

THE PATH TO TECHNOLOGY COMMERCIALISATION



GUIDE FOR SOUTH AFRICAN TECHNOLOGY-BASED ENTERPRISES, RESEARCHERS AND INNOVATORS



the dti

Department:
Trade and Industry
REPUBLIC OF SOUTH AFRICA

towards full-scale industrialisation and inclusive growth

the dti Customer Contact Centre: 0861 843 384

the dti Website: www.thedti.gov.za



© The Department of Trade and Industry (**the dti**), September 2016

Photos are royalty-free stock images, courtesy of **the dti** Photo Library.

the dti Campus

77 Meintjies Street

Sunnyside

Pretoria

0002

the dti

Private Bag X84

Pretoria

0001

the dti customer contact centre: 0861 843 384

the dti website: www.thedti.gov.za

Contents

FOREWORD BY THE MINISTER OF TRADE AND INDUSTRY.....	4	COMMERCIALISATION PHASE	21
ABBREVIATIONS AND ACRONYMS	5	A8 Production.....	21
TERMS GLOSSARY	5	A9 Market monitoring	22
THE PROCESS OF COMMERCIALISING TECHNOLOGY.....	8	A10 Business growth	22
CONCEPT PHASE.....	10	A11 Product support	23
1 Proof of concept.....	10	A12 Market diversification	23
2 Market-needs assessment	11	PARTNERSHIPS.....	24
3 Venture assessment	11	OPTION B: LICENSING OR ASSIGNMENT OF IPR.....	24
4 Disclosure of invention	12	PRE-COMMERCIALISATION AND DEVELOPMENT PHASE	24
WHAT SHOULD YOU CONSIDER IF YOUR INVENTION WAS PUBLICLY FUNDED?	12	COMMERCIALISATION PHASE.....	24
DEVELOPMENT AND PRE-COMMERCIALISATION PHASE	13	B1 IP protection application	25
5 Technical feasibility	13	B2 Technology marketing	25
6 Market study	14	B3 Licensing or assigning IPR	26
7 IP evaluation	14	WHAT TO KEEP IN MIND WHEN LICENSING?.....	26
8 Economic feasibility	15	Good Luck.....	27
DECISION: SELECTION OF PATH TO COMMERCIALISE PRODUCT/SERVICE.....	16	Annexure 1: Technology Readiness Levels.....	28
OPTION A: STARTUP OR EXISTING COMPANY	17	Annexure 2: Comparative Analysis of Preferred Commercialisation Paths	29
DEVELOPMENT AND PRE-COMMERCIALISATION PHASE	17	Annexure 3: Sources of Funding.....	30
A1 Engineering prototype.....	17	Annexure 4: Sources of Non-Financial Support.....	31
A2 Marketing plan	18	Annexure 5: Government Departments and Agencies	32
A3 Business plan	18	Annexure 6: Selected Public Knowledge Generators	33
A4 IP protection application	19		
A5 Preproduction prototype (pilot).....	19		
A6 Market validation	20		
A7 Business formation	20		

FOREWORD BY THE MINISTER OF TRADE AND INDUSTRY



In a highly competitive global environment, new technologies play a crucial role in maintaining and even improving South Africa's competitiveness, particularly in sectors such as manufacturing and mining, which can absorb larger numbers of unskilled or semi-skilled workers. Thus **the dti** is continuing with its efforts to nurture and support innovative firms, especially in those labour-intensive sectors that make up a significant percentage of the South African economy.

The reviews of the Technology and Human Resources for Industry Programme (THRIP) and Support Programme for Industrial Innovation (SPII) have brought realisation that technology development is not an end result, but technology must create an economic value through proliferation and commercialisation. Technology commercialisation is critical in supporting industrialisation and diversifying our economy through the creation of new industries.

Although the technology commercialisation concept sounds appealingly simple, the implementation can present complexities that inventors and researchers had not anticipated. Therefore, the aim of the guide is to enable users to minimise complexities and help them bring the country's innovations to industry and the wider community for societal and economic impact.

The guide outlines the key steps that are involved in the commercialisation process, from idea generation to market development once the product or process has entered the market. Depending on the industry, research institution, size of the firm, type of innovation, the market conditions and many other aspects, the path followed will need to fit the reality of each firm, entrepreneur or researcher as well as reflect individual circumstances and market conditions.

While it is not plausible to provide and include all the necessary steps and answers needed by users in the technology commercialisation process, the guide does aim to equip them with concepts, activities and milestones essential for commercialising new technologies and to accelerate the transfer of innovations developed in knowledge-based institutions to industry.

A handwritten signature in black ink, appearing to read 'R. Davies', positioned above a horizontal dotted line.

Dr Rob Davies (MP)

Minister of Trade and Industry

ABBREVIATIONS AND ACRONYMS

BBBEE	Broad-Based Black Economic Empowerment
CIPC	Companies and Intellectual Property Commission
HEI	Higher Education Institution
IP	Intellectual Property
IPR	Intellectual Property Rights
MCEP	Manufacturing Competitiveness Enhancement Programme
NDA	Non-Disclosure Agreements
NIPMO	National Intellectual Property Management Office
OECD	Organisation for Economic Cooperation and Development
OTT	Office of Technology Transfer
R&D	Research and Development
SAVCA	Southern African Venture Capital and Private Equity Association
SMME	Small, Medium and Micro-sized Enterprise
SPII	Support Programme for Industrial Innovation
STP	SEDA Technology Programme
TIA	Technology Innovation Agency
TRL	Technology Readiness Level
TVC	Technology Venture Capital
WIPO	World Intellectual Property Organisation

TERMS GLOSSARY

Angel investor

Angel investors are usually wealthy individuals who invest their money in entrepreneurial companies, unlike venture capitalists, who invest other people's money. Angel investments are typically the earliest equity investments made in start-up companies. They are often former entrepreneurs themselves, and typically enjoy working with start-up companies and provide valuable expertise.

Commercialisation

Commercialisation is the process of introducing a new product, service or process into the market with the purpose of deriving revenue. The launch of a new product is the final stage of product development, where funds are spent primarily on advertising, sales promotion, and other marketing efforts.

Copyright

Copyright is the legal right granted to an author, composer or publisher to exclusive publication, production, sale or distribution of software, or a literary, musical, dramatic or artistic work.

Crowdfunding

Using the internet as a medium, crowdfunding is an open appeal for funds made to the general public in support of specific projects. In the context of technology commercialisation, crowdfunding can be a useful tool to raise additional funds for inventors or entrepreneurs during the technology-development and commercialisation phases.

Development capital (pre-revenue)/Series B

Finance used after startup capital/early stage funding to push the business further and expand market share to become profitable.

Debt financing

Debt financing involves borrowing money with a promise to repay the amount borrowed, plus interest. Sources of debt financing include banks and savings and loan institutions; angel investors; venture capitalists; and personal loans from family, friends or other individuals.

Equity financing

Equity financing refers to raising funds for business purposes by trading complete or partial ownership of a company's equity for money or other assets. Venture capital is one of the more popular forms of equity financing used to finance high-risk, high-return businesses.

