Strategy for Research and Innovation

at

Tshwane University of Technology

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CONTENTS

1 BACKGROUND

1.1 Introduction

Internationally, higher education institutions have realised the importance not only of generating new knowledge through research and development (R&D) programmes, but also to actively participate in the application and utilisation of new knowledge. Innovative institutions have formulated and implemented strategies to attain critical mass in flow of R&D findings into the market place.

The emergence of new modes of knowledge production geared towards addressing the needs of government, industry and communities, as well as the need for higher education to stimulate economic growth, has brought about revised strategies. In particular, a number of universities have opted for developing a community of skilled graduates with relevant and specialised knowledge and skills; contributing to a modernised economy through the creation of new knowledge that is relevant to the needs of society, as well as technological innovation, technology transfer and entrepreneurial development; and stimulating economic growth and prosperity.

TUT is an institution still in the process of being constructed and the institutional strategy for the next five years focus on consolidation, renewal and development. Goal 3 of the Institutional Strategic Plan directly relates to research and innovation (R&I) stating that there will be a focus on enhancing human, intellectual and economic development through focussed engagement, research and innovation.

Against this background a R&I Strategy was developed that will guide the R&I process and present the necessary commitment to relevance and competitiveness in the pursuit of true R&I. Therefore the aim of this document is to develop a coherent and consolidated R&I strategy to guide the institution and the faculties in establishing a physical environment and a culture conducive to research and innovation. The strategy will have to be reviewed regularly to monitor effectiveness and to ensure that it remains a live document.

1.2 National Context

The context within which we conduct and manage R&I has changed considerably in recent years as a result of factors such as diminishing level of resources, the increased selectivity of funding at all levels, the increased competition for external funding and the changing policy environment. There have been a number of recent developments (see Appendix 1) at a national level that are being implemented to shape the R&I climate in South Africa. The most important developments are highlighted below:

1.2.1 National Plan for Higher Education

The National Plan for Higher Education of 2001 provides a framework for the restructuring of the higher education system to achieve the transformation goals outlined in the Education White Paper 3 of 1997. As the White Paper points out, the role of higher education in a knowledge-driven world is three-fold, focusing on:

- Human resource development
- High-level skills training
- Production, acquisition and application of new knowledge.

The National Plan for Higher Education, in particular, challenges higher education institutions to reposition themselves with respect to the following issues:

- Producing graduates geared for social and economic development
- Achieving staff and student equity
- Mission and programme differentiation
- **Sustaining and promoting research**
- Institutional collaboration
- Management and governance structures.

With regard to sustaining and promoting research the National Plan for Higher Education emphasises the fact that the decline in research outputs raises questions about the ability of the higher education system to meet the R&D agenda of the country. On average, masters and doctoral graduates accounted for 6% of all graduates in 1998. The benchmarks set in the National Plan for 2006 are at least 6% of the annual output of graduates at masters and 1% at doctoral level. The Plan goes so far to suggest that the future sustainability of the national research system and of the higher education system is under threat, since both systems are dependent on the production of postgraduates for replacement of academics leaving the system.

Furthermore, research requires a critical mass of resources: qualified staff, postgraduate students, and infrastructure. In general the doctorate qualification serves as an indicator of the capacity to undertake and supervise research. The building of research capacity is a long-term process and is dependant on an institutional environment that is conducive to research.

The White Paper clearly supports a focused approach to research, indicating that funding should be concentrated in areas where there is research capacity and which are responsive to the national research agenda.

Against this background, the priorities identified in the National Plan for Higher Education to sustain and promote research are:

- Increasing the output of postgraduates;
- Increasing research output;
- Sustaining existing research capacity and strengths, and to create new centres of excellence and niche areas where there is demonstrated research capacity;

- Facilitating collaboration and partnerships in research and postgraduate training, particularly at the regional level.

