and costs) for manufacturing, selling, distribution and even further development of the technology/product/process can be transferred to the licensee. If licensing is the most appropriate route for commercialisation of the Intellectual Property in question, the TTO, with the assistance of the inventor, should identify potential licensees or commercial partners to develop and commercialise the IP.



In line with the requirements of Section 11(1) of the IPRPFRD Act, preference should be given to non-exclusive licensing, parties that seek to use the IP in ways that provide optimal benefits to the economy and quality of life of the people of South Africa, BBBEE (broad-based black economic empowerment) entities and small enterprises. Exclusive licence holders must undertake, where feasible, to manufacture, process and otherwise commercialise within the Republic of South Africa. If a holder of an exclusive licence is unable to continue with the commercialisation of the Intellectual Property within South Africa during the duration of the license and the recipient wishes to retain the exclusive license, the recipient must furnish NIPMO with full reasons for retaining exclusivity (i.e. NIPMO approval is a requirement for off-shore exclusive licences (IP6 form)). NIPMO may request that the exclusive licence be converted to a non- exclusive licence if a recipient fails to furnish the reasons within the required period, or if NIPMO is not satisfied with such reasons.

The marketing process itself sets the licensing value (fees/royalties) of the technology. Factors include:

- Degree of interest shown by prospective licensees
- Estimated cost of the research which led to the discovery
- The projected cost of development needed to complete the product
- The scope of the license (exclusive vs. nonexclusive; nationally vs. worldwide; narrow vs. multiple fields of use, etc.)
- Royalty rates for similar products.

Upon identification of a suitable licensee, a license agreement is prepared to grant a company the right to develop and commercialise an invention. Depending on the findings of the assessment stage, the invention may be licensed to an existing company or as part of the process of forming a new company. In structuring partnership agreements with licensees, the TTO must negotiate terms that benefit all the parties concerned and must cover the key elements of a license agreement including:

- Provisions governing the scope of the license (whether exclusive or non-exclusive rights will be granted);
- The breadth of the field;
- Reporting and diligence obligations of the licensee; and
- Royalty considerations payable to ensure that fair value will be received based on future sales of any licensed products.

4.5.2 Basic Elements of a Licence Agreement

The basic elements of a licence agreement must cover the following:

- The identity of the parties
- The subject of the license
- The licensor's obligations
- The licensee's obligations
- The common obligations of both parties
- The terms and conditions of a licence agreement including
 - Geographic range of the license
 - Royalties
 - Performance requirements and reporting by the licensee
 - Registering the license with relevant entities
 - Confidentiality
 - The rights of inventors regarding publication
 - Reservations of rights for the institution to use the IP/technology for research and educational purposes
 - Protecting the research institution from liability
 - Insurance held by the licensee.
 - Definition of the agreement's lifespan, renewal options, and termination conditions, such as breaches or unmet performance benchmarks.
 - Detail regarding the intellectual property rights being licensed, including the type of intellectual property and whether the license is exclusive, non-exclusive, or sole.
 - An indication of whether the licensee can sub-license to third parties and the terms for doing so.
 - An outline of each party's indemnification responsibilities, including legal defences and liability for damages from third-party claims.
 - Specific methods for resolving disputes, such as arbitration or litigation.
 - An indication of the legal framework governing the agreement and jurisdictional considerations.
 - Conditions under which the agreement can be assigned or transferred.

- Guarantees about the IP's validity, ownership, or non-infringement.
- Audit Rights for the licensee to audit compliance with financial and performance terms.
- Indication of how notices should be given, including contact details and delivery methods.
- Terms for handling unforeseen events beyond the parties' control, impacting agreement obligations (Force Majeure).
- Conditions under which sublicensing is permitted.

Other goals that the TTO may seek to accomplish in development of a package of considerations include:

- The licensee should fund the patent application either through an up-front fee for reimbursement of costs already incurred or through a requirement for reimbursement of ongoing expenses;
- Required minimum annual royalties after a specified period of time regardless of actual sales; and
- Performance milestones to assure that the technology actually enter the market.

4.5.3 Exclusive License

Under an exclusive license, a, for example, patent owner transfers all circumstances of ownership to the licensee only retaining the title to the patent. From the point of view of the patent owner, she/he surrenders all rights under the patent (including the right to sue for infringement and the right to license) to the licensee. However, the exclusivity can be limited by a field of use i.e. the patent will not be licensed to anyone else in a stipulated field of use, or by jurisdiction.

Exclusive licenses are often considered where the licensee must make a significant investment. For instance, where technology is licensed at an embryonic stage an exclusive license can help encourage a licensee to make the necessary investment to develop the technology to the point of commercialisation and protect the knowledge. If an exclusive license is justified, the following are strategies to limit some of the potential negative aspects:

- The exclusivity of the grant can be made dependant on the licensee achieving certain minimum royalty payments or performance milestones.
- The exclusivity need not last for the same term as the agreement and can be limited to a shorter time period during which the licensee can establish the business (a “head start” provision).
- The exclusivity can be for only some of the grants of the agreement or only with respect to certain technologies. Or the license grant can be exclusive only within a specified field of use.



It should be borne in mind that NIPMO (and South African Reserve Bank) approval is required for offshore exclusive licences. An IP6 form entitled “Off-Shore Exclusive Licence of Intellectual Property” should be submitted to NIPMO prior to an exclusive licence being concluded. The TTO must further indicate on the IP6 form why there is insufficient capacity in the Republic to develop or commercialise the IP; or provide reasons why the Intellectual Property cannot be commercialised through other means⁵.

The process for South African Reserve Bank approval is covered in Section 4.5.6.

4.5.4 Non-Exclusive and Other Forms of License

A non-exclusive license is one that does not preclude the licensor from transferring to other licensees the same information or contractual rights or from exercising those rights itself.

Other forms of licenses include:

- Sole – exclusive license wherein the licensor also retains the right to practice the licensed subject matter

⁵The licensee must be capable of developing the Intellectual Property further (if required) and commercialising the IP, the agreement must ensure that benefits of the Intellectual Property are accessible to the Republic on reasonable terms, that the State is granted an irrevocable and royalty- free licence for the health, security and emergency needs to the Republic, and NIPMO may require a licence to be granted to any person in any field should the Intellectual Property not be commercialised and an agreement for commercialisation cannot be reached.

- Co-Exclusive – carry exclusive features, licensor agrees to issue a specified number of licenses
- Option Agreement – in return for payment, the licensor allows a specified evaluation period of the technology where the licensee can decide whether or not to acquire the technology.

4.5.5 Forms of Agreements

Inter-Institutional Intellectual Property Agreement (IIA's)

Also known as Intellectual Property Management Agreements, IIA's are used in cases where an invention is jointly made by inventors from different institutions. It sets out which party will take the lead on patenting and licensing the resultant Intellectual Property as well as various other terms such as the payment of legal fees and collection of royalties. For instance, an TTO from University A may enter into an inter-institutional agreement with an TTO from University B when researchers from those two institutions need to collaborate on a project.

Letter of Intent (LOI)

A letter of intent provides a company with a time-bound negotiation period in which to negotiate a license agreement. It is typically used in instances where the company would like to "lock up" Intellectual Property rights while conducting due diligence or speaking with investors and other potential partners¹⁰⁴. An LOI is also referred to as a Memorandum of Understanding (MOU).

License Agreement

License agreements describe the rights and responsibilities related to the use and exploitation of Intellectual Property developed by an entity. License agreements usually stipulate that the licensee should diligently seek to bring the Intellectual Property into commercial use for the public good and provide a reasonable return to the institution and the inventors.

Material Transfer Agreements (MTA)

These agreements are used to govern the sharing of tangible research materials (e.g. experimental animals, antibodies, computer chips, etc.) between institutions, typically for research or evaluation purposes. Intellectual property rights can be compromised if materials are used without a proper MTA. A sample outbound MTA is attached in the Supplementary Material.

Non-Disclosure Agreement (NDA)

NDAs are also referred to as Confidentiality Agreements and Secrecy Agreements. These agreements are often executed at the outset of discussions to protect the confidentiality of an Intellectual Property creation e.g. during the evaluation of the technology by potential licensees. NDAs may also be signed to protect proprietary information of third parties that an institution's researchers may need to review in order to conduct research or evaluate research opportunities. The party holding the Intellectual Property creates the agreement with edits by the receiving party being limited. A sample Confidentiality Agreement is included in the Supplementary Material.

Option Agreement

Also known as a Commercial Evaluation License, an option agreement provides a company a time-bound right to obtain a full license agreement by “exercising” the option to obtain this license. These agreements are normally used in instances where the company would like to do further research and development to evaluate the technology prior to entering into a full license agreement. One of the primary differences between an option and license agreement is that the former does not allow the company to commercially market and sell the technology. Accordingly, these agreements have smaller financial terms and are for a short duration. If the licensee finds the technology meets their needs, then the parties will generally negotiate a new exclusive or non-exclusive Intellectual Property or technology commercialisation license. Because of its limited duration, an option agreement is a useful mechanism in dealing with start-up companies and their inherent uncertainties. It gives the hopeful licensee an opportunity to secure funds and attract other resources needed for commercialisation, and it gives all parties time to evaluate the technology and to establish trust.

Pipeline Agreement

A pipeline agreement is normally encountered in contracts involving the formation of a university spinout company. Under these circumstances, the university (or its TTO) would have assigned (with NIPMO approval) or licensed certain Intellectual Property to the spinout. A pipeline agreement is essentially a sophisticated form of option agreement, the purpose of which is to set out the rights the spinout has to future Intellectual Property generated in the founder’s department. Under such an agreement, the recipient of the option (the spinout company) is obtaining a “pipeline” to enable it to obtain rights in the Intellectual Property from the originating university department.

Sponsored Research Agreement

Sponsored research agreements are used when companies fund a research project (conducted by researchers at a university or research institution) to develop a technology to the point that it can be commercialised. It spells out various items such as the scope of work of the project, project control, reporting requirements, publishing rights, Intellectual Property ownership rights, licensing rights, the budget and various other conditions and legal terms. The research agreement may include an exclusive right of first refusal to license the invention and any new inventions that come directly from the contracted R&D work. TTOs are requested to refer to the NIPMO Guideline on Ownership of Intellectual Property.

Standstill Agreement

Standstill agreements are used to allow negotiating parties to agree to a temporary halt to remove pressure from the negotiations and provide some room for working out the agreement. One form of a standstill agreement can be seen when two parties, engaged in negotiations, agree not to enter into negotiations with a third party. This type of agreement is intended to expand the scope for negotiations, and to avoid situations in which one side or the other feels pressured to act quickly or lose out on the deal.