Garage entrepreneur

This expression comes from famous entrepreneurs who have started their companies in their garages. Garages serve as early workshops for the development of the products, services or processes on which the company will be based. More generally, the term refers to entrepreneurs who develop their new or significantly improved product outside of an organisation or structure such as a university, science council or firm.

Grassroots invention

Grassroots inventions are solutions developed locally using local resources and capabilities to improve livelihoods and promote sustainability.

Growth capital (post-revenue)

Growth capital is an equity-type investment in a relatively established but still high-risk venture, and is specifically used to expand a firm's operations.

Innovation (technological)

Innovation refers to the introduction of a new or significantly improved product or process to the market. It also refers to an invention that has reached the market.

Intellectual property (IP)

Any creation of the mind such as inventions; literary or artistic works; designs; or symbols, names and images used in commerce.

Intellectual property rights (IPR)

IPR refers to independent assets that can be sold (assigned) or licensed to third parties. This includes patents as well as non-registered rights such as know-how.

Invention

This refers to a product, process or technique that displays some degree of novelty. In some circumstances, legal protection may be granted to an invention.

IPR Act

The Intellectual Property Rights from Publicly Financed Research and Development Act, 2008 (Act No. 51 of 2008), referred to as the IPR Act, was promulgated on 2 August 2010. It provides for the effective identification, protection, utilisation and commercialisation of publicly funded IP.

Know-how

Know-how can be defined as confidentially held information in the form of unpatented inventions, formulae, designs, drawings, procedures and methods. It also includes accumulated skills and experience of a firm's professional personnel.

Licensing

Legal permission granted by the owner to allow another party to use the IP.

Non-research and development activities

Non-research and development (R&D) activities refer to activities that do not require in-house R&D (such as production engineering or design work) or involve the acquisition of machinery, hardware, or software; external knowledge and know-how; licences; or skills development. Non-R&D activities also include the identification of new concepts through engagement with other parties, such as through marketing activities or consultants.

Office of technology transfer (OTT)

OTTs are part of public institutions (such as science councils) involved in R&D activities. They are responsible for identifying, protecting and commercialising IP developed and owned by the institution.

Patent

Patent gives the owner the right for a set period to exclude others from making, using, offering for sale, selling or importing the invention.

Public disclosure

This entails any communication to a person not obligated to keep the information confidential which provides the details that enable them to recreate the discovery. This includes, for instance, oral presentations, publications, websites and e-mails.

R&D activities

R&D activities, as defined by the Organisation for Economic Co-operation and Development (OECD), includes “creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications”.

Seed funding

Seed funding is the initial capital used for preliminary operations such as product development. It is often sourced from the company founders' personal funds, or from friends and family. The amount of money is usually relatively small as the business is still in the idea or conceptual stage.

Startup capital/early-stage funding/Series A

This refers to the funding required to set up business operations, such as renting office space and equipping the production system.

Startup company

A startup company is an entrepreneurial venture or a new business in the early stages of its life cycle.

Technology

Technology is defined by the Department of Trade and Industry (**the dti**) as the “application of scientific knowledge to solve practical problems, especially to address social, industrial or commercial objectives. Technology may also refer to the use of tools and machines, including the collection of such tools and machinery.”

Technology readiness level (TRL)

TRL is a measurement system to evaluate the maturity of a particular technology. Refer to the detailed TRLs in the annexure of this guide.

Trademark

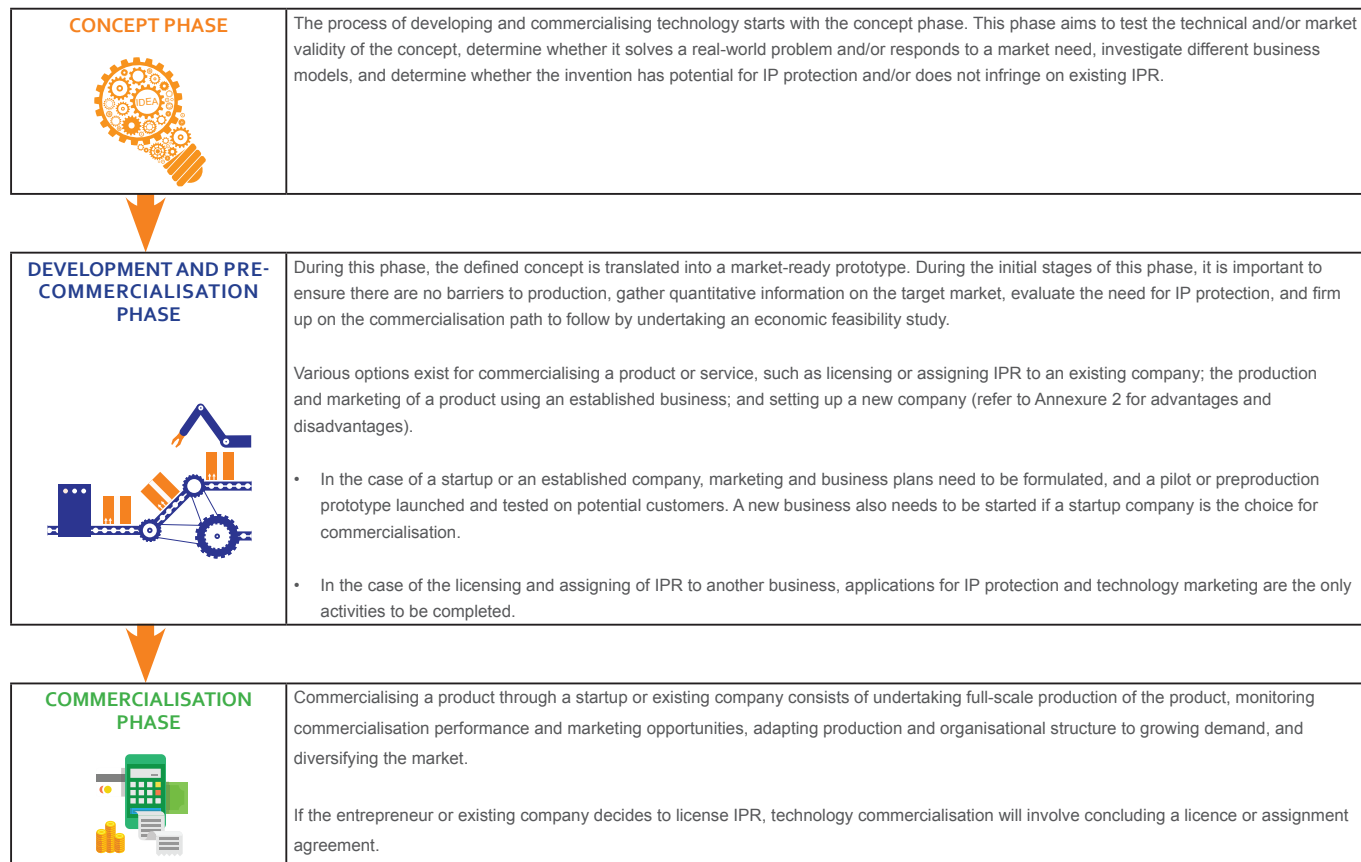
This refers to any name, symbol, figure, letter, word or mark used by a manufacturer or merchant to designate his or her goods, and to distinguish them from those manufactured or sold by others.