1.2.2 National R&D Strategy

The National R&D Strategy of 2002 is based on the National System of Innovation (NSI) as a conceptual framework which South Africa adopted in the White Paper on Science and Technology of 1998. At the core of this strategy is the focus on innovation as the key driver for economic growth and prosperity. One of the major challenges for the country is building a bridge to overcome the innovation chasm (the gap that exists between knowledge generation and applicable uptake) through appropriate mechanisms. The strategy also recognises the need to address the endemic dearth of diverse and appropriately qualified human resources base which is critical to the revival and sustained performance of the knowledge generation infrastructure. It emphasises the importance of linkages and partnerships, and coordination within the NSI and of an enabling environment and framework conditions necessary to build a functional and prolific NSI as a precursor to economic competitiveness. Hence the strategy's three pillars:

(i) enhanced innovation

(ii) Science, Engineering and Technology (SET) human resources and transformation;

(iii) Creation of an effective government for the science and technology system

1.2.3 Innovation towards a knowledge-based economy: Ten year plan for South Africa (2008-2010)

For more than a decade South Africa's government has been developing the NSI, which is an enabling framework for science and technology. A peer review of science and technology policies conducted by the Organisation for Economic Cooperation and Development (OECD) concluded that the NSI fails to commercialise the results of scientific research and that it must become more focussed on long-term objectives. Hence, the development of a ten-year plan for South Africa. The key objective of the ten-year plan is to articulate a national path of innovation, building on the NSI, in support of the transformation to a knowledge-based economy. The pillars of a knowledge-based economy are education, innovation, the economic and institutional regime and information infrastructure.

The vision for South Africa essentially is a society that uses its knowledge systems and human capital to solve problems in our country and on the continent, while exploiting economic opportunity in a sustainable way. The vision includes:

- Being one of the top three emerging economies in the global pharmaceutical industry, based on an expansive innovation system using the nation's indigenous knowledge and rich biodiversity;
- Deploying satellites that provide a range of scientific, security and specialised services for the government, the public and private sector;
- A diversified, supply secured sustainable energy sector;

- Achieving a 25% share of global hydrogen and fuel cell catalysts market with novel platinum group metal catalysts;
- Being a world leader in climate science and the response to climate change;
- Having met the 2014 Millennium Development Goals to halve poverty.

Progress towards a knowledge-based economy will be driven by human capital development, knowledge generation and exploitation, knowledge infrastructure and enablers to address the innovation chasm between research results and socioeconomic outcomes.

1.2.4 Universities of Technology

In December 2002 the Minister of Education announced far reaching changes to the higher education landscape, which would ultimately result is 22 institutions: 11 “universities”; 5 “universities of technology” and 6 “comprehensive universities”.

In 2004, the Committee of Technikon Principals released a publication “Universities of Technology in South Africa: Position, Role and Function”, in which a number of guidelines on research and innovation were formulated. The following recommendations are noteworthy:

(a) While recognising the importance of the complete continuum from basic research to the commercialisation of research outputs, universities of technology will mainly focus on applied research and innovation, solving specific problems of society and the practical implementation thereof.

(b) Universities of Technology should participate in the enhancement of R&D downstream related activities such as the patenting, licensing, commercialisation and marketing of intellectual property and R&D results in the form of products, processes or services.

(c) Universities of Technology should promote and support the development of knowledge and technology-intensive enterprises and participate in the establishment and management of technology and business incubators.

1.2.5 PhD as driver

In response to the challenges facing the NSI the National Research Foundation (NRF) identified a key driver for all its programmes, “the production of large numbers of high quality PhDs that are required to provide the bedrock for an innovative and entrepreneurial knowledge society”. South Africa’s annual doctoral graduates constitute only 0.002% of the South Africa population, compared to 0.01% in India and 0.02% in the USA.

Putting PhD as the driver would enable the NRF to contribute significantly to the achievement of skills and economic development programmes such as the Accelerated and Shared Growth Initiative of South Africa (ASGISA).