Unfunded Research Collaboration Agreement

An unfunded research collaboration agreement spells out the terms and conditions associated with a collaborative project between a company and a university or a research institute. Unlike a sponsored research agreement, this agreement does not include a provision for funding from the company.

Visiting Scientist Agreement (VSA)

Visiting scientist agreements (VSAs) are signed by people from outside institutions or companies who will be doing work at a research institution. They should be put in place before the visiting scientist starts at the institution and must spell out issues such as the scope of the project, ownership of any resultant Intellectual Property and how long the scientist will be at the institution.

4.5.6 Approval by Other Regulatory Authorities

Licensing agreements may need the approval of regulatory authorities other than NIPMO. For instance, in South Africa all international license deals (which have a foreign exchange implication) must be approved by the [South African Reserve Bank](#) (see below). In the European Union, there are competition regulations which restrict the granting of exclusive rights. It is recommended that the advice of patent attorneys be requested in such instances.



The export of Intellectual Property from South Africa has been regulated since the introduction of the Exchange Control Regulations in 1961 (as promulgated by Government Notice R.1111 of 1 December 1961 and amended up to Government Notice No. R.445 in Government Gazette No. 35430 of 8 June 2012). The two cases of out-licensing and in-licensing are now considered separately.

Out-Licensing

The regulations require that a South African resident wishing to assign or export Intellectual Property, whether registered or unregistered, to a foreign entity must obtain prior approval from the South African Reserve Bank. The term “capital” was originally defined as cash and money, which, when exported out of SA, required the approval of the SA Reserve Bank.

In the 2017 Budget Review, the National Treasury announced that Intellectual Property exchange control would be [relaxed](#). Based on Exchange Control Circular No 7/2017, the following amendments were made:

- Authorised Dealers⁶ (legal entities which act under agreement with the National Treasury in order to deal in Intellectual Property for the sole purpose of facilitating foreign exchange-related transactions) may approve upon request by South African resident individuals and/or corporates to sell, cede or transfer Intellectual Property to unrelated third- party non-residents for a fair and market related price provided the dealer confirms the basis for the sale price.
- Similarly, Authorised Dealers⁷ may approve upon request by South African resident individuals and/or corporates to license South African Intellectual Property to unrelated third-party non- residents for a fair and market related royalty provided the dealer views the license agreement and confirms the basis for the sale price.
- Finally, the sale, transfer, assignment and/or licensing is subject to the appropriate tax treatment.

⁶ Previously only the Reserve Bank could grant this approval

⁷ Previously only the Reserve Bank could grant this approval

The actual quote from the Budget Review stated:

“Government proposes that companies and individuals no longer need the Reserve Bank’s approval for standard Intellectual Property transactions. It is also proposed that the “loop structure” restriction for all Intellectual Property transactions be lifted, provided they are at arms-length and at a fair market price. Loop structure restrictions prohibit residents from holding any South African asset indirectly through a non-resident entity.”

In-Licensing

The Exchange Control Manual requires that:

- the acquisition of any patents, copyrights, trademarks, franchises and/or Intellectual Property in general requires prior Exchange Control approval
- agreements by South African companies to pay royalties, licence and patent fees to non-residents in respect of the local manufacturing of a product, are subject to the approval from the Department of Trade and Industry
- agreements by South African companies to pay royalties, licence and patent fees to non-residents, where no local manufacturing is involved, are also subject to the approval of Exchange Control
- any royalty payment eventually made to the non-resident licensor must be substantiated by an auditor’s report confirming the basis of calculation and that it is in terms of the agreement.

In its consideration of the application, the Department of Trade and Industry considers all cases based on the following factors:

- the strategic importance of the product;
- the economic importance of the product in the furthering of industrial development by means of import replacement, export promotion or expansion of the domestic market and its contribution to the national income and employment;
- the new technological know-how entering the country through the manufacturing process in question;
- the domestic content of the particular product;
- the financial interest of the licensor in the local venture;
- the duration of the contract; and
- the nature of any restrictions contained in the agreement, e.g. on the exportation of South Africa products.

Authorised Dealers may approve applications by South African residents to make payments in the prescribed manner to persons outside the Common Monetary Area in respect of royalties and fees per title on cinematograph films/video’s, records reproduced and musical works sold under licence in the Common Monetary Area, subject to certain conditions as accepted in the trade which specific information is available from the Authorised Dealer.

Authorised Dealers may approve, against the production of documentary evidence applications by South African residents to effect payment of fees due in respect of non-residents brought to South Africa for the specific purpose of installing or repairing specialised machinery and equipment or for commissioning and supervising the installation thereof as well as training local personnel in this connection.

The above [changes](#) are likely to make the raising of international funding and the investment by foreign Intellectual Property holders more attractive. Given the dynamic nature and complexity of the regulatory environment, it is highly recommended that further advice is obtained from legal experts should in- or out-licensing be under consideration.

4.6 Revenue

The way in which any income or revenue arising from the licensing or sale of Intellectual Property is disbursed, is critical to the success of the TTO function and may be covered by legislation, where the latter varies from one country to another. In South Africa, the following information is provided.



Section 1 of the IPRPFRD Act defines revenue as:

“all income and benefits, including non-monetary benefits, emanating from Intellectual Property transactions, and includes all actual, non-refundable royalties, other grant of rights and other payments made to the institution or any other entity owned wholly or in part by an institution as a consideration in respect of an Intellectual Property transaction, but excludes a donation and ‘gross revenues’ shall have a corresponding meaning”.

The TTO should be responsible for ongoing monitoring of license agreements and administration of any income arising from the Intellectual Property. This income could include:

- Evaluation fees
- Milestone payments
- License fees
- Royalty income
- Outright sale of IP
- Sale of commercial ventures built around the IP
- Sale of shares in such commercial ventures
- Dividends derived from such commercial ventures
- Commissions.

The distribution of income derived from Intellectual Property must be in accordance with the institution’s Intellectual Property policy. Section 10(2) of the IPRPFRD Act, sets out the minimum benefit sharing requirements for Intellectual Property creators at an institution and their heirs as:

“a) at least 20 percent of the revenues accruing to the institution from such Intellectual Property for the first one million rand of revenues, or such higher amount as the Minister may prescribe; and

b) thereafter, at least 30 percent of the net revenues accruing to the institution from such Intellectual Property.”

Section 10(5) of the IPRPFRD Act stipulates that:

“the recipient may distribute the balance of the revenues generated by Intellectual Property as it deems fit, but must apportion part of it for funding, among other things—

- a. more research and development;*
- b. the operations of the OTT of technology transfer, and*
- c. statutory protection of Intellectual Property.”*

4.7 Dispute Resolution

In the event of a dispute, various options are available to resolve the matter including litigation, arbitration and mediation. Table 5 provides a comparison of litigation, arbitration and mediation. Since the costs and time requirements for court litigation are excessive, it is important that an TTO understand different dispute resolution mechanisms and have, as part of its strategy portfolio, a specific dispute prevention and resolution strategy.

4.7.1 Litigation

It is advisable that TTOs avoid getting into situations that make litigation inevitable. In addition, an TTO should attempt, by all means, to resolve disputes at Executive level before proceeding to arbitration, mediation or litigation. The importance of a sound agreement which regulates the relationship from the outset is thus critical. Such agreements should always look for ways to resolve disputes through negotiation, such as involving the Deans, Deputy Vice-Chancellors or even the Vice-Chancellor to negotiate at the Executive level with the leadership of the business.

Table 5. Comparison of litigation, arbitration and mediation

Common Features of Intellectual Property Disputes	Litigation	Arbitration	Mediation
International	Solution limited to court's jurisdiction Multiple proceedings under different laws, with risk of conflicting results Possibility of actual or perceived advantage to party that litigates in its own country	Global solution A single proceeding under the law determined by parties Arbitral procedure and nationality of arbitrator can be neutral to law, language, and institutional culture	Global solution Single proceeding Mediation procedure and nationality of mediator can be neutral to law, language and institutional culture of parties
Technical	Decision maker might not have relevant experience	Parties can select arbitrator (s) with relevant experience	Parties can select mediator (s) with relevant experience
Urgency	Procedures often lengthy Injunctive relief available in certain jurisdictions	Arbitrator (s) and parties can shorten the procedure Arbitration may provide provisional measures and does not preclude seeking court-ordered injunction	Mediator (s) and parties can shorten the procedure. While provisional measures are not available in mediation, parties are not precluded from seeking court-ordered injunction
Legal framework	Court generally applies only its national laws	Applicable law may be determined by parties Absent party agreement – arbitrator (s) will select the law that it determines appropriate to the dispute Multiple national laws may apply concurrently Tribunal may decide in equity (rather than specific law)	Procedure less governed by law and more by social and economic interests of the parties
Finality	Appeal possible	Limited appeal possible	Any settlement agreement is binding between parties as a matter of contract law
Confidentiality/ trade secrets & reputation risk	Public proceedings	Proceedings, disclosures and awards are confidential	Proceedings, disclosures and outcomes are confidential
Continuing relationship	Parties may or may not be in a continuing relationship Dispute may be resolved without adverse party's active participation Adversarial nature of litigation may further antagonise parties	Parties often in a continuing relationship	Parties often in a continuing relationship Mediation shields the relationship by fostering an amicable resolution of the dispute

4.7.2 Arbitration

Arbitration is a form of alternative dispute resolution (ADR) that involves the resolution of disputes outside the courts (it is a private judicial hearing), where the parties to a dispute refer it to one or more persons (the "arbitrators", "arbiters" or "arbitral tribunal"); by whose decision (the "award") they agree to be legally bound. Arbitration while less costly than the courts is still a costly and time-consuming activity and should be avoided unless absolutely necessary. To send a dispute to arbitration, the parties must sign an agreement to submit to the arbitration process.

4.7.3 Mediation

When parties are involved in a dispute but need to safeguard their relationship because of ongoing interests, mediation is often a recommended route. Mediation is not in itself a binding process, but once consensus is reached, a contract is drawn which holds the parties to their agreement. The mediator assists the parties in reaching agreement by identifying common ground, establishing needs as opposed to rights and keeps the balance of power between the parties at all times. The mediator should remain neutral throughout the process.

As with arbitration, the starting point of mediation is the agreement of the parties to submit their existing or future disputes to mediation. Once a dispute arises and there is an agreement (either *ex ante* or *ex post*) to mediate, a party will initiate the process by informing the other party of the commencement of mediation. The mediation procedure is then largely determined by the parties, together with the mediator.

