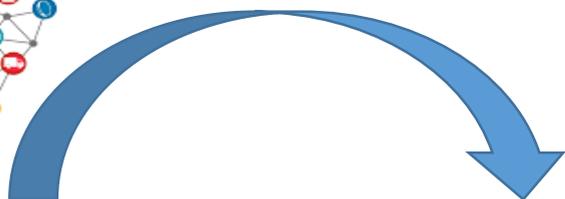


# Commercialisation Handbook

An Introductory Guide for Researchers

*IDEATION*



*WEALTH*

**Presented By:**

**RESEARCH COUNCIL OF ZIMBABWE**



Leadership, Innovation and Development

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## **Foreword**

This handbook seeks to describe and explain relevant aspects of research commercialisation and to briefly illustrate what Intellectual Property (IP) is, why it is important and how it supports research commercialisation. The importance of the successful commercialisation of IP generated by the research cannot be emphasised and is key to securing long term benefits out of research for socio-economic benefit of Zimbabwe.

## **Aims of the Commercialisation Handbook**

- ❖ Promotion of a commercialisation culture in Zimbabwe
- ❖ To promote and advise on procedures to protect research results for possible commercialisation.
- ❖ Rapid turn-around on negotiated research collaboration contracts.
- ❖ Marketing of the institutional technologies.
- ❖ Incubation support for knowledge-based enterprise development.

## **Preamble**

The Nation is focused on establishing a knowledge based economy through a functional National Science Technology and Innovation System (NSTIS). Research and Development (R&D) is the bedrock for new knowledge stock hence, commercialisation of research outputs is important to attract Foreign Direct Investment (FDI), growth of the local industry and to accelerate Zimbabwe's socio-economic transformation. Industry and Academia should leverage on conversion of ideas or research into competitive goods and services.

Research outputs commercialisation is key to boost economic growth in Zimbabwe. Hence, Universities and research institutions are being encouraged to consider commercialising research products as one of their critical activities for income generation. Although much emphasis and encouragement has been put forward to accelerate research commercialisation, especially among academics in Zimbabwe, the pace has been low and discouraging. Challenges range from Intellectual Property insecurities, limited knowledge on commercialisation steps and institutional bureaucracies. According to Pertuze (2016), there is need for trust between academia and industry, which is limited in the current environment, making commercialisation complex and risky. Hence, creation of trust is one of the several reasons for the importance of long term industry-university relationships and subsequent commercialisation.

Development of the Framework to guide the implementation and commercialisation of research outputs was done under the auspices of the 2<sup>nd</sup> Rapid Results Initiative (RRI) on Functionality of the NSTIS. The Framework was developed based on desk research on worldwide best practices, practical experience of TWG members, guidelines from the World Intellectual Property Office (WIPO) and existing local institutional guidelines. A Consultative Workshop was held on 20 April 2018 to engage various stakeholders on the proposed Framework. Participants present from all pillars of the NSTIS (Government, knowledge creators, users and funders), provided input to improve the framework; endorsed it, hence its adoption.

The Second Science Technology and Innovation (STI) of policy 2012 addresses issues of R&D and commercialisation of research outputs. The policy emphasises the need for literacy and application of new and emerging technology, the need to build capacity in Science and Technology, collaboration in STI and accelerating commercialisation. Another blueprint that supports technology transfer and R&D is the Industrial Development Policy (2018). The policy highlights Government commitment to support public-private research institutes including Scientific and Industrial Research and Development Centre (SIRDC) to create a strong knowledge base and establish a strong and research and innovation network for production of competitive goods and services. Facilitation of linkages between technology research institutions and industry is a key success factor.

## **1.0 Introduction**

### **1.1 What is Commercialisation?**

This is defined as the monetisation of intellectual property, typically through developing and trading in products, services, processes or technology (“products”). Generally, value is created during the process of translating research into a commercialisation outcome and this value can be monetised in some circumstances during the commercialisation process (e.g. licensing of the underlying IP), rather than exclusively at its conclusion (e.g. product revenue). Proceeds from research commercialisation can come from licensing fees, product/service revenues, royalties, sale of shares, etc. Much more so than the other forms of research translation, research commercialisation involves considerable risk uncertainty and requires the investment of resources into overcoming and mitigating that risk in order to secure a return on the investment (Edith Cowan University 2016)

Commercialisation of technology involves any possible configuration or scheme that allows those who invest in technological innovation (inventors, research systems, private firms and others) to capture some of the economic benefits generated by their innovation. Patent licensing, research grants and contracts, R&D joint ventures, and technical services for a fee, are all examples of commercialisation schemes. (OECD 2007)

World over, there is now new trajectory of R&D outputs, outcomes and impacts globally with the following characteristics:

#### **Outputs**

- Number of Publications, Patent applications, IP Assets generated.
- IP Assets Licensed.