1.3 Institutional Context

1.3.1 History

The merging of Technikon North West (TNW), Technikon Northern Gauteng (TNG) and Technikon Pretoria (TP) into the new Tshwane University of Technology presented a number of opportunities and challenges for R&I. Both the establishment of a research culture and staff development were at different levels of development at the three former institutions. Nevertheless, the development of research potential within staff was important to all. This strategy aims to consolidate and build on the efforts of the past and has a strong medium term focus on research capacity development and the establishment of a R&I culture. The establishment of an institutional culture for R&I is fundamental for increased scientific production and for providing motivation for enthusiastic and sustained innovative research.

1.3.2 The Institutional Operating Plan

The Institutional Operating Plan (IOP) essentially describes the nature of the operations of TUT in terms of the desired position and the drivers. It highlights a number of drivers that will ensure TUT to transform from a technikon to a university of technology. These include teaching and learning; research and innovation; community engagement, leadership in and through technology; strategic and vibrant partnerships, an innovative and entrepreneurial culture; cooperative education and quality and excellence.

TUT has actively supported and made progress in infusing R&I into its core business as indicated by part of the mission: “Being a research hub responsive to the challenges of the continent” and “Generating, integrating and applying knowledge to stimulate socioeconomic development”. In fact, innovation is central in the vision of the university: “To be a quality-driven university of technology at the cutting-edge of innovation”.

1.3.3 Staff Capacity for Research and Innovation

Over the last four years (2004-2007) there was a slight increase in the number of academic staff with a masters or doctoral degree as highest qualification. In 2007, an average of 12% of academic staff had a doctoral degree as highest qualification and 36% a Masters degree as highest qualification. The comparative lack of research qualifications amongst academic staff indicates a lack of capacity, not only to carry out research, but also to supervise postgraduate research and to attain satisfactory throughput rates. With the current capacity to train postgraduate students it will be a challenge for TUT to increase the number of full-time postgraduate students. Partnerships with other Higher Education Institutions, Science Councils and Private Companies involved in R&I will be essential to provide additional capacity to supervise postgraduate students.

TUT currently has 24 NRF rated researchers (approximately 2.7% of the permanent teaching staff), making it the top performer among universities of technology. These researchers are recognised by their

peers as leaders in their research fields and play an important role in providing expertise and mentoring other staff members.

A high priority should be placed on building the necessary staff capacity for conducting research. This includes correcting imbalances of the past, equity and redress. In line with Goal 4 of the institutional Strategy: "TUT must attract, build and retain expertise through appropriate initiatives and interventions". This includes the improvement of qualifications, skills and competencies of staff. The strategy should particularly be supportive in developing the research potential of staff in the early stages of their careers.

1.3.4 Student Profile

Currently only 3,9% of the total student body at TUT are on postgraduate level. The approved enrolment plan and performance targets (2007-2011) for TUT stipulates that the portion of enrolments in postgraduate qualifications must not exceed 6% of which 5% should be masters and doctoral enrolments.

In 2005 the average pass rate (including cancellations and absence from examinations) amongst undergraduate students was 65%. In order to contribute to R&I, core R&I staff need to be surrounded by competent students. A low pass rate amongst undergraduates reduces the chances of large numbers of competent postgraduate students to support academic staff in their R&I activities.

The impact of the recently published Higher Education Qualification Framework (HEQF) on postgraduate training at TUT will have to advice postgraduate recruitment strategies. The "feeder" system for postgraduate studies mainly are own students, students from other higher education institutions, international students and industry. The current assessment of the HEQC indicates that a large component of our own students will take five instead of four years to enter the masters programme. Therefore, in addition to developing strategies to retain our own students we will have to develop strategies to attract more students from the other "feeder" sources.

Traditionally and currently a large number of postgraduate students are in the labour market, with the result that they study part-time and extend their studies over a longer period of time. Special support and strategies to attract full-time students are required. This is in line with Goal 5 of the Strategic Plan of the Tshwane University of Technology: "TUT must recruit students with academic potential and empower them to be well-rounded graduates".