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Chapter 5. Seed and Patent Funds

5.1 Patent Funds

The costs for the assessment, filing and maintenance of patents can be considerable and it is recommended that TTOs secure dedicated budgets for these activities.



In some respects, the mandate placed on the universities by the IPRPFRD Act (Act No 51 of 2008) is an unfunded responsibility although seed funding and support for TTOs can be, and is, obtained from NIPMO. Section 13(1) to (3) of the IPRPFRD Act states:

“There is hereby established an Intellectual Property Fund to be managed by NIPMO.

The purpose of the Intellectual Property Fund is to –

(a) provide financial support to institutions for the statutory protection and maintenance of Intellectual Property rights.....

An institution may recover the costs incurred in obtaining statutory protection for the Intellectual Property contemplated in this Act from the Intellectual Property Fund –

(a) to the extent determined by NIPMO; and

(b) on such terms as may be determined by NIPMO.”

Furthermore regulation 13(1) and (2) of the IPRPFRD Act reads as follows:

“NIPMO must develop appropriate policies and procedures for the effective implementation of the Intellectual Property Fund to ensure that the objects of the Act are met.

NIPMO must, in accordance with the objects of the Act, determine the operations of the Intellectual Property Fund, subject to availability of funding from National Treasury.”

NIPMO will thus provide financial support to institutions for a range of activities which secure Intellectual Property rights for Intellectual Property which was generated following a R&D activity conducted using public funds. The application procedure and associated deadlines are prescribed in the NIPMO Intellectual Property Fund Guideline (available from the [NIPMO website](#)).

It is essential that all PRHEIs budget for patent costs, and that these funds are able to cover not only patent fees but also seed funding which is required to review Intellectual Property or develop the value of the underlying intellectual assets. Further details on seed funding now follows.

5.2 Seed Fund

TTOs can adopt an aggressive/proactive approach in selecting a portfolio of technologies to pursue by ripening technologies which are too embryonic for private markets. An TTO might actively seek mechanisms, including sponsored research and private development firms, to perform the applied research necessary to bridge the gap for high potential, embryonic

technologies. A seed fund program can serve as initial capital to a potential start-up to help it achieve certain business and technical milestones, leading towards market uptake. TTO seed fund capital can be derived from its share of royalties or other income generating activities of the TTO.

In some instances, institutions may contribute to seed funds, which can play a role in increasing their share of the financial rewards. This type of investment can reduce investment risk by moving the technology through various proof-of-principle and proof-of-concept stages, producing a more favourable negotiating position for the institution. The aim is to increase returns by funding further development in order to reduce the investment risk faced by the spin-out. Furthermore, moving an early-stage development through some proof-of-concept stages can help provide additional information which can result in a stronger patent application.

At one local institution, there are three levels of funding, namely the Pre-Seed Explorer Fund, the Pre-Seed Concept Fund and the Seed Fund, with typical allocations being R20,000, R100,000 and R500,000 respectively. Each fund has its own scope and is designed to enable the progression of the initial research result into a form which can be protected and licensed.

Venture capital may also be another source of seed funding although this would be unusual in the context of Southern Africa. In engaging with venture capital, it is important to remember that there is often a cultural disconnect between venture capitalists and TTO professionals. A survey conducted by the USC Stevens Institute for Innovation at the University of California made the following recommendations with respect to successful technology transfer that includes the Venture Capital (VC) community:

- Understand how to fit into a VC fund's business goals. VC funds have a fixed life span in which to provide the venture and limited partners with a cash return on investment, typically in the form of an initial public offering or acquisition.
- Package ideas in VC-friendly ways. Institutions need to get better at gathering, filtering, translating and packaging new ideas. This involves more than simply eliminating "academese" from business plans presented to VCs; it means coaching would-be entrepreneurs on how to discuss their ideas in compelling business terms, not technological jargon.
- VCs are not an endless source of cash for unproven or infeasible inventions, nor are they in the business of writing blank cheques; they expect to be highly involved in their portfolio companies. This is especially true of the early or "seed" stage investments that characterise the majority of ideas originating in university laboratories.
- Be ready to make a deal. TTOs must strike a balance, maintaining an efficient business-like relationship without sacrificing legal protections for the institution and its entrepreneurs. What investors would like to see from institutions is a genuine effort to make the deal process as smooth and expedient as possible, including a standardised, transparent deal process.
- Focus on people. Although protectable Intellectual Property is important, investors are primarily interested in the inventors they expect to be involved in the start-up. However,

inventors should be cautioned that they should not expect to run the company as the chief executive officer.

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Chapter 6. Incubation and Spin-Out Companies

Intellectual Property generated within a research institution can be commercialised through a range of mechanisms, including the registration and licensing of patents, as covered in the previous chapters. However, in some cases the latter option is either not possible or not suitable and an alternative means need to be pursued. The range of options, including licensing, is shown in Figure 5 (Walwyn, 2005). The diagram proposes that the establishment of spin-out companies with partial PRHEI ownership should be considered in cases where the institution considers that the new business overlaps with or adds value to its core business.

In the following sections, the processes for the establishment of a spin-out company and then the incubation of such companies within the university environment, are covered. Further details on the advantages and disadvantages of licensing vs. spin-out are also presented in the introduction to Section 3.7.

6.1 Spin-Out Companies

A 'spin-out' is a company that is created using the resources of the institution from which the technology originated. The institution usually incubates the spin-out company at least until the first round of venture capital investment. Staff members from the institution are often transferred to the new company either on a permanent or on a secondment basis. Research institutions may spin-out companies in order to separate their commercial activities from their core purpose, i.e. teaching and research, while an existing company may spin-out a new company when the technology in question falls outside of its core business.

Setting up and running a spin-out company typically involves a number of stages, which may include the following (not always in this order and some of these stages may be simultaneous):

- A. *Start-up*
 - Initial discussions with inventors, including initial due diligence on the Intellectual Property and investigation of possible routes to commercialisation.
 - Preparation of a business plan for the company.
 - Incorporation of the company.
 - Originating institution approval of a proposal to spin-out Intellectual Property into the company.
 - Agreement in principle with the inventors, including relative shareholdings.
- B. *Structuring a deal*
 - Finding suitable sources of funding e.g. business angels or venture capital.
 - Identify investors' requirements for warranties, information, control and exit.
 - Agreement in principle with the investors, including amount of investment, relative shareholdings, scope of Intellectual Property to be put into company, business plan, role of the inventors in the company, etc.
- C. *Detailed negotiations and formalities*
 - Negotiation of detailed agreements between originating institution, inventors and

- investors, including investor protection provisions, warranties, etc.
- 'Completion', including transfer of Intellectual Property rights, funding, etc. into company, appointment of directors, etc.
- Articles of association - restrictions, limits on transferring shares, compulsory share transfer provisions, etc.

D. Ongoing management of the company

- Employment of key staff, acquisition of premises, trading
- Policies, operating procedures, Intellectual Property management protocols and Intellectual Property strategy
- Further rounds of financing
- Taxes, insurances, etc.
- Exit strategies

In establishing the company, it will be essential to have a fully-developed business plan which must be brief (around 20 pages, excluding annexures) and should contain the following sections (section headings may differ between business plans):

- *Executive summary* - short and accurate, covers the key points of the plan and draws the reader's attention.
- *Management Team* - define the management team in terms of their portfolios, experience, qualifications, strengths, etc. Identify missing skills and how they will be resolved. Commercial experience, research excellence, grant income, team size and international collaborations should all be emphasised. An organogram should be provided highlighting key positions e.g. Chairperson, Chief Executive Officer, Chief Financial Officer, Technical Development Team Leader, etc. In the early days, full-time senior management may not be needed.
- *Technical background* - this should be brief and should be suitable for the layperson. It should explain the product, provide proof of originality and ownership (patent searches, patent applications, etc.), detail any further development needed, etc. Pipelines should be discussed here (future products in development).
- *The opportunity* - list the unique selling points of the business proposition. This section should also discuss how the technology will be developed to produce a product/service and what the company will do.
- *Market information and marketing techniques* - it is necessary to consider what the market is, how much it is growing by, and what market share could realistically be obtained. If there are potential customers lined up then it is useful to have letters of intent to attach to the appendix. How will the products be advertised and sold, who will buy it and at what price?
- *Competition analysis* - who are the competitors and what are the company's potential strengths and weaknesses compared to the competition?
- *Technology development* - what is required to bring the first product to market and what the next product(s) will be? How will the product be manufactured, by whom and where?
- *Business development* - how will the company develop throughout the next five to ten years? Milestones and Gantt charts, scenario planning, SWOT and PESTLE analyses can be included here.

- *Financial information* – this section should include the level and timescales of any investment required. Profit and loss forecasts, cash flows and balance sheets should be included here.
- *Risk management* – what risk management strategies will be applied, why and when?
- *Exit route* – describes how investors and shareholders will realise profit from their investment.
- *Appendix* – can include curricula vitae of the management team, patent search reports, letters of intent, etc.

In some cases, the business may be at too early a stage for numerical projections on revenue and margin to be meaningful; as a result, the investment decision may be made based on confidence in the inventors, proposed spinout managers and the technology. It is uncommon for the initial spin-out business plan to be identical to the final. Typically, the plan should go through a series of iterations, building on new facts and ideas.

Typically, investors and managers change their approach as the plan evolves. Whilst it is good practice to prepare a formal plan with detailed financial projections, the initial approach to investors is often based on a short executive summary. Some investors will expect to receive more detailed information in the form of a business plan presentation backed up by a more formal document. A business plan template for a start-up business is provided in the Supplementary Material.

6.2 Incubation

Business incubation is a practice which supports and accelerates the growth and success of entrepreneurial companies by providing an array of business support resources and services including physical space, capital, coaching, common services, and networking connections. The business incubator provides a nurturing, instructive and supportive environment for entrepreneurs during the critical stages of starting up a new business. The goal of incubators is to increase the chance that a start-up will succeed, shorten the time to market and reduce the cost of establishing a new business. It has been shown in various studies that incubated companies have a higher success rate than start-up companies that attempt to establish new businesses outside of any support network.

Incubators are located and funded by a range of entities including private companies (such as the Standard Bank Incubator), entrepreneurs (Springlab.co), municipal entities, provincial governments (The Innovation Hub), national government departments (eGoli Bio and others) and universities (e.g. Propella and LaunchLab).