#### **Outcomes**

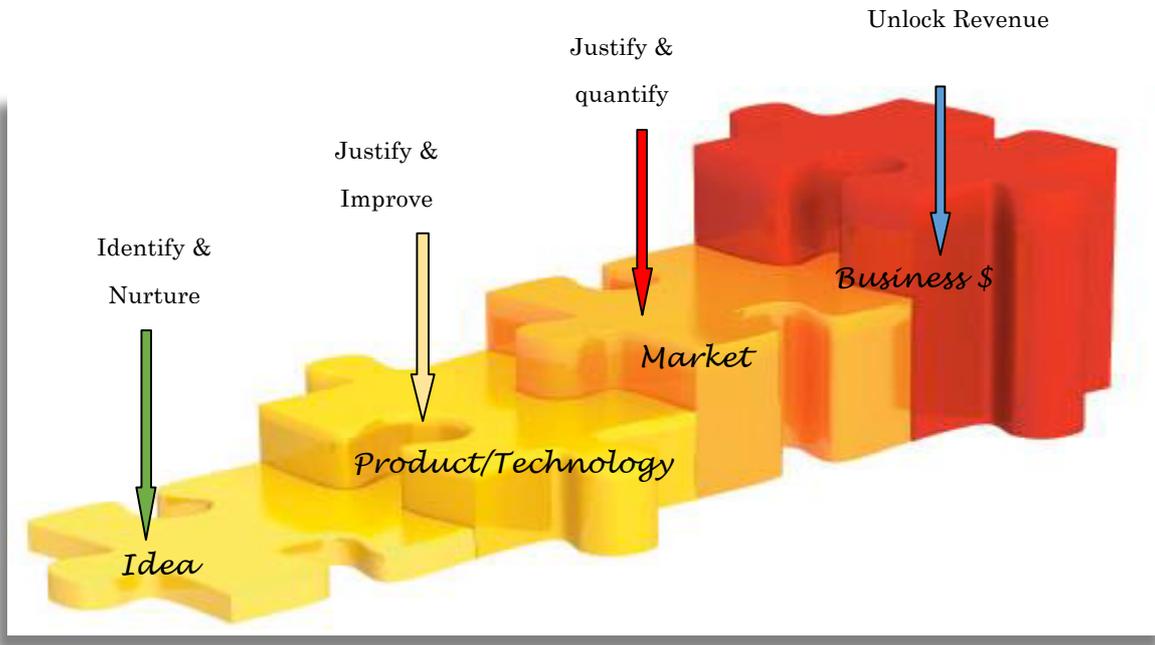
- Income from Technology Licensing.
- Number of Companies created directly based on the product of R&D.
- Increase in sales, tax revenues, and profitability.
- Jobs created.

#### **Impacts**

- Contribution to the GDP and poverty reduction.

In a nutshell, commercialisation is the process of transforming ideas, knowledge and inventions into greater wealth for individuals, businesses and/or society at large as illustrated in the figure below. The wealth comes in many forms: new products, services and business opportunities, which meet the public’s needs, as well as possible benefits for research institutions and ultimately socio-economic transformation.

Fig 1: The Ideal Complete Picture



*Adapted from National Technology Business Centre (NTBC) Zambia 2017*

## 1.2 Rationale for Commercialisation

Research and development (R&D) is an important contributor to economic growth. In order to meet the ambitions of the national vision i.e. to be a Middle Income Economy by 2030, we require radical innovation premised on solid R&D, however, greater financial support for research, science technology and innovation is necessary in order to contribute to the national target of increasing and sustaining R&D expenditure to at least 1% of GDP. R&D investment is likely to lead to growth through its positive effect on innovation and total factor productivity. There is therefore need for a new paradigm shift which moves from the old way of thinking where academic institutions were driven by service and no pains if the R&D outputs were not utilised. Further, an entrepreneurial thrust is crucial for economic growth for realisation of new start-ups and job creation. It is therefore the process of commercialisation that helps to accelerate scientific progress i.e. the transfer of a new technology between two or more public or private-sector partners. Commercialisation will not only support the economic development of the country but also enhances its competitiveness. The commercialisation of innovative results contributes to growth in Zimbabwe by adding to the range of products offered by existing businesses or by stimulating the creation of new businesses, thus helping to boost the country's attractiveness. Moreover, the commercialisation of research results helps to drive the emergence of a new way of funding research. Commercialisation can also generate additional income for the country.