Venture capital

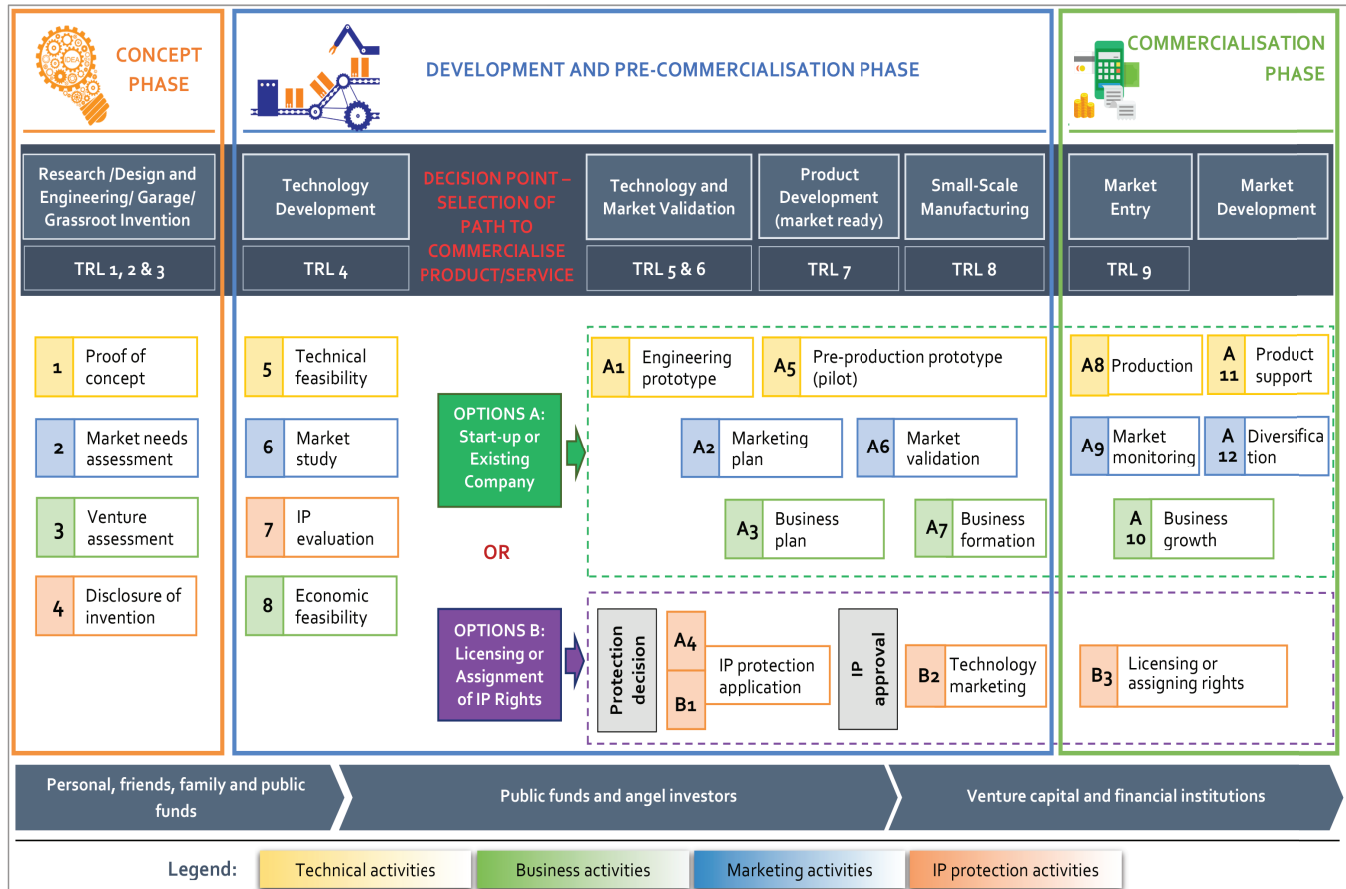
A subset of the private equity asset class mainly concentrating on high-tech, high-risk and high growth-potential businesses whose growth is typically achieved through radical global scaling. Venture capital is primarily used to support the relaunch, launch and early-stage redevelopment phases of a business.

THE PROCESS OF COMMERCIALISING TECHNOLOGY

Generic activities undertaken by innovative enterprises towards the successful commercialisation of their products and services are divided into three major stages: the concept phase; the development and pre-commercialisation phase; and the commercialisation phase.



Each phase includes a number of milestones. These milestones refer to activities that can be grouped under technical, business, marketing, and IP protection categories as shown in the figure below. Overall, the path to successful commercialisation is a complex, non-linear process. Depending on the venture and the driver behind the venture (i.e. market pull vs. technology push), certain activities presented in the diagram may be skipped, whereas others might need to be repeated.





CONCEPT PHASE

The concept phase consists of the following steps:

1. Proof of concept
2. Market-needs assessment
3. Venture assessment
4. Disclosure of invention

It is important to note that it is commonly accepted that an innovative concept originates either from an attempt to solve a real-world problem (technology push) or respond to market needs (market pull). The distinction between the two approaches is sometimes blurred. This implies that both the proof of concept and the market needs assessment steps can kick-start the commercialisation value chain.

1 Proof of concept

This step involves defining the concept and investigating its technical validity, the potential stumbling blocks to production, and the levels of customisation to complete the project. To have commercial potential, the product or service to be developed must solve a real-world problem and/or respond to a market need, and should do so in a manner that is better, cheaper or faster than existing solutions. This step is usually associated with basic and applied research.

Key activities

- Define the concept.
- Demonstrate the viability of the performance assumptions.
- Identify critical hurdles to production.
- Determine the ideal state of the technology.

Product/output of activities

Verbal description, schematic, formula, conceptual model or paper design.

Funding sources

Personal finance, family and friends, and public funding for students and researchers at higher education institutions (HEIs) and science councils.

2 Market-needs assessment

This step aims to answer questions such as: “Does the concept meet a market need?”, “Who will buy the product?”, “How many customers/clients will buy it?”, and “How much will they pay for it?” At this stage, the information will come primarily from secondary sources, such as market studies, interviews and trade literature.

Key activities

- Determine the top features and benefits of the product.
- Identify competitors.
- Determine customers' requirements for the product (direct engagement with potential customers is recommended).
- Identify potential barriers to commercialisation.
- Determine market distribution channels.
- Identify criteria for product pricing.

Product/output of the activity

Short summary of the information collected.

Funding sources

Personal finance, family and friends, public funding for students and researchers at HEIs, and science councils.

3 Venture assessment

After confirming that the product can be made (proof of concept) and there is a sufficient demand for it (market-needs assessment), an investigation into the most plausible path to commercialise the product should commence. Different commercialisation paths* should be considered by answering the following questions:

- Does the inventor have sufficient resources to pursue a commercial venture, or does it make more sense to license the product?
- If the inventor chooses to license:
 - Who are the potential licensees?
 - How much additional development work and resources are needed to secure a license?
- If the inventor opts for a venture:
 - What expertise is needed?
 - How much and what financial resources are required?
 - Will the venture generate sufficient profit to justify the risk?