A contribution to the stimulation of R&I can be made by exposing undergraduate students to notions of research in the course of their studies by having senior professors teaching at first-year level.

1.3.5 Research and Innovation Funding Profile

The total R&I income increased substantially between 2004 and 2006, with a total income of R58,6 million in 2006. The R&I income decreased to R54.6 million in 2007. The primary source of income by far is the DoE Development Grant (2004-2006), followed by Industry Funding, THRIP, DoE Subsidy Grant for Research Outputs and NRF grants.

TUT provides internal funding to support, among others, R&I capacity building, equipment, postgraduate scholarships and postdoctoral fellowships. It will be essential to include funding for activities such as business development and patent registration as part of the budget.

Strategies aimed at increasing R&I income form external sources should be a priority. Activities that will contribute to this are likely to include business/industrial funded R&I and intellectual property exploitation. Every staff member engaged in undertaking or supporting research and innovation activities should take the responsibility to improve the R&I income.

1.3.6 Research and Innovation Output

Research output in scientific journals, technological publications, patents and artefacts and accredited proceedings of scientific conferences is widely regarded as a reliable indicator of the relative knowledge productivity of universities. Over the past four years such output from TUT has not shown any notable increase, as the research output ratio (units per permanent teaching staff member) was 0.095 in 2004, 0.089 in 2005, 0.089 in 2006 and 0.098 in 2007. This is currently far off the TUT corporate target of 0.18 and the benchmark of 0.5 set by DoE. In 2005 TUT was responsible for 50% of all the research output of universities of technology. However, this constitutes only 1.25% of the total research output of higher education institutions in South Africa for the same year.

Interventions should be identified to ensure output from postgraduate research.

It is believed that increasing the research output will positively impact on the improvement of innovation output.

1.3.7 Status of Research and Innovation Infrastructure

The research infrastructure of TUT, constituted by the respective resources of the three former technikons, display features which indicate backlogs and various situations of disadvantage. Chief among these are:

(a) Library facilities

Historically, collections and acquisitions were primarily aimed at the teaching function, with the implication that multiple copies of textbooks were purchased and taken up in the collection. Also, due to financial constraints, the library has been highly selective in the acquisition of electronic media. The library has also not purchased any new academic books over the past two years. As it stands, the library primarily is a collection of teaching-related material, rather than one for research. The transition from primarily a teaching library to a teaching and research library should be a priority.

(b) Laboratory equipment and space

Although some departments managed to acquire good quality equipment, the equipment in several other departments is under-maintained, out-dated and not state-of-the-art. Many members of the academic staff share equipment with colleagues elsewhere in South Africa and even abroad. In general, there is a lack of technical support for equipment that is available. Reports of long-standing shortages in laboratory

space and space to accommodate postgraduate students are also common. The state, quality and reliability of the available equipment directly influence the level of inventiveness of the R&I being conducted.

The availability of infrastructure and resources 24 hours a day can optimise the utilisation of what is available in the system and contribute to addressing some of the challenges. It is expected that this change will in some way correlate with the establishment of a R&I culture at TUT.

1.4 Challenges

The major challenges facing TUT in becoming a recognised institution for research and innovation are summarised below:

- Becoming a fully functional university of technology, including the full chain of R&I activities, while maintaining career education
- Addressing human capital development, including the improvement of staff qualifications and skills development
- Increasing full-time postgraduate students and post-doctoral fellows
- Increasing income generation through R&I
- Building a holistic, coherent R&I culture
- Managing R&I on a multi-campus setting
- Increasing R&I output.
- Enhancing TUT's contribution to its internal and external communities through knowledge transfer and commercialisation of research.

2 MISSION AND OBJECTIVES

2.1 Mission

To establish TUT as an institution recognised by it peers, government, industry and civil society for research and innovation.