## **2.0 Objectives of Research commercialisation**

- To achieve an effective and proactive transfer of knowledge from research institutions and focus the promotion of technology to the requirements of the country and relevant development needs.
- To analyse strategic technological demands of innovative companies or the business sector as a whole.
- To promote and strengthen research outputs for both researchers and companies.
- To establish procedures to promote entrepreneurship through the creation of new businesses to encourage and support the creation of University Spin-Off / start-up companies.
- To develop a conducive environment for innovation amongst all stakeholders.

### **2.1 Potential Personal Benefits of Commercialising Research**

- Practical application of research in developing products fosters the widest possible recognition of your research efforts.
- Collaboration with industrial partners may also result in financial sponsorship of additional research.
- Collaboration with industrial partners may financially support students, provide them invaluable experience, and potentially future career paths.
- Potential monetary compensation in the form of equity, license fees or royalty payments.

### **2.2 University Benefits of Commercialising Research**

- Ensures public benefit from university research.
- Enhances the university's research environment.
- Development of lasting industry relationships.
- Generates revenue for the university.

### **2.3 Benefit for researchers**

TT is a good thing at the personal level for researchers for a number of reasons:

- The chance to use income generated as discretionary research funding;
- The chance to see their science used for benefit of society;
- Exposure of the intellectual challenge for turning laboratory research into products; Increased awareness of interesting applied problems;
- The opportunity for personal wealth.

### **2.4 Other benefits**

Several routes can be established for knowledge and technology transfer:

- ❖ Founding of spin-offs or start-up companies
- ❖ Licensing.

- ❖ R&D collaboration.
- ❖ Training and provision of services

## 2.5 Benefit sharing upon Commercialisation

In order to promote commercialisation there has to be fair and equitable benefit sharing. Table 1 below describes a typical benefit sharing model.

**Table 1: Typical Benefit sharing model**

Elements	Details
Main benefits for sharing	Income, Royalty, equity
Key beneficiaries	Inventor, Institution, Inventor's group, and department, TTO
Sharing principle	Only net revenue is shared Net revenue = gross income – administrative expenses Sharing can be in terms of equity
Duration of income stream	As long as there is revenue stream Revenue receipt even after inventor leaves employment Next of kin entitled to benefits

## 3.0 The Commercialisation Process

### 3.1 Research Commercialisation Framework for Zimbabwe

The following is the commercialisation process that outlines key steps from research to the transfer of the technology to a new or existing company. The process and services provided can differ significantly between institutions. The steps are interrelated and interdependent with each other to achieve sustainable research product commercialisation. There can be different entry points for the respective parties but all elements are useful for researchers and their business partners to develop an effective strategy for a successful research products commercialisation.