Key activities

- Critically review existing capability and capacity, and identify any additional financial, physical and human resources (expertise and experience) needed for each commercialisation path investigated.
- Establish IP requirements (refer to Step 4).
- Determine a preliminary profit potential.

Product/output of the activity

Description of the business model.

Funding sources

Personal finance, friends and family, and public funding for students and researchers at HEIs and science councils.

** Please find information on the advantages and disadvantages of the different commercialisation paths in Annexure 1.*

4 Disclosure of invention

Disclosing an invention is particularly applicable to inventions generated through publicly funded R&D. It does not offer protection, but it allows the evaluation of the commercial potential of a technology, and, possibly, a starting point for the process of IP protection and commercialisation.

Publicly funded R&D

In the case of an invention being developed using public funds (fully or partially), the disclosure should be made to the OTT at a public institution (such as a university or research council), or as advised by the department responsible for IP protection at a public organisation. OTTs ensure the identification, protection, utilisation and commercialisation of IPs emanating from publicly funded R&D for the benefit of society.

Inventions that are not publicly funded

In the case of the invention being fully funded by a private entity (including direct and indirect costs), it would be advisable to do a “novelty search” to establish whether the invention is unique and/or does not infringe on existing IPR in specific countries or regions. The search for any South African-granted patents can be done through the Companies and Intellectual Property Commission (CIPC) office and its online services. The World Intellectual Property Organisation website is the reference network for worldwide patent databases.

Key activities

- Disclose the invention to an OTT for publicly funded R&D.
- Undertake a novelty search.

Product/output of the activity

Submitted disclosure form.

Funding sources

Public funding.



WHAT SHOULD YOU CONSIDER IF YOUR INVENTION WAS PUBLICLY FUNDED?

Submit the disclosure as early as possible – once it is established that the invention could have commercial potential.

If you plan to share “enabling information” about your invention in a public domain, do not do so until the disclosure is made and an IP application is filed (discussed later). Otherwise, the ability to seek protection for the invention will be seriously jeopardised. Avoid:

- publishing anything related to the invention;
- giving a presentation on the invention to third parties;
- posting information online about the invention;
- sharing the content of the invention with third parties without concluding a non-disclosure agreement, material transfer agreement, or a similar agreement signed with that party; and
- including information in a thesis and releasing it to the public.



DEVELOPMENT AND PRE-COMMERCIALISATION PHASE

The following milestones should be reached before an inventor/entrepreneur can move on to the development and pre-commercialisation phase:

- The technical feasibility of the concept is proven
- The value proposition of the product is defined.
- The target market and competitors are identified
- Customer requirements are determined.
- The most plausible path to commercialise the product is investigated.
- IP requirements are established.
- The invention is disclosed, if applicable and planned.

The development and pre-commercialisation phase can be divided into two sets of activities – activities before the path to commercialisation is confirmed, and activities embarked on once the commercialisation path is set. During the initial stage, the following steps are completed by an inventor/entrepreneur before pursuing a selected commercialisation route:

- Technical feasibility
- Market study
- IP evaluation
- Economic feasibility

5 Technical feasibility

This involves developing a working model for the product to be developed, and aims to demonstrate that the product is functional and producible. It also provides a visual means to introduce the concept to others.

Key activities

- Test the technical feasibility.
- Identify the operational requirements.
- Determine potential safety and environmental hazards.
- Undertake a preliminary production feasibility assessment.
- Undertake a preliminary manufacturing assessment.
- Estimate the cost of an engineering prototype.

Product/output of the activity

Working model of the product.

Funding sources

Public-sector grants and angel investors.

6	Market study
<p>The market study focuses on quantifying the market assumptions developed in the concept phase. It includes answers to the following questions:</p> <ul style="list-style-type: none"> • Who exactly is the target market? • What product does it currently use (including units sold and price)? • How is the industry structured? • What are the distribution channels? • What is the market environment? • What will make the product competitive? <p>Key activities</p> <ul style="list-style-type: none"> • Quantify the size of the market (including international markets). • Identify its segments. • Analyse the market segments, including size, growth rate and competitive environment. • Analyse business capabilities for market share, competitive position, and product and resource capabilities. • Describe the market environment, including economic industry trends, the regulatory framework, and possible barriers to entry. • Obtain customer feedback. <p>Product/output of the activity Thorough quantitative analysis.</p> <p>Funding sources Public-sector support and angel investors.</p>	

7	IP evaluation
<p>This is a continuation of the process that started with the disclosure of the invention (Activity 4).</p> <ul style="list-style-type: none"> • In the case of a publicly funded invention, the objective of the IP evaluation is for the OTT to determine its scientific merit and commercial potential prior to proceeding with IP protection and commercialisation. • In the case of a privately funded invention, the aim of this step is to determine whether the invention needs protection, the type of protection it requires, and where to protect it. <p>Key activities for publicly funded inventions The screening of an invention comprises:</p> <ul style="list-style-type: none"> • an IP analysis, which requires, among other things, reviewing the development history of the invention; assessing the technology's stage of development; identifying whether the invention is novel and whether other issues relating to IP law and landscape may affect its protection; and determining the type of IP protection; and • a market and business assessment (refer to steps 2 and 3). <p>Key activities for privately funded inventions</p> <ul style="list-style-type: none"> • Determine whether the invention is novel and does not infringe on someone else's IPR (refer to Step 4). • Identify the type(s) of IP protection it requires. • Determine, based on the market study and novelty search, where IP protection is needed (nationally and internationally). <p>Product/output of the activity Screening report and decision on future course of action.</p> <p>Funding sources Public-sector support and angel investors.</p>	

8 Economic feasibility

By this stage, some ideas concerning which commercialisation path to follow should already be formed. Economic feasibility aims to provide facts and analytical rigour to inform the decision of which commercialisation path to follow, and facilitates determining the economic benefits of the venture. Economic feasibility covers:

- demand forecast;
- supply analysis;
- competition assessment;
- analysis of regulatory environment; and
- cost-benefit analysis.

Key activities

- Undertake a financial analysis of the business venture, including break-even scenarios based upon the product unit price, sales volume, and cost (goods, capital, management and administration).
- Determine, based on the financial projections, whether sufficient profit margins will be generated to justify the venture.
- Determine whether it is more sensible to license or assign the IP.

Product/output of the activity

Integration of the technical product information and the market study into break-even financial models.

Funding sources

Public-sector support and angel investors.

DECISION:
SELECTION OF PATH TO COMMERCIALISE
PRODUCT/SERVICE

OPTION A
Startup or existing
company

OR

OPTION B
Licensing or
assignment of IPR

OPTION A: STARTUP OR EXISTING COMPANY



DEVELOPMENT AND PRE-COMMERCIALISATION PHASE

Before proceeding to the next set of steps, an inventor/entrepreneur must ensure that the following milestones have been reached:

- A working model of the product is developed;
- The structure and characteristics of the target market are well understood;
- The type of ip protection and where to launch application(s) are determined (this applies only if ip protection is sought); and
- Economic feasibility is proven, i.e. Generation of sufficient profit to warrant the risks associated with a business venture.

The development and pre-commercialisation phase, when choosing to commercialise a product or process through a startup or existing company (Option A), involves the following steps:

- Engineering prototype
- Marketing plan
- Business plan
- IP protection application
- Preproduction prototype
- Market validation
- Business formation.