Decisions on whether to establish an incubator, its relationship with the TTO and the level of university-funding are all strategic issues. For local and regional governments intent on industry development, the arguments in favour of incubator programmes are compelling; these structures are well-established means of building a pipeline of new industries which can become major employers and contributors to local economic growth.

For a university, the need for an incubator will depend on the availability of similar structures in the region, the university's approach to spin-out companies and its level of internal resourcing. It has been shown that TTOs working alongside incubators are more successful in licensing and commercialisation (see Section 2.4). However, these organisations require financial resources, of which only a portion may be secured from external funding.

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Chapter 7. Stakeholder and Client Relationship Management

This chapter will cover the important area of stakeholder and client relationship management for TTOs. The latter typically have two sets of clients (the researchers) and the external clients (the licensees), and are performing a business development function for the institution.

7.1 Managing the Relationship with the Inventor

The inventor plays a key role in the technology transfer lifecycle, as shown in Table 6. Apart from originating and disclosing the invention, the inventor(s) remains a crucial partner for the protection, marketing, licensing and compliance aspects of technology transfer in cooperation with the TTO. Good relations between the TTO and the inventor(s) are thus imperative for a successful commercialisation undertaking.

Table 6. The roles of the inventor in the technology transfer process

Role	Details
Creator of technology	Create and develop the technology that will be transferred by the TTO
Invention disclosure	Confidential disclosure of the details of the invention to the TTO to allow Intellectual Property to be evaluated and protection to be sought.
Intellectual Property protection	Provide information to the TTO and the Intellectual Property attorney needed during specification, application and prosecution stages. Once the Intellectual Property right is issued and the technology licensed by the TTO it is monitored for performance and infringements (the inventor should also be encouraged to monitor infringements).
Marketing	Knowing the industry and the invention well, an inventor can provide the TTO with a clearer understanding of unmet market needs and whether the technology addresses these. Information on other market-related information such as market size, market location and competitors can be provided to the TTO.
Licensing	Identification of potential licensees in partnership with the TTO. With the involvement of the TTO, sharing relevant information with potential licensees e.g. what the technology can and cannot do. Technical updates and insights during the license negotiation process e.g. the inventor should assist the TTO with identifying what materials, know-how, etc., can be transferred to the licensee. Licensee due diligence by TTO e.g. is the licensee diligently pursuing the technology's development? License compliance issues by TTO.
Compliance	Once the Intellectual Property protection is issued and the technology licensed, the TTO is primarily responsible for monitoring infringements. The inventor may assist the TTO in the role of infringement policing by recognising when a product is sold that may infringe the IP. An inventor should also be encouraged to report suspected infringement to the TTO, which can then assign responsibility to the institution legal services department for pursuing infringers.

Source: Di Sante et al. (2007)

The ‘marketability’ of the inventor is also a crucial element in technology transfer. Factors pertaining to the marketability of the inventor can include:

- His/her reputation in the specific scientific field
- Previous technology transfer successes (if done before)
- His/her willingness to cooperate in speaking to potential licensees or investors
- Persuasive vision of where the technology can lead
- Realistic expectations of financial returns.

For an TTO, the ideal inventor is someone who is involved and interested in giving input and support to the TTO; is willing to rely on, and learn from, the experienced judgment of the TTO’s professionals; is willing to work alongside the TTO in the pursuance of the institution’s interest in commercialising the IP.

7.2 Managing the Interface with the Research Community

The research community within the PRHEs are the feeder of the Intellectual Property portfolio; without the contribution and inventions of this community there will be no technology to transfer. It is therefore essential that the TTO understands the needs and aspirations of this community and is able to obtain their support for the work of the TTO.

One of the underlying assumptions of the TTO is that such offices are able to benefit from the pooling of inventions across the various research departments and more efficiently market these inventions through a well-established network in industry. Reputation, and particularly a reputation for honesty, is of utmost importance in being able to ensure the improved transfer of technology from the research benches to the commercial arena. Similar sentiments apply to all its stakeholders; managing the interface with the research community requires the TTO to be clear about its role, its promises and its distribution of benefits. Deceiving or misleading the research community will not build the trust that is required for the relationship to be productive and mutually beneficial. It is important that the TTO is transparent and honest in its dealings with this community, and that it does not overpromise on the potential rewards.

7.3 Managing the Technology Transfer Office/Attorney Relationship

The relationship between the TTO, Intellectual Property attorneys and the inventor is a crucial one that must be effectively coordinated by the TTO as follows:

1. The TTO should make introductions between Intellectual Property attorney and the inventor(s), personally or by electronic mail. The TTO must impress upon the inventor(s) the need to cooperate with Intellectual Property attorney’s requests for information, but that this activity must be coordinated via the TTO to ensure budgets are not exceeded.
2. The TTO should insist that the number of meetings between attorney and the inventor(s) be held to a minimum, once again coordinated via the TTO. In most cases, one meeting to discuss the invention and one meeting to discuss a draft patent specification is sufficient. Brief telephone conferences/electronic

communication can be used to fill in gaps left by such parsimony of meetings.

3. The inventor should furnish any information to facilitate the preparation of written examples for the patent application. If the information provided does not provide sufficient detail, the inventor must be requested to provide additional write-ups, often the subject of draft publications (Note: must not be published before filing the provisional patents).
4. The TTO should advise the Intellectual Property attorney which aspects of an invention it considers to be valuable. The Intellectual Property attorney can then frame the patent claims in such a way that will provide the desired protection and enhance licensing opportunities.
5. The TTO should provide the Intellectual Property attorney with sufficient advance notice about foreign-filing plans. In addition, the TTO should ensure that communications channels between the Intellectual Property attorney and inventor remain accessible via the TTO to facilitate rapid timeous responses to office actions, further patent protection (if the inventor develops the technology further), etc.
6. It is crucial that the TTO inform the Intellectual Property attorney, upfront, that all pertinent decisions about the application process will be made by the TTO and not the inventor. The TTO should clearly specify to the Intellectual Property attorney (preferably in the engagement letter) that it must be the point of contact at the institution, but that the inventor may be copied and informed of all interactions between the attorney and the TTO.

7.4 Relationships with Investors

It is important to develop networks between the TTO and the investment community. The following guidance is provided:

1. Know the investment community
 - Map the landscape of investors – seed, venture capitalists, angel investors, etc.
 - Understand investor needs and interests
 - Actively network with investors and build long-term relationships.
2. Understand what the investors prefer
 - Certainty and minimised risk
 - A company with a strong Chief Executive Officer (generally not faculty inventors or students) and the authority conferred by having relevant industry experts on board
 - Companies making serious efforts to address big market opportunities rather than incremental improvements.
 - Deals referred by a trusted source
 - A deal process that is transparent, smooth and expedient rather than slowed down by red tape and ‘unimportant’ issues.
3. Package new opportunities effectively:
 - Use current presentation tools and techniques
 - Limit academic/scientific/technical jargon
 - Present ideas in business terms

- Focus on obtainable or accessible markets and products
- Present practical commercialisation plans, timelines and costs.

4. Show investors the value
 - How will they make money with the idea?
 - What is the incentive to take the risk?
 - What is the size of the market that can be served and the opportunities to scale up?

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Chapter 8. Management of Intellectual Assets Portfolio

8.1 Management of the Intellectual Property Portfolio

An Intellectual Property portfolio is the list of all Intellectual Property owned by the institution. Managing an Intellectual Property portfolio and comparing it to those of other companies/institutions is essential to help to better determine the economic value of an institution's Intellectual Property and thereby enable an institution to remain competitive. Effective Intellectual Property portfolio management can help the TTO to identify commercial opportunities and risk factors such as growing markets and the appearance of substitute technologies.

Intellectual Property portfolio management should be a strategically run process, as a 'one size fits all' approach does not apply. This is especially relevant given the fact that most TTOs will have only limited Intellectual Property budgets. However, a simple inventory of patents will not suffice. A good docketing system, in electronic form, that automatically sends reminders should be used. A wide range of commercial software-based solutions are available. The TTO may either use these in-house or rely on an Intellectual Property attorney or Intellectual Property agent that uses such a system for managing the Intellectual Property portfolio. Missed deadlines for payments may result in loss of rights or additional, avoidable expenses.

A key element of portfolio management is the identification of underperforming Intellectual Property that have little or no strategic value to their owners or to the market as a whole. These Intellectual Property may be abandoned subject to NIPMO approval, or donated as part of a comprehensive patent portfolio optimisation strategy to reduce the cost of ongoing maintenance.

The management of Intellectual Property is about managing innovation with the procedures and processes that are required to turn that innovation into valuable Intellectual Property rights. A truly strategic approach to Intellectual Property management spans processes from conception to product or service market release. Integrating Intellectual Property management into the R&D, advanced development, and product development cycles seamlessly provides opportunities to gain and enhance Intellectual Property protection while offering the potential to reduce risk and lower costs. The key elements of Intellectual Property portfolio management combine the right Intellectual Property tools, procedural know-how, and organizational attributes and behaviours to contribute to successful Intellectual Property portfolio management. These questions can help you to begin defining the Intellectual Property portfolio and to design an IP management strategy.

- What Intellectual Property do we have (the Intellectual Property audit)?
- What Intellectual Property do we need, based on institutional strengths (the gap analysis)?
- Strategy to acquire what we need, through strategic discussion with leading institutional researchers (the investment strategy)?

- What licenses have we signed, and how will we monitor the income streams generated?
- What don't we need (the deployment strategy)?
- Ongoing maintenance and monitoring for effective development of the Intellectual Property strategy.

Further details on how to answer the above questions within the Intellectual Property management portfolio now follow.

8.1.1 The Intellectual Property Audit

In order to establish the Intellectual Property landscape for an institution, the process should commence with an audit of the Intellectual Property within the institution's ownership or control. Assets falling into this category will include any registered trademarks, copyrights, designs, plant breeders' rights or patents owned by the institution, any licenses to third parties and any licenses from third parties, including cross-licenses. Also included in this category are things such as in-house work manuals, databases, recipes, franchise agreements, publications and product/process know-how MTAs. Once the assets have been identified, the Intellectual Property is then inspected to determine who owns them, whether they have not lapsed (remain registered) and enforceable and whether they are being effectively used. The individual components should also be given an importance rating by looking at factors such as whether or not they are embodied in core technologies, the life expectancy of the underlying Intellectual Property in the said technology and the potential or actual exclusivity of the technology.