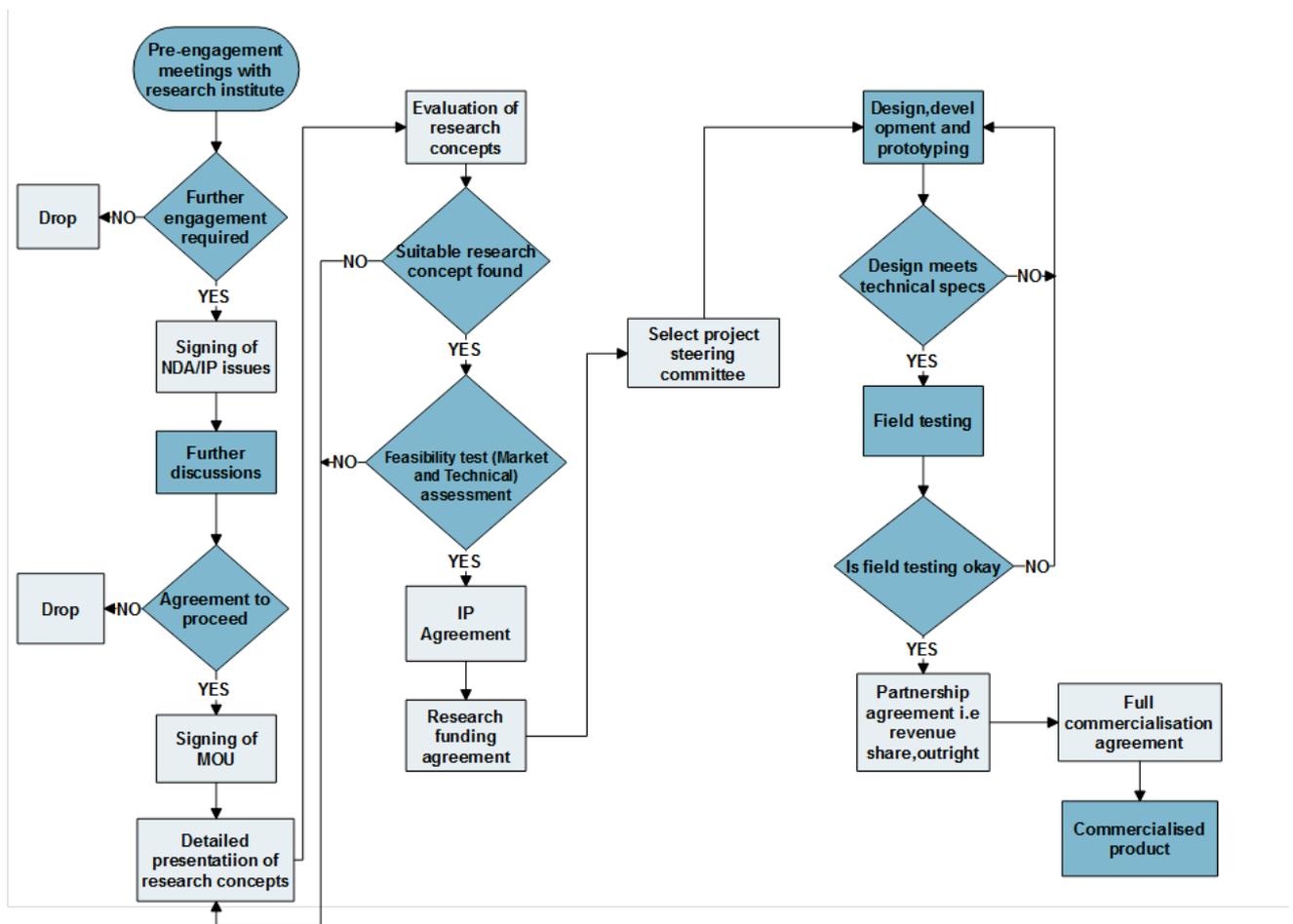


Fig 2: Commercialisation Process Path

Research Council of Zimbabwe 2018

There are twelve major stages to effectively enable sustainable commercialisation of research products.

### Stage 1: Pre-engagement meetings with the research institution.

At this stage, the research institution and the industry operator /organization holds preliminary meetings to discuss possible areas of collaboration. A preliminary assessment is done to see if there is need for further engagements or drop the engagement. If there is need for further engagement then the next step is taken that is to:

### Stage 2: Signing of Non-Disclosure Agreement (NDA)

At this stage the parties plan to discuss detailed issues including sharing of confidential information and such to protect the shared information parties sign an NDA. **IP protection issues should be mentioned upfront.**

### Stage 3: Signing of Memorandum of Understanding

After signing of NDA the parties engage into further discussions and if they agree to proceed then the next stage will be signing of a Memorandum of understanding as a sign of mutual understanding of what needs to be done.

### Stage 4: Detailed presentation of research concepts.

The research institution presents detailed concepts or proposals that might be of interest to the industry partner or organization. The industry partner then evaluates all presented concepts and select suitable concepts for the next stage:

### Stage 5: Feasibility test

The selected concept is then taken to feasibility stage whereby it would be tested against two major parameters which are market test and technical test. In pursuit of producing demand driven innovations for Zimbabwean market it is very important to ensure that the concept meets the market needs. If the concept fails feasibility test it is dropped and if it passes it goes to the next stage which is:

### Stage 6: IPR negotiation and agreement

The industry partner and the research institution would have to discuss IPR issues and agree on whether they will have joint IP or one of the parties will remain with IPR.

### Stage 7: research funding agreement

At this stage the parties agree on project funding arrangement that is whether they will jointly fund or the industry partner should fund the project. If they agree the next stage will be:

### Stage 8: forming of a project steering committee.

The parties would meet to form a project steering committee whose duties will be to coordinate the project. The committee should consist of members from both parties that is the industry and the research institution.