OPTION A: STARTUP OR EXISTING COMPANY

A1 Engineering prototype

The finished product prototype – in the form of a single part, assembly, system or service – should provide an accurate representation of what the final product will be in terms of material content, physical configuration and function. This provides the basis for the final analysis of the technical, cost and market acceptance of the product, as well as for establishing final design and production specifications. Developing an engineering prototype is usually expensive because of the lack of economies of scale in production, and the disproportionate costs of design and testing.

Key activities

- Determine the materials, components, processes and manufacturing steps needed to meet technical performance and specifications.
- Test materials, components and processes.
- Design and develop an engineering prototype or pilot process.
- Optimise the design iterations.
- Undertake final tests.
- Estimate a preproduction prototype costs for the product unit.

Product/output of the activity

Engineering prototype or pilot process.

Funding sources

Angel investors, public funding.

OPTION A: STARTUP OR EXISTING COMPANY

A2 Marketing plan

The purpose of this activity is to identify the best marketing options, including securing verifiable expressions of interest from potential distributors and customers. The marketing plan outlines the strategies the entrepreneur intends to implement to reach the market, capture and retain market shares, and grow sales. Devising such a plan requires the entrepreneur to work with a multitude of entities, such as packagers, wholesalers, retailers, advertisers, and consumer focus groups.

Key activities

- Determine the competitive advantage of enterprise and product.
- Identify a number of marketing means and specific objectives.
- Select target markets and determine target market niche.
- Select product features.
- Fix price.
- Select distribution channels.
- Obtain direct market feedback (market test).
- Identify marketing team.

Product/output of the activity

A concise marketing component of the business plan that highlights the best strategic business options for the venture.

Funding sources

Angel investors.

OPTION A: STARTUP OR EXISTING COMPANY

A3 Business plan

The business plan includes the following information:

- Business rationale.
- Assumptions.
- Risks.
- Projections for the next five years.
- Information on financial options.
- Organisational structure.
- Strategic partners.
- Marketing options.

Key activities

- Finalise the business's organisational structure, including the selection of a board of directors (or advisory team).
- Form a commercialisation team (design, manufacturing, marketing and management).
- Finalise agreements on any breakthrough technology requirements critical to commercialisation.
- Develop a financial plan for present and future funding needs, including timing and strategies.
- Develop a detailed business plan for future business developments – objectives, schedules, milestones and allocations of the required financial and human resources.

Product/output of the activity

Business plan.

Funding sources

Angel investors.

OPTION A: STARTUP OR EXISTING COMPANY

A4 IP protection application

Protection of IP is filed with relevant parties, such as CIPC in South Africa and national and regional patent offices abroad. IP protection is usually linked to patenting, but other forms of protection (such as trademarks, design registration or copyrights) can and should be considered. Obtaining IP protection for an invention is usually a costly and lengthy process.

Key activities for OTT-supported inventions

- If an OTT, during the screening exercise, determines that the invention is novel and has potential for commercialisation, and decides to obtain statutory protection for the invention, it would file an application for IP protection in South Africa and other potential jurisdictions.
- Filing for IP protection is done with assistance of a patent attorney, and in collaboration with the inventor(s).

Key activities for privately funded and other publicly funded inventions (excluding OTT-supported inventions)

- Consult with experienced IP practitioner to decide on the country/region where protection should be filed.
- Request the services of an attorney to assist with the IP application.
- File IP protection as advised by the IP practitioner.

Product/output of the activity

Filed application with relevant parties.

Funding sources

Public funds, personal funding, debt funding and angel investors for privately funded inventions.

OPTION A: STARTUP OR EXISTING COMPANY

A5 Preproduction prototype (pilot)

Piloting production aims to prepare the product for introduction into the marketplace. The preproduction prototype provides information on, among other things, the manufacturability of the product, the manufacturing processes, product material and components, installation and production costs, safety and environmental factors, regulatory requirements, and time schedules. Once the assumptions are tested and validated, full production can start or the service can be delivered.

Key activities

- Develop a preproduction prototype.
- Determine manufacturing processes, equipment and tools.
- Select final product materials and components.
- Assess specification conformance.
- Test product performance, quality, safety and reliability.
- Design a field support system.
- Determine full production costs.

Product/output of the activity

Small production.

Funding sources

Angel investors.

OPTION A: STARTUP OR EXISTING COMPANY

A6	Market validation
<p>Before proceeding to full-scale production, the enterprise should assess its marketing approaches and obtain customer feedback through data collection and qualitative surveys.</p>	
<p>Key activities</p> <ul style="list-style-type: none"> • Undertake limited product sales. • Collect data on the volume, rate and demographics of sales. • Conduct a customer survey and analyse customer responses (price, design, function, packaging and delivery). • Transmit design modifications to technicians. 	
<p>Product/output of the activity</p> <p>Quantitative assessment of sales performance and qualitative analysis based on customer feedback.</p>	
<p>Funding sources</p> <p>Angel investors.</p>	

OPTION A: STARTUP OR EXISTING COMPANY

A7	Business formation
STARTUP OPTION	
<p>This option is pursued only if the decision was taken to start a new business to commercialise the developed technology.</p>	
<p>Key activities</p> <ul style="list-style-type: none"> • Hire and train employees. • Make arrangements for the next stages of financing. • Establish accounting procedures. • Set up a process for strategic planning for the enterprise. 	
<p>Funding sources</p> <p>Angel investors.</p>	
EXISTING COMPANY OPTION	
<p>This option is mainly applicable to those situations when technology was developed within an existing commercial business, such as an established company.</p>	
<p>Key activities</p> <ul style="list-style-type: none"> • Analyse the company's infrastructure, facilities and human resources. • Identify additional production facilities, labour and other resources required for the production and marketing of the product. 	
<p>Funding sources</p> <p>Internal business funds and debt financing.</p>	

OPTION A: STARTUP OR EXISTING COMPANY



COMMERCIALISATION PHASE

Before proceeding further, an inventor/entrepreneur must ensure the following outcomes have been reached during the development and pre-commercialisation phase:

- An engineering prototype or pilot process is produced.
- Detailed marketing and business plans are developed
- IP applications are filed, where required
- A pre-production prototype is developed.
- Customers' feedback on the product is collected and analysed
- A team of adequately skilled employees is selected.
- Necessary financial and administrative processes are put in place

The commercialisation phase for a product commercialised through a startup or existing company consists of the following steps:

- Production
- Market monitoring
- Business growth
- Product support
- Market diversification

OPTION A: STARTUP OR EXISTING COMPANY

A8 Production

Production activities refer to the building of the manufacturing process and the full-scale production of the product. One should keep in mind that in today's global economy, price is not necessarily the dominant economic imperative. Time to market, quality and customer satisfaction also play an increasingly important role.

Key activities

- Finalise the commercial-level product designs.
- Develop manufacturing process schematics.
- Establish quality-control procedures.
- Finalise distribution systems.
- Establish manufacturing facilities (if needed).
- Implement a trial run and make modifications accordingly.
- Run the full-scale production.

Product/output of the activity

Market-ready product.