The audit, therefore, is not simply a question of establishing ownership or licensing rights, but includes an assessment of the importance of the technology and its likely markets. For key technologies, it can also include an assessment of the strength of protection offered by specific Intellectual Property and whether these can be asserted in the relevant territories to protect the technology as intended.

Another important category to analyse is the contracts which the institution has entered into with third parties. This will help ascertain what Intellectual Property rights it holds and what it can use. Contracts can include non-disclosure agreements, distribution agreements, marketing agreements, original equipment manufacturer and reseller agreements.

Part of the Intellectual Property audit process should include a review of the Intellectual Property management policies and procedures used by the institution to identify, acquire and protect its Intellectual Property and against the Intellectual Property of others.

The following steps can broadly constitute the audit process:

- Develop an Audit Plan
 - Define the scope of the audit and the documents to be reviewed
 - Define a schedule for the audit
 - Define responsibilities among the audit team
 - Define the personnel to be interviewed
- Collect relevant information

- Nature of assets (product brochures, release notes, etc.)

- Issues peculiar to relevant patent laws
- Background about the relevant technology
- Gather documents (license and maintenance agreements, distribution agreements, government contracts, employee agreements, journal articles, published papers, etc.)
- Analyse the information
- Write the Audit Report. The deliverables of an audit will largely depend upon the scope and objectives of the exercise. They can include:
 - Catalogue of Intellectual Property assets
 - Development history of identified IP
 - Plan for economical use
 - Actions to maintain assets
 - IP defects and/or weaknesses
 - List of filings to be pursued
 - Continued use of trade marks
 - Discovery of potential infringement issues by self/third parties
 - Maintenance fees required to keep Intellectual Property in force
 - Review of policies e.g. disclosure policies
 - Policies and procedures to be amended and/or implemented e.g. procedure to ensure appropriate filings are made in a timely manner in future
 - To-do list for subsequent audits.

An Intellectual Property audit should be conducted annually to ensure compliance and it may be event-driven. For instance, it may be conducted when capital infusion is needed, when there is an impending lawsuit or, when there are changes to legislation related to Intellectual Property.

8.1.2 The Gap Analysis

Gap analysis in the management of intellectual assets portfolio for a university involves assessing the disparity between the current state of the university's intellectual property (IP) assets and its desired state or strategic objectives.

8.1.3 The Investment Strategy

Having gained a better understanding of where the portfolio sits in the wider market, the next step is to identify some of the gaps that need to be filled to drive growth. Important questions include:

- Where can R&D investments be increased to build on strengths?
- Which key inventors should be contacted to build the Intellectual Property portfolio with new invention disclosures?
- In what research areas should collaborative relationships be established?

8.1.4 The Deployment Strategy

As a patent approaches its expiration, its value decreases significantly if it has not been licensed. An TTO thus needs to periodically analyse its Intellectual Property portfolio to

determine how to make best use of its Intellectual Property portfolio value. Unlicensed patents should be considered for termination. Factors to consider include:

- Are there patents in the Intellectual Property portfolio that should be abandoned or made publicly available? Unproductive low value patents may not be worth the fees necessary to keep them in force. Abandoning Intellectual Property derived from publicly financed R&D requires NIPMO approval.
- Is there dormant, but valuable Intellectual Property that could be sold or licensed to generate revenue? Assignment of Intellectual Property derived from publicly financed R&D requires NIPMO approval.
- Is there Intellectual Property that should be kept strictly for defensive purposes?

8.1.5 Ongoing Maintenance

Successful completion of the steps in determining what is in the starting portfolio, identifying what is missing and what can be divested, is only part of the process. Ongoing realisation of rewards from mining a patent portfolio depends on keeping the intelligence behind the patent portfolio management strategy up to date. There are various tools that TTOs can use for this ongoing maintenance, including current awareness services. These will help to monitor both competitors' activities and what is happening in the wider technology area. These automated and electronic systems are costly and should be used only in offices where the return on investment is justified. Most smaller TTOs use manual internet searches to keep up with the latest developments and trends, and talk with the researchers whose business it is to keep up to date in their field of specialisation.

8.1.6 Portfolio Knowledge Management System

A knowledge management system to effectively organise and leverage an Intellectual Property portfolio should have the following basic features:

- A centralised database and document repository to capture and store all relevant Intellectual Property information and documentation
- A patent scoring and reviewing methodology
- Threaded commentary support to capture the progressive understanding of an individual patent over its lifespan as it is repeatedly tested through assertions, rebuttals or prior art challenges
- Visualisation tools to allow high level scanning of the portfolio
- Searching and filtering tools to mine the patent database and find the most

- appropriate patent information for a given context
- Contact details of project teams, Intellectual Property experts, vendors, subject matter experts, etc.
- Automated system alerts to assist with the management of patent maintenance fees
- Effective security protocols to protect sensitive information

8.2 Management of Other Intellectual Assets

The intellectual assets of a research institution, whether it is a university or a public research institute reside in many forms other than its registered Intellectual Property. Unique technological knowledge and expertise lies in firstly its research and teaching staff, whose collective experience is able to drive the process of knowledge production. In addition, the institution may manage or oversee other intellectual assets including specialised equipment, culture collections, specimen collections and books.

Although these assets are not directly covered by an Intellectual Property regulatory regime, the institution should take care that their value is preserved. Such measures may include establishing and maintaining inventories of biological and other collections, and updating asset registers to reflect their market value. It is proposed that these registers could be placed under the care of the TTO, and that some of the operational costs be covered through directed commercialisation efforts, including the lease or partial sale of the warehoused collections.

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Chapter 9. Reference Material

Useful reference material is listed, arranged according to the relevant chapter.

Chapter 1: Introduction and Overview

Guides:

Patent Foundation. 2004. Operating Manual (Unabridged Version). University of Virginia (Virginia).

Chapter 3: Intellectual Property Management

Booklets:

University of Cape Town. 2015. Inventors Guide. University of Cape Town (Cape Town).

Chapter 4: Patent Valuation

Books:

Park, C.S. 2004. *Fundamentals of Engineering Economics*, 3rd ed. New York: Pearson/ Prentice Hall.

Blank, L. & A.Tarquin, A. 2005. *Techno-Economics*. 6th ed. Boston: McGrawHill.

Fabrycky, W.J. & Thuesen, G.J. 2001. *Techno-Economics* 9th ed. Upper Saddle River NJ: Prentice Hall,

Hartman, J.C. 2007. *Techno-Economics and the Decision-Making Process*. Upper Saddle River, NJ: Prentice Hall.

Newman, D.G. et al. 2009. *Engineering Economic Analysis*. 10th ed. Oxford: Oxford University Press.

Articles:

Walwyn, D. R., Huddy, S. M. & Rybicki, E. P. 2015. Techno-economic analysis of horseradish peroxidase production using a transient expression system in *Nicotiana benthamiana*. *Applied Biochemistry and Biotechnology*, 175(2), pp 841-854.

Triki, Z., Bouaziz, M. & Boumaza, M. 2014. Techno-economic feasibility of wind-powered reverse osmosis brackish water desalination systems in southern Algeria. *Desalination and Water Treatment*, 52(7-9), pp 1745-1760.

Kaldellis, J., Vlachou, D. & Korbakis, G. 2005. Techno-economic evaluation of small hydro power plants in Greece: a complete sensitivity analysis. *Energy Policy*, 33(15), pp 1969-1985.

References

- Abrams, I., Leung, G. & Stevens, A. J. 2009. How are US technology transfer offices tasked and motivated-is it all about the money. *Research Management Review*, 17(1), pp 1-34.
- Association of University Technology Managers. 2015. AUTM U.S. Licensing Activity Survey, FY2014. Oakbrook Terrace: Association of University Technology Managers.
- Capart, G. & Sandelin, J. 2004. Models of, and missions for, transfer offices from public research organizations. Capart and Sandelin (Stanford).
- Department of Trade and Industry. 2016. The Path to Commercialisation; Guide for South African Technology-Base Enterprises, Researchers and Innovators. Department of Trade and Industry (Pretoria).
- Di Sante, A., Krattiger, A., Mahoney, R., Nelsen, L., Thomson, J., Bennett, A., Satyanarayana, K., Graff, G., Fernandez, C. & Kowalski, S. 2007. The role of the inventor in the technology transfer process. *Intellectual property management in health and agricultural innovation: a Guide of best practices, Volumes 1 and 2*, pp 507-513.
- Heher, A., Krattiger, A., Mahoney, R., Nelsen, L., Thomson, J., Bennett, A., Satyanarayana, K., Graff, G., Fernandez, C. & Kowalski, S. 2007. Benchmarking of technology transfer offices and what it means for developing countries. *Intellectual property management in health and agricultural innovation: a Guide of best practices, Volumes 1 and 2*, pp 207-228.
- Hughes, A. & Kitson, M. 2012. Pathways to impact and the strategic role of universities: new evidence on the breadth and depth of university knowledge exchange in the UK and the factors constraining its development. *Cambridge Journal of Economics*, 36(3), pp 723-750.
- McMillan Group. 2016. University Knowledge Exchange (KE) Framework: good practice in technology transfer. HEFCE (London).
- Mustapha N & Ralphs G. 2024 Effectiveness of technology transfer in public research institutions in South Africa: A critical review of national indicators and implications for future measurement. *African Journal of Science, Technology, Innovation and Development*, Vol. 14, No. 4
- NIPMO. 2014. Office of Technology Transfer: Best Practices Manual. NIPMO (Pretoria).
- OECD & Eurostat. 2005. Oslo Manual: Guidelines for collecting and interpreting innovation data. OECD Publications (Paris).
- Patent Foundation. 2004. Operating Manual (Unabridged Version). University of Virginia (Virginia).
- Phan, P. H. & Siegel, D. S. 2006. The effectiveness of university technology transfer.

- Public and Corporate Economic Consultants (PACEC). 2012. Strengthening the Contribution of English Higher Education Institutions to the Innovation System: Knowledge Exchange and HEIF Funding. PACEC (Cambridge).
- Rasor, R. & Heller, P. 2006. Administration of Large and Small Technology Transfer Offices. *AUTM Technology Transfer Practice Manual*, 2(Part 1), pp.
- SARIMA. 2017. Guide on Research Management. SARIMA (Pretoria).
- Siegel, D. S., Veugelers, R. & Wright, M. 2007. Technology transfer offices and commercialization of university Intellectual Property: performance and policy implications. *Oxford Review of Economic Policy*, 23(4), pp 640-660.
- Teixeira, A. & Monteiro, A. 2016. The efficiency of Portuguese Technology Transfer Offices and the importance of university characteristics. *SPRU 50th Anniversary Conference*. Brighton: SPRU.
- University of Cape Town. 2015. Inventors Guide. University of Cape Town (Cape Town).
- Walwyn, D. 2005. Selecting the most appropriate commercialisation strategy is key to extracting maximum value from your R&D. *International journal of technology transfer and commercialisation*, 4(2), pp 162-171.
- WIPO. 2018. *List of Documents on Intellectual Property Valuation* [Online]. Geneva: WIPO. Available: <http://www.wipo.int/sme/en/documents/valuationdocs/index.htm> [Accessed 7 January 2018].
- Wright, M. 2007. *Academic entrepreneurship in Europe*, Edward Elgar Publishing.