### Stage 9: Design develop and prototyping

At this stage the concept is developed into a prototype after sharing of technical specifications. The prototype undergoes a lab testing and if the design meets set specifications it then moves to the next stage.

### Stage 10: field testing

The prototype is then further developed for actual field testing in a real market environment. If it fails to work we go back to redesigning stage and if it passes field test the next stage would be:

## Stage 11: partnership agreement

The research institution and the industry partner would meet to discuss the go to market strategy or partnership agreement. Issues of whether a revenue share arrangement or outright purchase would be discussed at this stage. If parties agree on a model then the patent is registered and the next stage would be:

## Stage 12: full production and commercialisation agreement

After agreeing on the partnership model the partners go on to develop the commercialization strategy and then finally launch the product in the market.

### **3.2 Pre commercialisation activities**

- a) Identification of research results or outputs;
- b) Technological potential assessment;
- c) Innovation surveillance /comparison with existing innovations or related outputs;
- d) Identification of IP assets in the Research Output;
- e) Intellectual property protection and strategy;
- f) Market opportunities research;
- g) Business plan development; and
- h) Begin Commercialisation.

### **3.3 Commercialisation activities**

Commercialisation is the process of transforming new technologies into commercially successful products. It has been agreed that the commercialisation process includes:

- a) market assessment;
- b) marketing strategy development;
- c) product design, manufacturing, engineering, worker training;
- d) management of intellectual property rights;
- e) raising capital or identification of and negotiation with potential partners;
- f) comprehensive support for the creation of spin-offs; and
- g) Identification of potential sources of public or private funding.

### **3.4 Key Issues Involved With All Paths to Commercialisation**

#### **34.1 Control Issues**

Whether licensing the technology, or starting up a new company, commercialisation means giving up some measure of control over the technology. There is possibility of losing control over what happens to the IP in the future and use of the IP for further development.

#### **3.4.2 Technology Issues**

Regardless of the commercialisation path you follow, you will need to prove that your technology works. Tangible proof-of concept, or better, a functional prototype is required. The potential market for the technology can be an important factor in the choice of

commercialisation path or point of entry within the framework.

### **3.4.3 Team Issues**

Inventors must be honest about their role and commitment to the commercialisation of their technology. If inventors are not prepared to make a large commitment, or are not interested in working as part of a management team, then a licensing path might be appropriate. When creating a start-up company, inventors must recognise their skills and limitations and seek to fill any gaps with the right expertise.

### **3.4.4 Market Issues**

The potential market for the technology can be an important factor in the choice of commercialisation path. Not every invention warrants the creation of a new company. Some markets, quite simply, will be too small to warrant company creation. In other cases, markets may be controlled by large and mature companies that would make it difficult to compete. Be realistic about the value of the technology and carefully weigh the size and structure of the market as part of choosing the right path to commercialisation.

## **4.0 Institutional mechanisms for Commercialisation**

The mechanisms for commercialisation may vary from institution to institution. The commonly used methods particularly in Zimbabwe are mainly Contract and collaborative research respectively. These methods can be described as follows:

- a) Contract research** involves one company sub-contracting a clearly defined research or development project to a public research organisation selected for its research competences and/or equipment. The company usually claims ownership of the results, and the public research organisation does not retain any intellectual property beyond the possible enhancement of its know-how and commercial gain from the revenue from payment from the company.
  
- b) Collaborative (competitive) research** involves public research organisations and companies jointly select a research area and agree on a division of tasks that reflects their respective competences. Individual partners retain ownership of the results they have generated, and all partners jointly decide how to manage any exploitation rights. This type of cooperation requires negotiation with regard to IP.