Funding sources

Venture capitalists (early stage).

OPTION A: STARTUP OR EXISTING COMPANY

A9 Market monitoring

After having introduced the product to the market, it is crucial to follow a systematic approach to monitoring performance, customer profiles and marketing positioning.

Key activities

- Determine areas for market growth.
- Assess customer and distributor satisfaction.
- Refine product features.

Product/output of the activity

Confirmation or modifications of the marketing strategy assumptions.

Funding sources

Venture capitalists (early stage).

OPTION A: STARTUP OR EXISTING COMPANY

A10 Business growth

Business growth is not only about increasing sales, but also depends on the business's ability to adapt its structure and organisation to growing demand.

Key activities

- Acquire equipment and facilities.
- Hire and train employees.
- Execute contracts.
- Arrange for next financing rounds.
- Institutionalise management vision, mission and policies.
- Establish regular board of director meetings.
- Monitor industrial business trends and practices.
- Identify opportunities and threats to profit growth.
- Conduct strategic and tactical planning for the enterprise.

Product/output of the activity

A business that is identified by the market as a reliable and preferred source for a product.

Funding sources

Venture capitalists (early stage).

OPTION A: STARTUP OR EXISTING COMPANY

A11 Product support

Businesses operate in highly competitive and changing environments, so it is necessary to adapt the product continually to meet customer needs and expectations. One must perceive products and services as dynamic devices and perishable commodities that must retain customers' loyalty through continual improvement and modifications.

Key activities

- Develop on-site technical instructions and updates for the safe and effective use of the product or process.
- Design and introduce, in a timely manner, minor improvements in materials, components, systems and software.
- Set up and provide warranty services.
- Identify the potential for new product spin-offs or major design changes.
- Disseminate alerts and offer remedial action for unplanned product deficiencies or different safety and environmental requirements.

Product/output of the activity

A competitive product.

Funding sources

Venture capitalists (development stage).

OPTION A: STARTUP OR EXISTING COMPANY

A12 Market diversification

A business should consider diversifying when sales are no longer growing. This requires modifying the product to expand market share or meet existing demand.

Key activities

- Monitor and scan the market environment.
- Allocate resources to make improvements to the existing product.
- Allocate resources for new product development.

Product/output of the activity

Portfolio of competitive products and multiple markets for the business to protect it from economic downturns.

Funding sources

Venture capitalists.

OPTION A: STARTUP OR EXISTING COMPANY



PARTNERSHIPS

Forming partnerships with other firms, both foreign and local, can assist in reaching success in commercialisation.

- Partnerships with foreign firms allow accessing the global market, leveraging technical knowledge/capabilities, acquiring well-developed products, or entering into licensing agreements for technology developed outside South Africa.
- Partnerships with other small, medium and micro-sized enterprises assist in acquiring knowledge, know-how and complement skills not available in-house, and building market strength.
- Partnerships with large domestic firms can be important in securing technology and financial backing, and acquiring experience and exposure.

It is also important to keep in mind that:

- Great attention must be given to the choice of activities to be outsourced (the core business competencies and capabilities must be identified and remain in-house);
- Legal agreements defining the nature and conditions of the partnership must be carefully crafted; and
- Some elements must be taken into account when considering a partnership, such as business culture, time and/or cultural difference for offshore partners, and ip issues.

OPTION B: LICENSING OR ASSIGNMENT OF IPR



PRE-COMMERCIALISATION AND DEVELOPMENT PHASE

Before proceeding to the next steps, an inventor/entrepreneur must ensure that the following outcomes have been reached:

- The technical feasibility of the concept is proven
- The value proposition of the product is defined.
- The target market and competitors are identified
- Customer requirements are determined.
- The most plausible path to commercialise the product is investigated.
- IP requirements are established.
- The invention is disclosed, if applicable and planned.



COMMERCIALISATION PHASE

Commercialising a technology by assigning or licensing IPR includes:

- IP protection application;
- technology marketing; and
- licensing or assigning IPR.

OPTION B: LICENSING OR ASSIGNMENT OF IPR

B1 IP protection application

Protection of IP is filed with relevant parties, such as CIPC in South Africa and national and regional patent offices abroad. IP protection is usually linked to patenting, but other forms of protection (such as trademarks, design registration or copyrights) can and should be considered. Obtaining IP protection for an invention is usually a costly and lengthy process.

Key activities for OTT-supported inventions

- If an OTT, during the screening exercise, determines that the invention is novel and has potential for commercialisation, and decides to obtain statutory protection for the invention, it would file an application for IP protection in South Africa and other potential jurisdictions.
- Filing for IP protection is done with assistance of a patent attorney and in collaboration with the inventor(s).

Key activities for privately funded and other publicly funded inventions (excluding OTT-supported inventions)

- Consult an experienced IP practitioner to decide on the country/region where protection should be filed.
- Request the services of an attorney to assist with the IP application.
- File IP protection as advised by the IP practitioner.

Product/output of the activity

Filed application with relevant parties.

Funding sources

Public funds, personal funding, debt funding, and angel investors for privately funded inventions.

OPTION B: LICENSING OR ASSIGNMENT OF IPR

B2 Technology marketing

The purpose of this activity is to market the technology to potential commercial partners to identify the most suitable partner to develop the technology and successfully introduce it into the market.

Key activities

- Market the technology through, for instance, technology brokers, showcase events, trade shows, open innovation platforms, exhibitions, and direct meetings with companies.
- Identify the preferred partner(s).

Product/output of the activity

Identified commercial partner(s).

Funding sources

Public funds, personal funding, debt funding, and angel investors for privately funded inventions

OPTION B: LICENSING OR ASSIGNMENT OF IPR

B3 Licensing or assigning IPR

This option considers two choices: licensing and assignment.

- Licensing involves signing a contract between the IPR owners and the party authorised to use the rights in exchange for an agreed payment. IPR remains with the licensor.
- Assignment involves the transfer of ownership of IPR to another party for a predetermined fee. In this instance, the ownership is transferred to the party purchasing the rights.

In South Africa, licensing is the preferred choice. If the holder of the IPR decides to follow the assignment route, approval from National Intellectual Property Management Office (NIPMO) will be required for such a transaction.

Key activities

- Decide on the option to follow (licensing or assignment).
- Exchange non-confidential information to launch more in-depth discussions, and sign a non-disclosure agreement before providing more detailed information about the invention.
- Negotiate the terms of the agreement.

Product/output of the activity

Signed licence or assignment agreement.

Funding sources

Angel investors, public support in the form of loans or provided by an OTT (for publicly funded inventions).

OPTION B: LICENSING OR ASSIGNMENT OF IPR



WHAT TO KEEP IN MIND WHEN LICENSING?

Template license agreements are easy to obtain; however, it is recommended to seek legal advice to minimise future issues. As a minimum, a licence agreement should include:

- the licence type (such as sole, exclusive, non-exclusive licences);
- clear definitions of the IP;
- the period for which the licence is valid;
- the scope of the licence;
- the licensee's plans for commercial development;
- whether or not sub-licences are permitted;
- the nature and amount of upfront fees and royalties;
- maintenance fees/minimum royalties;
- milestone payments, including performance milestones;
- guarantees or warranties on the technology; and
- whether or not the licensor has rights to any improvements developed by the licensee and can continue to exploit the IPR.