Appendix One: Intellectual Property Legislation in South Africa⁸

A. Patents

A.1 Overview

The South African patent system is the system by which patents are granted in South Africa, and is governed under the South African Patent Act, Act 57 of 1978, and the Companies and Intellectual Property Commission (CIPC) is the custodian of all new patent applications that are filed within the Republic of South Africa. As is the case in many other countries, a patent provides legal protection for a new and industrially applicable invention. This invention, which constitutes either a product or process, has to be brought about as a result of an inventive step. Essentially, this new product or process has to represent a new way of doing things or has to provide a technical solution to a real life industrial problem.

An invention is only considered to be new and based on an inventive step if the same idea has not been expressed in writing, orally or practically, or in any other way, anywhere immediately prior to the priority date of the invention. In patent, industrial design rights and trade mark laws, a priority right or right of priority is a time-limited right, triggered by the first filing of an application for a patent, an industrial design or a trade mark respectively. The priority right allows the claimant to file a subsequent application in another country for the same invention, design, or trade mark effective as of the date of filing the first application. When filing the subsequent application, the applicant must claim the priority of the first application in order to make use of the right of priority. The right of priority belongs to the applicant or his/her successor in title.

The period of priority, i.e., the period during which the priority right exists, is usually 6 months for industrial designs and trade marks and 12 months for patents and utility models. The period of priority is often referred to as the priority year for patents and utility models. In patent law, when a priority is validly claimed, the date of filing of the first application, called the priority date, is considered to be the effective date of filing for the examination of novelty and inventive step or non-obviousness for the subsequent application claiming the priority of the first application. In other words, the prior art which is taken into account for examining the novelty and inventive step or non-obviousness of the invention claimed in the subsequent application would not be everything made available to the public before the filing date (of the subsequent application) but everything made available to the public before the priority date, i.e. the date of filing of the first application.

In South Africa there is no examination of the claims made in the patent specification, but rather a deposit system allows for the granting of a patent without examination of the claims. If a South African inventor applies for a patent, the application is accompanied by a provisional or complete specification. A provisional specification is lodged at CIPC if the inventor is still testing or developing the product or process. The provisional specification affords temporary protection for 12 months, extendible locally for 3 months, and forms the basis for a complete patent application and foreign patent applications. Once the invention has been fully

⁸ The following sections have been extracted from the NIPMO Guide.

developed and tested, a fresh patent application, with complete specification, is filed. If the product or process has already been technically finalised from the start, only a complete specification is lodged.

The responsibility for ensuring that the application is valid resides with the applicant. South Africa is a non-examining country. This means that CIPC does not investigate the novelty or inventive merit of the invention - only the form or documentation is verified and not the substance of the product or process. For peace of mind, the inventor can make use of the services of a qualified patent attorney to investigate the existence of previous patent specifications that relate to the relevant invention. This procedure, although expensive, may negate possible future litigation procedures and unnecessary financial expenses.

It is crucial that an international patent search should be conducted, especially if an inventor wants to commercialise a product or process in foreign jurisdictions. The same applies for a patentee, who wants to commercialise an invention and who does not want to infringe someone else's patent. A search should then be conducted at the South African Patent Office. An online search system is currently available at <http://patentsearch.cipc.co.za> though the range of searchable fields is somewhat limited compared to other national patent search systems. Searches can also be carried out by hand at the Patent Office through a card based system; however, electronic patent searches may be performed on a contract basis on proprietary systems such as the Electronic Patent Journal (EPJ).

South Africa is a signatory of the Patent Cooperation Treaty (PCT). This means that South Africans are able to file both national and international applications. This is in line with the supranational recognition of Intellectual Property restrictions within the context of globalisation.

A.2 Patentability

Section 25 of the Patents Act defines the scope of patentable inventions as follows:

"A patent may, subject to the provisions of this section, be granted for any new invention which involves an inventive step and which is capable of being used or applied in trade and industry or agriculture. A patent can be anything which consists of:

- *a discovery;*
- *a scientific theory;*
- *a mathematical method;*
- *a literary, dramatic, musical or artistic or any other aesthetic creation;*
- *a scheme, rule or method for performing a mental act, playing a game or doing business;*
- *a program for a computer; or*
- *the presentation of information, shall not be an invention for the purposes of this Act."*

The Patents Act excludes: new discoveries; new scientific theories; new mathematical methods; new schemes, rules or methods for performing mental acts, playing games or doing business; new computer programs; and presentation of information. However, even if an inventor's product or process falls within the scope of the excluded categories, patent

attorneys may be able to draft the patent specification in such a manner that the invention gets legal protection.

A.3 Lifespan and Timing of a Patent

A patent can last up to 20 years from the date of application, provided that it is renewed annually before the expiration of the third year. An annual renewal fee, starting from the expiry of the third year, is necessary to keep the patent in force. Payment of fees vary across jurisdictions, and failure to make these payments will result in loss of rights. It is thus advisable to consult a patent attorney and also consider appointing a patent attorney to manage these payments on your behalf, since they typically have systems in place to ensure that these payments are made on time.

The date on which the patent application is filed is referred to as the priority date, i.e. the date from which the invention is deemed to have existed and from which the invention is protected, once the right has been granted. The priority date is important for determining priority in cases where similar inventions are patented. The institution should decide whether to pursue patent protection outside of South Africa no later than 12 months from the filing date of the original South African provisional patent application. Often a provisional application is filed first, since the inventor may still not have completely refined the invention. A provisional application can be filed in a number of jurisdictions in the first instance - one is not limited to South Africa, but typically does so because of costs. There may be a benefit to filing in the United Kingdom in the first instance, but this approach should only be used upon advice from a patent attorney. This same advice also applies to filing a PCT application.

A.4 Inventor and Location

Section 27 of the Patents Act states that:

“An application for a patent in respect of an invention may be made by the inventor or by any other person acquiring from him the right to apply or by both such inventor and such other person. In the absence of an agreement to the contrary, joint inventors may apply for a patent in equal undivided shares.”

Patents are territorial rights - a patent granted in South Africa can be enforced in South Africa only. However, you may, within 12 months of filing your South African provisional patent application, file foreign patent applications based on the provisional patent application. Only once each such foreign patent application has proceeded to grant will you have an enforceable patent right in any such countries. The model of a "worldwide" patent does not exist.

Fundamental criteria to consider when deciding on where to patent include:

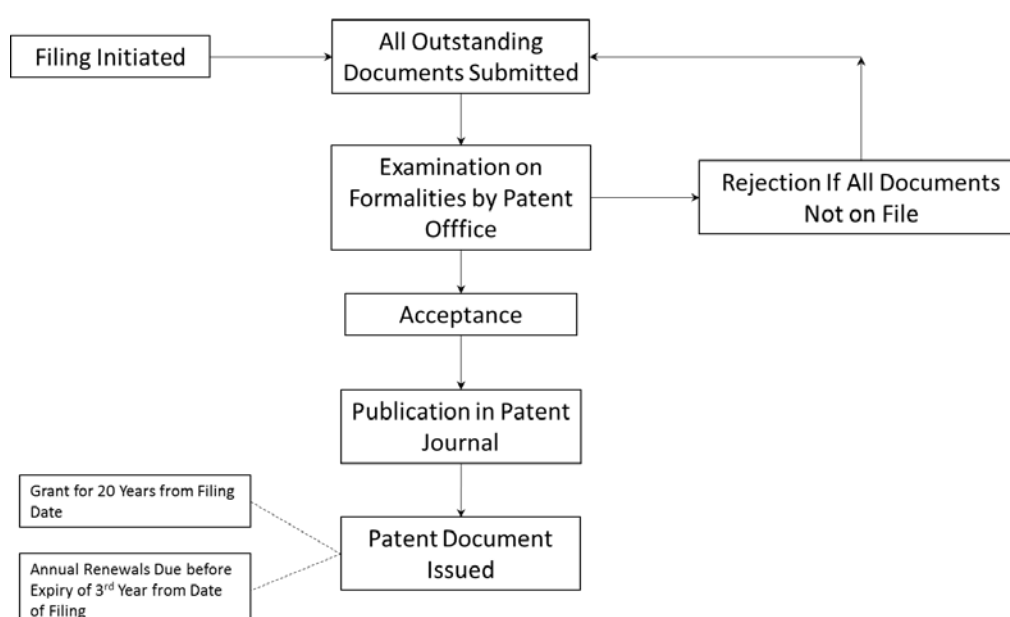
- The perceived commercial value of the invention in the country (this may depend on the size of the market or manufacturing capability for example)
- The cost of obtaining patent rights to the invention in the country
- Whether the invention is patentable in the countries under consideration. Many of the requirements for patentability differ from country to country and may preclude

one from obtaining patent protection in a particular country.

There are three different routes for filing internationally, each with its own pros and cons:

- Filing separate applications in each country directly. Figure 10 provides a schematic of the South African patent registration procedure.
- Filing applications in regional patent offices (e.g. European Patent Office, African Intellectual Property Organisation, African Regional Industrial Property Organisation, and Eurasian Patent Organisation).
- Filing an international patent application under the PCT. Figure 11 provides a timeline for filing a PCT application and thereafter filing national phase applications in each country of interest.