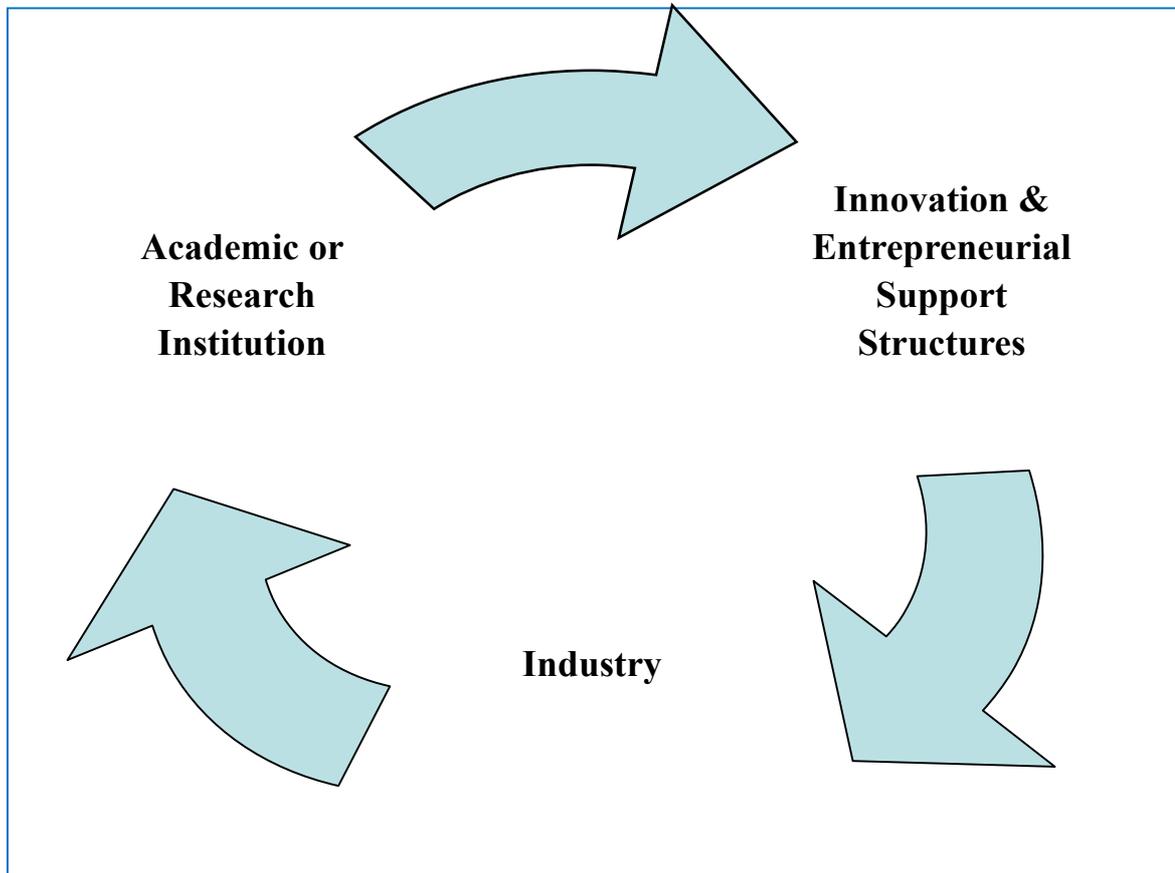
### **4.1 Support structures for Technology Transfer or Commercialisation**

Technology Transfer uses commercial routes to achieve the same objective i.e. to unlock revenue and wealth. When successful, technology transfer achieves a number of positive objectives simultaneously:

- Transfer of new knowledge outside the University or Research Institution;
- Source of new innovative ideas for industry;

- Opportunities for income generation by industry and university;
- Generates a positive social and economic impact.

It is critical that each institution has the necessary infrastructure for technology transfer and commercialisation which allows the interaction of the institution with the outside world for business and generating revenue. Industry should also be able to communicate their needs to the knowledge generators. The cycle should be as illustrated below.



**Fig 2: Cycle of interaction for smooth commercialisation**

#### **4.2 Role of the TTO**

All in all these facilities understand academic culture, speak the language of industry and behave like a private enterprise. The innovation and entrepreneurial support structures could start with a single officer and then growing into Technology Transfer Office; Business Incubation Services; University Companies and Industrial/Science Park.

In addition to the TTO, a commercialisation office or unit has the role to:

- Create IP awareness
- Manages IP/invention or research output disclosures,
- filing and protection of IP
- Markets IP and negotiates for licensing or other forms of commercialization
- Negotiates contract and collaborative research projects
- Marketing of technology

- Technology Licensing

#### 4.3 Other activities of the TTO

- Managing research grants
- Managing services and contract research
- Managing consultancy undertaken by researchers
- Training students and entrepreneurs
- Managing business incubation programmes, including premises
- Managing science parks
- Pilot new technologies
- Establish new companies

To be able to recognise new opportunities, the technology transfer manager needs to win the confidence of academics, which is why it is helpful for the TTO to be embedded within the institution. Likewise, staff should be exposed to both academics and business people.