For the licensor:

- Record the license on the IP register.
- Obtain NIPMO's approval for exclusive and royalty-free licenses in the case of publicly funded IP.

For the licensee:

- Consider including other IPRs, such as know-how.
- Access to publicly funded IP: preference is given to non-exclusive licensing, BBBEE and small enterprises.

Good Luck

Things work out best for those who make the best of how things work out.

John Wooden

There are no secrets to success. It is the result of preparation, hard work, and learning from failure.

Collin Powell

Many of life's failures are people who did not realise how close they were to success when they gave up.

Thomas Edison

Forget past mistakes. Forget failures. Forget everything except what you're going to do now and do it.

William Durant

To be successful, you have to have your heart in your business and your business in your heart.

Thomas Watson Sr.

You were born to win, but to be a winner, you must plan to win, prepare to win, and expect to win.

Zig Ziglar

Whatever the mind of man can conceive and believe, it can achieve. Thoughts are things, and powerful things at that, that when mixed with definiteness of purpose and burning desire can be translated into riches.

Napoleon Hill

ANNEXURE 1: TECHNOLOGY READINESS LEVELS

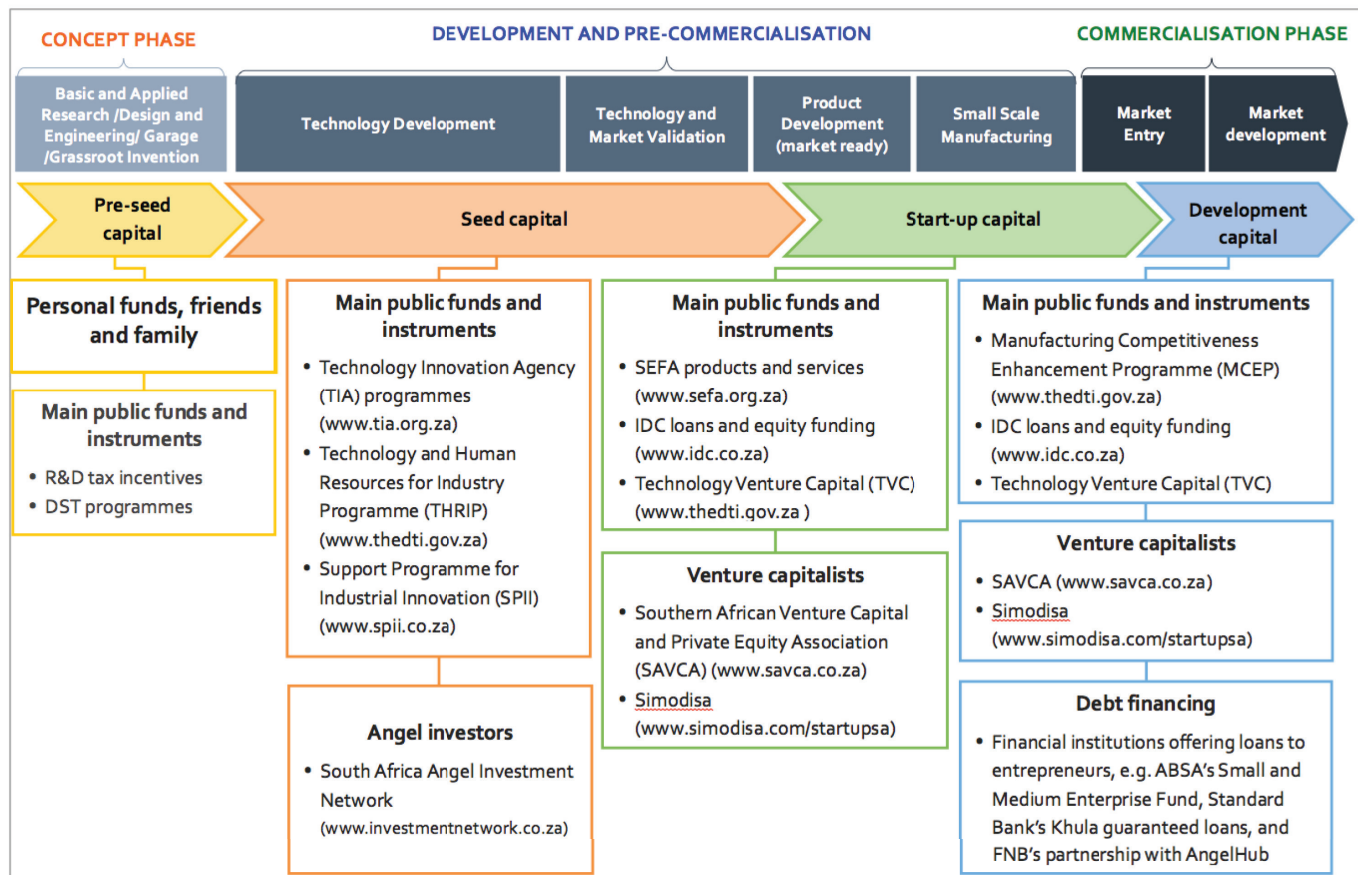
Real world	TRL 9	Actual system is proved by long-term use in the business system	Actual technology proved through successful deployment in an operational setting. The technology is applied in its final form and under real-life conditions, such as those encountered in operational tests and evaluations. This includes using the invention under operational conditions.
	TRL 8	Actual system completed and approved through test and demonstration	Actual technology completed and qualified through tests and demonstrations. The technology has been proven to work in its final form and under expected conditions. The prototype is tested and evaluated to see whether it meets operational requirements.
	TRL 7	System prototype demonstration in and operational environment	Prototype ready for demonstration in an appropriate operational environment. The prototype should be near operational and ready for the demonstration of an actual prototype in an operational environment. Activities include prototype field testing.
Simulated world	TRL 6	System/ subsystem model or prototype demonstration in a relevant environment	System/subsystem model or prototype demonstration in a simulated environment. A representative model or prototype system is developed that represents near desired configuration. Activities include testing in a simulated environment or laboratory.
	TRL 5	Component and/or breadboard validation in relevant environment	Component and/or validation in a simulated environment. The basic technological components are integrated and developed with reasonably realistic supporting elements so that the technology can be tested in a simulated environment.
	TRL 4	Component and/or breadboard validation in laboratory environment	Component and/or validation in a laboratory environment. Basic technological components are integrated to establish whether they will work together (validation in laboratory environment). Activities include the integration of ad hoc hardware in the laboratory.
Research Lab	TRL 3	Analytical and experimental critical function, and characteristic proof of concept	Analytical and experimental critical function and/or proof of concept. Active research and development are initiated, including analytical and laboratory studies, to physically validate analytical predictions of separate elements of technology. Activities might include components that are not yet integrated or representative.
	TRL 2	Technology concept and/or application formulated	Technology concept and/or application are formulated. Invention begins at this level. Following the observation of the basic principles, practical applications can be invented. The application is still pure speculation and there is no proof or detailed analysis to support the assumptions.
	TRL 1	Basic principles observed and reported	Basic principles of concept are observed and reported. At this level, scientific research begins to be translated into applied R&D, such as paper studies of technology's basic properties.