Figure 10. Patent registration procedure in South Africa



A.5 Patent Cooperation Treaty

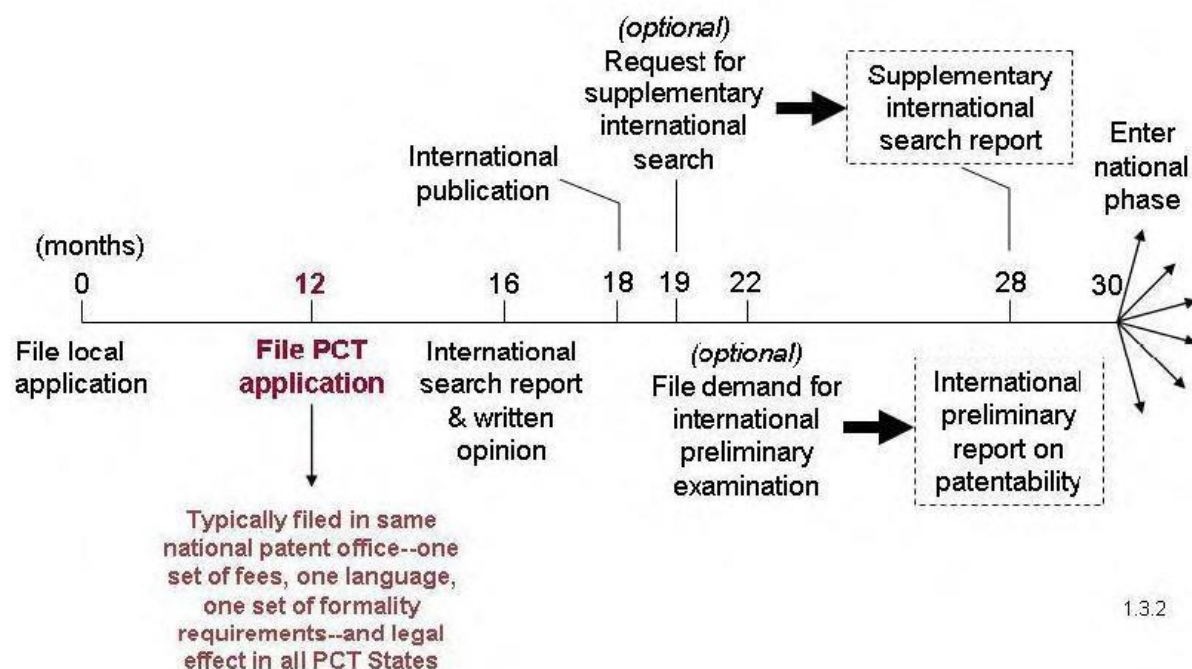
With the traditional patent system, if patent protection is sought in a range of countries, individual patent applications need to be made for each respective country. This involves the preparation and filing of several patent applications, translation costs, the services of patent attorneys in these countries, and fees to the various patent offices – all resulting in considerable costs. With the exception of depository patent systems (e.g. South Africa), under the traditional system the patent office in each country (where protection is sought) must carry out substantive examination of the application and search procedures.

The PCT came into effect in 1978 (1999 in South Africa) as a means of overcoming some of these issues. It is an agreement for international co-operation in the field of patents. More specifically, it is a treaty that provides for rationalisation and co-operation with regard to the filing, searching and examination of patent applications. There are about 148 countries (including South Africa) that are part of this international treaty. The PCT system is a patent

filing system and not a patent granting system. The task and responsibility for the actual granting of patents remains the responsibility of the Patent Offices in the designated countries where protection is being sought. There is no PCT patent.

The PCT streamlines the international search and preliminary examination process thereby aimed at reducing costs. It provides for the formal examination of the international application by way of a single patent office – the Receiving Office. Each international application is subjected to an international search and the searching authority provides a report on whether any similar inventions have been filed or granted. This enables the applicant to decide whether or not to proceed with prosecution. In some instances, one will get a poor search report but decide to go ahead anyway and take one's chances in the particular jurisdiction you are interested in so it is not necessarily a reflection on patentability but more a tool to understand the Intellectual Property landscape.

Figure 11. Timeline for filing a PCT application (WIPO, 2010)



The PCT provides a centralised international publication of international applications together with related international search reports. It provides the option of an international preliminary examination and provides reports that assist the Patent Offices in the various signatory countries, with an opinion as to whether the claimed invention meets certain international criteria for patentability.

Under the PCT system (unlike the traditional system) the applicant is afforded additional time before committing to a decision on whether or not to apply for patents in other countries and incurring the considerable costs involved in this process.

B. Copyright

Copyright in South Africa is governed by the Copyright Act (Act 98 of 1978), as amended. South Africa is a party to the Berne Convention and the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS). It has signed, but not acceded to, the WIPO Copyright Treaty. The Berne Convention governs copyright between signatory countries and thus obliges South Africa to give recognition and protection to copyright works from those countries⁹. TRIPS is an international agreement administered by the World Trade Organization (WTO) that sets down minimum standards for many forms of Intellectual Property regulation.

Material protected by copyright is termed a 'work'. Copyright is the form of Intellectual Property protection provided to the creators of 'original works of authorship' and includes literary, dramatic, musical, artistic, and certain other intellectual works, both published and unpublished, that have been reduced to material form. The copyright protects the form of expression rather than the subject matter of the work. It therefore does not extend to the idea or creative element contained in the work. In contrast, patent protection covers the concepts underlying an invention as well as their specific application.

The main purpose of copyright is to reward creative efforts and to protect copyright owners from a loss of revenue as a result of the unauthorised use of their works. Copyright therefore affords economic rights to 'authors' enabling them to control the use of their creations in various ways, such as preventing others from making copies, issuing copies to the public, performing the work in public, broadcasting the work, and using it on-line. It also allows 'authors' to object to others misrepresenting or modifying their works. Copyright is in essence property and may thus be sold, assigned or licensed for use by others.

Copyright arises automatically, without any registration, as soon as an original work has been reduced to a material form. For most works, with the exception of films and videos, it is not necessary to register copyrights legally. Copyright exists automatically for the following types of works:

- Literary works
- Computer programs
- Musical works
- Dramatic works
- Choreographic works
- Pictorial, graphic, and sculptural works
- Motion pictures and other audio-visual works
- Sound recordings
- Architectural works

The lifespan of copyright depends on the type of work protected:

- The copyright of literacy works lasts for 50 years after the death of the author.

⁹University of the Witwatersrand (2013). Copyright Guidelines for Staff & Students of the University of the Witwatersrand, Johannesburg

- The copyright of computer programs lasts for 50 years after the first copies were made available to the public.
- For sound recordings, the copyright lasts for 50 years from the day the work was first broadcast.
- For films, 50 years from the date the film was shown.

C. Trade Marks

A trade mark is any word, name, symbol, phrase, logo or design, or any combination thereof that is used in commerce to identify or distinguish the goods and/or services of one manufacturer or trader from those of another. A service mark is the same as a trade mark except that it identifies and distinguishes the source of a service rather than a product.

Trade mark rights may be used to prevent others from using what is referred to as a 'confusingly similar' mark/sign. However, these rights do not allow trade mark owners to prevent others from making the same goods or from selling the same goods or services under a clearly different mark/sign.

There are ordinary, collective and certification trademarks and non-traditional trademarks (Appendix E) such as sound marks, colour marks, holograms, gesture marks and olfactory (small/scent) marks.

Collective trademarks - A group of traders may register a so-called collective trademark for use by its members only. The purpose of such a trade mark is to show that a member of the association provides the goods or services associated with that specific association/organisation. The collective mark may often be used together with the individual company's trade mark. When a collective trade mark has been registered, the owner may allow use of the mark by any person who complies with the regulations relating to its registration. Geographical names or other indications of geographical origin may be registered as collective trademarks e.g. Stellenbosch Farmers Winery.

Certification trademarks - A certification mark exists to indicate that a product is of a certain quality or has certain characteristics rather than to distinguish it from the products of other traders e.g. the cotton mark, the wool mark, the leather mark.

A trade mark can only be protected as such and defended under the Trade Marks Act (Act 194 of 1993) if it is registered. The registration procedure results in a registration certificate which has legal status, allowing the owner of the registered trade mark the exclusive right to use that mark. Trade marks must be registered legally through an application to the Trade Marks Office. The CIPC administers the Register of Trade Marks, which is the record of all the trademarks that have been formally applied for and registered in South Africa.

Unregistered trademarks may be defended in terms of common law. To protect this trade mark, the owner can sue the infringer for 'passing off' which is when the infringer has led the public to believe that his/her goods/services are the same as or associated with the goods/services of the trade mark owner.

A registered trade mark can be protected forever, provided it is renewed every 10 years upon payment of the prescribed renewal fee. If the renewal fee is not paid within the prescribed time period, the Registrar may remove the trade mark from the Register. It may be subsequently restored through a restoration procedure.

A trade mark may be registered if:

- It serves the purpose of distinguishing the goods/services of one trader from those of another trader
- It does not consist exclusively of a sign or an indication which may serve, in trade, to designate the kind, quality, quantity, intended purpose, value, geographical origin or other characteristics of your goods or services, or the mode or time of their production or of rendering of the services
- It has not become customary in your field of trade
- It does not represent protected emblems, such as the national flag or a depiction of a national monument
- It is not offensive or contrary to the law or good morals or deceptive by nature or way of use
- There are no earlier conflicting rights

D. Design

Registered designs are governed in South Africa by the Designs Act (Act 195 of 1993). The Designs Act covers two-dimensional designs such as a logo on a product and three-dimensional designs such as the shape of the product. A design is about the shape, form, appearance, pattern, ornamentation and configuration of a product or article, rather than its functionality. It stipulates that a visual feature may, but need not, serve a functional purpose. Essentially a Design is about shape and features that appeal to the eye. Some designs are necessitated by function and others are aesthetic.

If the design's every visual feature serves a functional purpose, then common law states that the design is not registrable. The Designs Act states that should an innovation be both, a visual feature, and serve a functional purpose, it may be registered.

There are 2 types of designs which can be registered:

An aesthetic design

- Has to be new and original
- It should appeal to the eye in its shape, configuration or ornamentation
- Must be able to be produced by an industrial process.

A functional design

- Has to be new and not commonplace
- Where the shape or configuration is necessitated by the function

- Must be able to be produced by an industrial process.

Protection is afforded to aesthetic designs for a period of 15 years, and to functional designs for 10 years. Registered designs have to be renewed annually before the expiration of the third year, as from the date of lodgement. Information on the steps to be taken to renew a design is obtainable on www.cipc.co.za.

E. Trade Secrets

A trade secret is a formula, practice, process, design, instrument, pattern, or compilation of information which is not generally known in the public domain or reasonably ascertainable, by which a business or organisation can obtain an economic advantage over competitors or customers.

The obligation to maintain the confidentiality of a trade secret may be contractual, or may be the result of a fiduciary requirement, e.g. a director of a company may not divulge the company's trade secrets without being in breach of his/her fiduciary duty. It is an established principle of South African common law that information or know-how, which an employer divulges in confidence to an employee, or information, which the employee obtains during the course of his employment on the understanding that it is confidential, is typically regarded as a trade secret. A researcher is thus expected to keep the confidential research activities and the research results of his/her organisation confidential.