### 5.0 Key issues in Research Commercialisation

#### 5.1 Intellectual Property

##### 5.1.1 What is Intellectual Property?

The objective of protecting intellectual property is to encourage the creation of valuable ideas and to protect them from being stolen. The four most common types of intellectual property are:

- Copyright ©:** Gives the author exclusive rights to reproduce the copyrighted material. Copyrights can be in published or unpublished works, e.g., original literary, musical, dramatic or artistic works, computer programs and other matter. Copyright protects the expression of ideas, but not the ideas themselves.
- Trade Secret:** A broad term to cover secret information that is defined by how it is treated and protected. It provides an owner of the information with a market advantage over its competitors. To enforce trade secret actions, an owner must show that the trade secret has been maintained in a way that reasonably anticipates preventing others from learning about it. Unlike patents, trademarks, and copyrights, there is no registration of a trade secret with a government agency.
- Trademark <sup>TM</sup>, ®:** A logo, word, slogan, symbol or design that distinguishes a product or a service. Trademarks protect corporate identity and can be legally registered.
- Patent:** Provides inventors and those with rights to inventions the exclusive right for a limited period of time to prevent anyone else from making, using or selling the invention. Patents are granted on machines, articles of manufacture (devices), compositions of matter (materials), processes (methods), and improvements of any of these. Patents are filed in each country individually.

##### 5.1.2 University Policy

Each university has their own policy regarding ownership of IP and the rights of the inventor.

The policies of each institution can vary dramatically so the first step should be to contact your Technology Transfer Office (TTO) to discuss what obligations you must fulfill and what services are available to you.

### **5.1.3 The Policies of Common Research Funding Organisations**

If you received grant funding at any time during the development of your technology, it will be important to consider the implications of any commitments or responsibilities you have to those granting organisation(s).

### **5.1.4 The Implications of Collaborative Research**

It is not just the university and grant funding bodies to which you may have commitments and obligations. Anyone who has participated in your research may have a legitimate claim of co-inventorship and might seek to share in any of the financial benefits from the commercialisation of the research. Consider the following:

- Professors who supervised the work.
- Students who have worked with you on the project or research.
- Visiting researchers or casual collaborators from other institutions.
- Gifts, grants or contracts from organisations or companies.

Setting off on the right foot by determining the proper ownership of the IP is fundamental to successful commercialisation.

## **5.2 IP Commercialisation routes**

The choice of a Commercialisation route may depend on the financial investment required, nature of the technology/product/process, the status of technology and sometimes aspirations of the inventor. In some instance, the target market and how it can best be reached as well as the market concentration, may have influence on the selection of the commercialisation method. There are generally six possible commercialisation routes as described below.

- a) **Licensing** - Involves the negotiation and execution of a license agreement to grant a licensee certain rights on IP, protecting a technology in exchange for consideration. The licensee may be an established company or a start-up company.
- b) **Outright sale** - Giving up all rights to the IP, usually for a fee or for shares / equity.
- c) **Join Ventures** - Institutions invites investor to jointly exploit IP. The IP is valued and converted into equity. Investor brings money and the Institution brings technology and know-how.
- d) **Spin outs** - Creation of a company by institution to commercialise an IP.
- e) **Startups** - Creation of company by investors from outside based on IP Assets of an institution.
- f) **Donation** - Publicly funded research belongs to the Public. This route takes away the incentive to commercialise.

## **5.3 IP protection v Publication (or Why Protect)**

There are two mechanisms to bring technical and scientific knowledge into the public sphere:

- i. Patent/ IP Application and
- ii. Journal Publications.

Several debates on these issues have arisen but, publication can take place after patenting. Scientific publication is a useful means of knowledge dissemination and can be faster than the patent process but the protection of copyright integral in the written work does not extend to the innovations contained therein.

#### **5.4 Combining IP protection and Publishing**

Innovative ideas, products, processes etc, should be protected by IP. Disclosing innovations, inventions or creations without protection may result in others using and commercialising without any benefit to the originator, creator or knowledge generator. If there is commercial/market potential and impact of a research output its worth protecting before publishing. Combining patenting and publication permits researchers to benefit from the two activities – taking advantage of potential commercial value and being recognised in the academic community for their publications. Filing for the protection of the IP should come first then the publishing can take place within specified guidelines that do not compromise the commercial value of the research output.