ANNEXURE 2: COMPARATIVE ANALYSIS OF PREFERRED COMMERCIALISATION PATHS

Each of the three commercialisation options has its own advantages and disadvantages, and will need to be chosen taking into consideration personal circumstances, financial investments required, expected returns on investment, the nature of the technology, market conditions (such as stiff competition, which makes it difficult to start a business), access to funding and skills, and other factors.

Advantages	Disadvantages
Established company	
<ul style="list-style-type: none"> Has instant resources and skills for commercialisation Has acquired knowledge of regulatory and other market requirements Has access to an established network of potential partners for innovation Has already built a client base (branding) Has developed ability to raise funds and some track record to access debt funding 	<ul style="list-style-type: none"> Depending on the size of the company, there can be less flexibility in decision-making and adaptation to market changes In the case of a radical innovation, commercialising the technology through the creation of a spinoff company may be required for focused visibility, branding and resources related to the technology
Licensing	
<ul style="list-style-type: none"> The IP creator(s) retain ownership of the IP, as opposed to IP assignment Provides instant resources dedicated to commercialisation Can provide instant revenue, and guaranteed revenue for a defined period of time Provides brand recognition for the licensor Can offer access to better manufacturing capacity, wider distribution outlets, greater local knowledge, and management expertise Can offer opportunities to enter new markets The licensor can continue focusing its efforts on R&D Can be used as a means for protecting IP by turning an infringer or competitor into an ally or partner Can be a business opportunity when a technology sells best if it is incorporated with another technology 	<ul style="list-style-type: none"> Loses partial control of the technology Less lucrative than inventor-led commercialisation Production process becomes known by others, with the risk of a breach of confidentiality Reduces the inventor's involvement Can make the licensing entity highly dependent on the success of the licensee to sell the product/process in order to receive royalties When a product or technology is not clearly defined or is not complete, the licensor may be expected to continue development at great expense to satisfy the licensee
Startup	
<ul style="list-style-type: none"> Allow commercialisation of a technology with very lucrative possible outcomes when there is no existing industry for the technology (radical innovation), or competition is limited, and/or there are multiple applications for the technology IP nurturing and commercialisation in a focused manner Flexible structure for decision-making allows the company to adapt to market changes quickly 	<ul style="list-style-type: none"> High uncertainty regarding the market absorption of the product/service Risky and resource-intensive process Need to find the right skills for commercialisation and market development Need to secure funding for commercialisation and market development, which can be challenging without a track record and in the South African context, where there is an underdeveloped venture capital industry National and international regulatory requirements can be difficult to navigate and comply with Can take a long time to become profitable when a market is not already established

ANNEXURE 3: SOURCES OF FUNDING¹



¹ The list of funding opportunities presented in this figure is not exhaustive. For a list of public innovation and technology funding instruments, please visit the dti's website: http://www.thedti.gov.za/financial_assistance/Innovation_value_Chain.jsp

ANNEXURE 4: SOURCES OF NON-FINANCIAL SUPPORT

Small Enterprise Development Agency Technology Programme – Incubation services



Tel: 0860 103 703
Website: www.seda.org.za

Biomanufacturing Industry Development Centre Programme



Tel: 012 841 3867
Website: biomanufacturing.csir.co.za

Technology platforms and stations



Tel: 012 472 2701
Website: www.tia.org.za

Silicon Cape Initiative



Website: www.siliconcape.com

Branson Centre of Entrepreneurship



Tel: 011 403 0613
Website: www.bransoncentre.org

The Innovation Hub



Tel: 012 844 0000
Website: www.theinnovationhub.com

OpenIX Open Innovation Exchange



Tel: 012 844 0000
Website: www.openix.theinnovationhub.com

mlab Southern Africa (mobile solutions laboratory)



Tel: 012 844 0240
Website: www.mlab.co.za

Maxum Business Incubator



Tel: 012 844 0012
Website: www.maxumconnect.com

Biomanufacturing Industry Development Centre Programme



Tel: 012 841 3329
Website: www.sarima.co.za

ANNEXURE 5: GOVERNMENT DEPARTMENTS AND AGENCIES

the dti



Tel: 0861 843 384
Website: www.thedti.gov.za

Small Enterprise Development Agency



Tel: 0860 103 703
Website: www.seda.org.za

Department of Science and Technology



Tel: 012 843 6300
Website: www.dst.gov.za

Small Enterprise Finance Agency



Tel: 0 12 748 9600
Website: www.sefa.org.za

Department of Small Business Development (DSBD)



Tel: 0861 843 384
Website: www.dsbd.gov.za

National Research Foundation



Tel: 012 481 4000
Website: www.nrf.ac.za

National Treasury



Tel: 012 315 5111
Website: www.treasury.gov.za

National Intellectual Property Management Office



Tel: 012 844 0222
Website: www.nipmo.org.za

Technology Innovation Agency



Tel: 012 472 2701
Website: www.tia.org.za

Companies and Intellectual Property Commission



Tel: 086 100 2472
Website: www.cipc.co.za

Industrial Development Corporation



Tel: 011 269 3000
Website: www.idc.co.za

South African Bureau of Standards



Tel: 0861 27 7227
Website: www.sabs.co.za

ANNEXURE 6: SELECTED PUBLIC KNOWLEDGE GENERATORS

Council of Scientific and Industrial Research



Tel: 012 841 2911
Website: www.csir.co.za

Water Research Commission



Tel: 012 330 0340
Website: www.wrc.org.za

Human Sciences Research Council



Tel: 012 302 2000
Website: www.hsrc.ac.za

Higher education institutions



Tel: 0800 45 4646
Website: www.universitiessa.ac.za

Medical Research Council of South Africa



Tel: 012 339-8500
Website: www.mrc.ac.za

Centres of Excellence (CoE)



Tel: 012 481 4000
Website: www.nrf.ac.za

Agricultural Research Council



Tel: 012 427 9700
Website: www.arc.agric.za

Hartebeesthoek Radio Astronomy Observatory



Tel: 012 301 3224
Website: www.hartrao.ac.za

Council for Geoscience



Council for Geoscience

Tel: 012 841 1911
Website: www.geoscience.org.za

South African Institute for Aquatic Biodiversity



Tel: 012 603 58000
Website: www.saiab.ac.za

MINTEK (national mineral research organisation)



Tel: 011 709 4111
Website: www.mintek.co.za

iThemba Laboratory for Accelerator Based Sciences



Tel: 012 843 1000
Website: tlabs.ac.za

Notes:

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

This image shows a full page of a document template designed for handwriting practice. It features a series of evenly spaced, horizontal dashed lines across the entire width of the page. The background is plain white, providing a clear guide for letter height and placement. There are no margins, text, or other markings present.

the dti Campus

77 Meintjies Street

Sunnyside

Pretoria

0002

the dti

Private Bag X84

Pretoria

0001

the dti Customer Contact Centre: 0861 843 384

Website: www.thedti.gov.za



the dti

Department:
Trade and Industry
REPUBLIC OF SOUTH AFRICA

towards full-scale industrialisation and inclusive growth

the dti Customer Contact Centre: 0861 843 384

the dti Website: www.thedti.gov.za