This general statement is subject to a number of qualifications. A restriction on the use of information that is not truly of a confidential nature and which prevents the employee from applying his/her skill and knowledge in competition with his former employer, is regarded as unenforceable. Secondly, the proprietor of the information should treat it as confidential and take steps to contain the dissemination of such information to a select group. The mere fact that information qualifies for copyright protection does not necessarily mean that the same information cannot also constitute a trade secret.

In South African law, an action for the breach of an obligation to keep a trade secret confidential may constitute breach of contract, on the Aquilian action for unlawful competition, the breach of a fiduciary duty and Copyright law. The South African law of delict engages primarily with “the circumstances in which one person can claim compensation from another for harm that has been suffered”.

The classic remedy for a delict is compensation: a claim of damages for the harm caused. If this harm takes the form of patrimonial loss, one uses the Aquilian action; if pain and suffering associated with bodily injury, a separate action arises, similar to the Aquilian action but of Germanic origin; finally, if the harm takes the form of injury to a personality interest (an *injuria*), the claim is made in terms of the *actio iniuriarum*. Roman-Dutch law, based on Roman law, is the strongest influence on South Africa's common law, where delict also falls under the law of obligations.

A TTO is not normally expected to know or understand the finer points of South African law, but should be aware of the options available for breach of confidentiality, and should in turn refer such breaches in confidentiality to the institutions legal services for further action if necessary.

F. Plant Breeders' Rights

A plant breeders' right (PBR) is a form of Intellectual Property right granted to breeders of new plant varieties for protection of their varieties against exploitation without their permission. If you breed a plant variety and would like to obtain financial reward for your efforts, you must register that variety with the Registrar for Plant Breeders' Rights. Once you have registered a plant variety, it becomes your Intellectual Property. Any individual breeder or breeding institution may apply for a plant breeder's right. Foreign breeders can only apply through an agent, usually a patent attorney, residing in South Africa. Plant breeders are only granted rights for kinds of plant that are declared in terms of the [Plant Breeders' Rights Act, 1976 \(Act 15 of 1976\)](#). These are listed in Table 1 of the Regulations.

To be granted a PBR, plant varieties must be new, distinct, uniform, stable and have an acceptable denomination (variety name), based on the following definitions.

- A variety is considered new if the propagating material:
 - (Seed or cutting from a plant) of a variety has not been sold in South Africa for longer than one year
 - of a variety of a tree or of a vine has not been commercialised in another country for more than six years, or in the case of any other plant for more than four years
- Distinct if it is clearly distinguishable from any other variety of the same species.
- Uniform if the plants of a variety look similar and are sufficiently uniform in relevant characteristics
- Stable if the plants of the particular variety still look like the original plants after repeated cultivation.

Once the variety is approved, the applicant will be issued with a PBR certificate. PBR are valid for 25 years for vines and trees, and for 20 years for all annual varieties, calculated from the date on which a certificate of registration is issued. A candidate may apply to the Registrar of Plant Breeders' Rights for provisional protection of a variety until all tests are completed and the PBR is granted. Provisional protection is recommended for crops where tests take more than one year to complete.

During the validity period of the Plant Breeders' rights, the holder is obliged to maintain the variety and guarantee that the propagating material is always available; and pay the prescribed annual fees. Failure to do so may result in cancellation of the PBR. For further information on regulations and application procedures for PBRs visit: http://www.services.gov.za/services/content/Home/OrganisationServices/permitslicencesrights/plantproduction/Applyforplantbreedersrights/en_ZA

Appendix Two. Freedom to Operate and Prior Art Searches

Freedom to Operate

Freedom to Operate (FTO) searches, also known as clearance searches, are used in the first instance to determine the freedom to operate to obtain (with reasonable certainty) an Intellectual Property right such as a patent for a new invention, and in the second instance to determine the freedom to operate to use or commercialise an Intellectual Property right.

A FTO for obtaining an Intellectual Property right identifies specific rights, jurisdictions, expiry dates and other pertinent information that can be analysed to determine how the potentially blocking patents are to be construed and how broad or narrow the issued claims may be. A FTO to use or commercialise an Intellectual Property right involves a full review of all existing Intellectual Property rights (within a jurisdiction) which might be infringed by using/commercialising/working the proposed product, process, service or Intellectual Property right.

A FTO search will uncover:

- In-force Patents: Identification of active patents that may pose a risk of infringement
- Pending Patent Applications: Knowledge of pending patent applications that, if granted, could pose future infringement risks
- Patents that have expired or lapsed
- Parts of technology that are subject to license requirements, and those that are not
- Territorial limitations of patents.

An FTO analysis usually consists of the following steps:

1. Analysis of the principles. An expert (usually an experienced TTO staffer/employee) looks at the technology or product an entity is planning to use or produce.
2. NIPMO provides institutions with Intellectual Property tools commonly used in FTO searches, and the TTO staff are able to access and use these tools for this purpose. The TTO employee conducts a patent search and collects all accessible information about existing Intellectual Property rights, which are in force. Multiple search strategies should be employed, possibly using multiple searchers, databases, or searching facilities to obtain greatest coverage. Both patent and non-patent literature should be scanned.
3. The TTO personnel/patent agent/attorney conducts technical comparisons and determines if the technology is infringing any Intellectual Property right or not.
4. If yes, the attorney examines in which countries the corresponding Intellectual Property right are valid and how long the protection will last.
5. Finally, the TTO staffer/employee patent attorney provides an Opinion Letter and makes recommendations on how to proceed. The FTO opinion should include other non- Intellectual Property right considerations. For example, do any license agreements, settlement agreements, or orders of court affect the FTO, either by clearing an otherwise insurmountable hurdle, or imposing further restrictions outside any Intellectual Property right claims? The Opinion Letter can never guarantee absolute certainty as no clearance search can be 100 percent effective, and thus

should be so qualified.

Generally, FTO searches use computerised databases and search engines capable of surveying publicly accessible patent, technical, and commercial literature. Issued patents,

published patent applications, and scientific/technical publications, as well as databases of institutional meeting presentations and public domain grant awards (e.g. National Research Foundation (NRF), Technology Innovation Agency, Support Programme for Industrial Innovation, etc.), can be searched using keywords, researchers' names (e.g. NRF-rated researchers), assignee/owner names, and subject-matter classifications.

Patent assignment databases should be searched to reveal the names of real parties of interest, as well as transfers of ownership. Patent annuity and maintenance fee records should be searched to verify that patents identified as relevant are in fact still in force. A search of the records of known competitors may reveal common threats to FTO status. When appropriate, press releases, industry-specific news reports, and stock analysts' reports also should be investigated.

Some of the common strategies for using the results of FTO searches in the commercialisation of novel Intellectual Property are the following:

- *Purchase the patent or in-licensing*: licensing implies obtaining a written authorisation from the patent holder to use the patented technology for specified acts, in specified markets and for a specified period of time. The convenience of such an agreement will depend largely on the terms and conditions of the proposed license.
- *Cross-licensing*: when two companies exchange licenses in order to be able to use certain patents owned by the other party. Cross-licensing requires that the company has a well-protected patent portfolio that is of value to potential licensing partners.
- *Inventing around*: this implies inventing an alternative to a patented invention in order to avoid infringing on the patent claims.

An FTO search is more extensive than a prior art search as it helps determine whether the product or the production of it infringes other patents and will investigate whether any of the steps or processes used to make the product infringe another patent.

Prior Art

Also known as a patentability search or a novelty search, these searches can be conducted to identify prior art that may be relevant to determining novelty and inventiveness of the potentially patentable invention. The goal of the prior art search is to understand if and how the potentially patentable idea differs from the existing prior art, to help decide whether to pursue patent protection, to determine the potential scope of the patent, and to help establish the business value of the idea.

Both patent and non-patent literature should be searched, and materials related to the idea should be evaluated to determine their novelty and inventiveness. A prior art search may be conducted before filing a patent application to gauge the likelihood of obtaining broad claim coverage. If a prior art search reveals references that anticipate the claimed invention, the inventor and the patent attorney should consider how to 'avoid the prior art' by drafting the claims to overcome it. If this is not possible, they may wish to consider whether filing the patent application is still appropriate.

An online prior art search can be done using a field search and/or using keyword searches

- *Keyword search:* Before beginning a search based on keywords, the researcher should start by listing those words that would be used to describe the invention. The quality of a keyword search will largely depend on the suitability of keywords selected.
- *Field search:* A field search is a more targeted search within specific fields or categories relevant to the invention. A field search might be used to refine the results of the keyword search. Once the keyword search has been conducted, field search can be used to narrow the results down to the field in which the relevant invention operates.

There are several databases, free and paid-for, that may be used for prior art searches.

They include free databases, subscription databases and scientific databases.

Free databases

- Google Advanced Patent Search -
http://www.google.com/advanced_patent_search Free Patents Online -
<http://www.freepatentsonline.com/>
- Patent Lens -
<http://www.patentlens.net/patentlens/RPX>
Insight <https://insight.rpxcorp.com/>
- World Intellectual Property Organization (WIPO) -
<http://www.wipo.int/patentscope/en/>
- Technology and Innovation Support Centres –
<http://www.wipo.int/tisc/en/>
- Patent Cooperation Treaty -
<http://patentscope.wipo.int/search/en/search.jsf>
- European Patent Office -
<http://www.epo.org/searching/free/espacenet.html>
- South African Patents Office -
<http://patentsearch.cipc.co.za/patents/patentsearch.aspx>
- United States Patent and Trade mark Office (USPTO) -
<https://www.uspto.gov/patents-application-process/search-patents>
- Free Patents Online –
<http://www.freepatentsonline.com/>
- RPX Insight –
<https://insight.rpxcorp.com/>

Subscription databases

Delphion –<https://www5d.delphion.com/products/research/research-search>

Derwent World Patents Index - <https://clarivate.com/products/derwent-world-patents-index/>

LexisNexis Total Patent - www.lexisnexis.com/totalpatent Derwent Innovation -
<https://clarivate.com/products/derwent-innovation/>

Clarivate Analytics <https://clarivate.com/product-category/patent-research-intelligence->

and-services/

Innography - www.innography.com

Patsnap - www.patsnap.com

Questel Orbit - www.questel.com

Scientific databases

There are various scientific and technical databases that are specific to different fields that will be useful when conducting patentability searches, such as the Thomson Reuters web of knowledge & web of science database collections

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