### **6.0 Areas for Commercialisation**

Demand driven research in Zimbabwe is envisaged to provide a boost to the manufacturing sector, provide home-grown solutions for other sectors such as mining and agriculture, eventually culminating in job creation and augmenting the Gross Domestic Product (GDP). Research needs of Industry are generally premised on research output that enables improved productivity, greater profitability, improved efficiency, sustainability and efficient use of human resources. The following research needs for the various industrial sectors of the country as provided by members of the Confederation of Zimbabwe Industries (CZI), Chamber of SMEs and the SMEs Association of Zimbabwe, are potential areas of Commercialisation to catapult Zimbabwe into a highly internationally competitive nation with respect to goods and services.

#### **6.1 Mining**

- Environmentally friendly extraction processes chemicals and equipment.
- Improved ergonomics.
- Cost effective equipment designs.
- Improved safety and protective equipment and systems.
- Robotics and digitisation for operations deemed dangerous to humans.
- Application of drone technology in remote sensing and monitoring.
- Biosensors for mineral exploration and environmental monitoring.

#### **6.2 Construction**

- Tremor tolerant structural designs.
- Durable, cheaper building materials e.g. tiles, bricks.

- Cost effective equipment designs.
- Energy efficient designs with built in rainwater harvesting and purification systems.
- Smart designs with reduced carbon dioxide emissions for climate change resilience and adaptation.
- Improved ergonomics.
- Improved safety and protective equipment and systems.

### **6.3 Manufacturing**

- 3D printing of parts used in the manufacturing industry.
- Durable, cheaper raw materials.
- Materials recycling e.g. plastics.
- Biodegradable materials e.g. plastics.
- Automated systems.
- Energy efficient and improved production capacity systems.
- Alternative power sources.
- R & D for home grown developed products e.g. Zimbabwe's first motor vehicle, cell phone etc.
- Computer aided design and computer aided manufacturing.

### **6.4 Agriculture**

- Improved drought tolerant crops.
- Durable, cheaper tools and implements designs.
- Smaller implements e.g. tractors.
- Liming alternatives, improved greener fertiliser and pesticide formulations.
- Biological control and IPM of existing and emerging pests and diseases.
- Automated systems and digitisation.
- Grain storage technology and space efficient designs.
- Improved grain drying technology.
- Greater use of molecular techniques in crop and animal breeding.
- Molecular characterisation of Zimbabwean flora and fauna for IP protection when need arises.
- Application of drone technology for example, yield prediction, pest and disease surveillance.

### **6.5 Other Sectors (Retail, Real Estate, Financial Services)**

- Improved digitisation.
- Better interactive e-commerce enabled platforms for clients.
- Improved security of transactions.
- Development of nation-wide payment system including SMEs and transport operators to eliminate / reduce the need for cash and evolve into a cashless economy.

## **7.0 Incentives for Commercialisation**

Collaboration between research institutions and either commerce or industry has mainly been through contract research. There is a gap in the R&D of novel products from *de novo* for particular industrial sectors of the country such as mining, manufacturing and agriculture. The following proposed incentives have potential to ignite and boost the level of research outcomes that result in commercially viable end-user products/ technology that address the needs of industry and other economic sectors of Zimbabwe.

### **7.1 Financial returns**

- Royalties and other commercialisation net revenue, generally shared equally between the university, the research centre or faculty and the inventors.
- Access to equity in spin-off companies, most commonly around 25 per cent.

### **7.2 Support mechanisms**

- Provision of business development staff and resources, both to help identify commercialisation opportunities and provide support and financial relief to inventors in the early stages of the new opportunity's development. This enables inventors to better balance their research endeavours without detriment to their academic careers and other responsibilities.

### **7.3 Finance and other resources**

- Provision of pre-seed and seed funding for technology development (proof of concept and working prototypes).
- Funding support for IP protection (including patents).
- Market and competitor intelligence to allow development of business models.

## **8.0 Conclusion**

The Research Commercialisation Handbook is all encompassing, in a bid to remedy the notion that academic Institutions are slow, bureaucratic, service oriented and slow in decision making. It is essential for Commercialisation of research outputs to actually occur such that Zimbabwe occupies its global niche. This should be possible with this guideline on the Research Commercialisation process. It is envisaged that this Manual will provide knowledge generators with essential legal, business, negotiation and marketing skills for technology transfer or commercialisation. However it is important to highlight that the 1<sup>st</sup> edition is not necessarily cast in stone. Stakeholder input is invited for continuous improvement and subsequent revision.

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