2.2 Objectives

- Developing human capital for R&I (postgraduate students, staff development, strengthening leadership for R&I)
- Developing and strengthening platforms for R&I
- Building an enabling environment and institutional culture for R&I

- Developing and strengthening partnerships with external stakeholders
- Increasing R&I funding
- Increasing R&I output
- Revising R&I quality assurance management

The strategies linked to the objectives listed above are portrayed in Section 4.

3 CONCEPTUAL FRAMEWORK

3.1 National System of Innovation

The National System of Innovation is the flow of technology and information among people, enterprises and institutions which is key to the innovative process on the national level. According to innovation system theory, innovation and technology development are results of a complex set of relationships among actors in the system, which includes enterprises, universities and government research institutes.

The key priorities of the NSI are to:

- Improvement of competitiveness
- Improving the quality of life
- Ensuring environmental sustainability
- Work on human resource development
- Ensure community development through technology transfer instruments

3.2 The R&I Chain

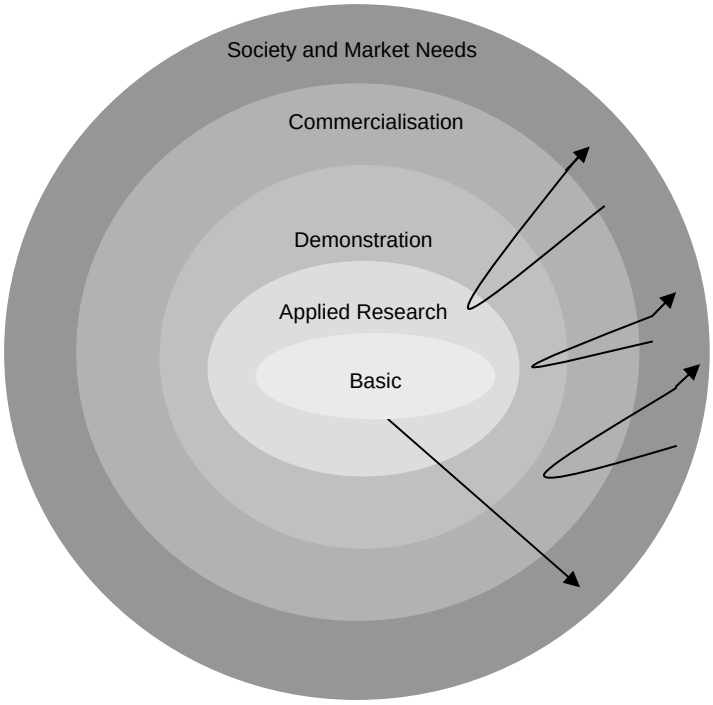
The R&I chain is a complex and dynamic process that is not linear, but rather cyclical in nature. The schematic representation below is merely a means of illustrating this complexity and cyclical nature, and should not be viewed as a grouping of isolated or well-defined processes (fundamental concepts are elucidated in Appendix 2). The R&I chain comprises 3 primary process groupings, namely:

(a) Research (basic and applied research)

(b) Prototype development and implementation

(c) Commercialisation (technology transfer, business development, active marketing)

Important to note is that several anticipated problems arise in the transcendence from basic research to implementation. This requires adaptation to processes which leads to iteration between processes. The complexity of the research and innovation chain means that there are various players and funders within the cycle.



3.3 R&I Focus Area Concept

An R&I focus area, with constituent niche areas, is an area with a central focus that can involve several disciplines or aspects of one discipline. It is designed to bring resources and people together around a central theme and a critical mass of people and provide the platform for the full spectrum of R&I activities. The theme should be relevant to national and regional needs, priorities and opportunities.

The development of R&I focus areas at TUT will be an essential way of developing critical mass in R&I. As one of the main R&I objectives, TUT is pursuing the development and implementation of R&I focus areas in which R&I efforts can gain momentum, to create centres of excellence. The R&I focus area is therefore envisaged as the generating point for heightened R&I outputs and increased capacity for the involvement of staff and postgraduate students. The focus areas will usually be interdisciplinary and will clearly have to be limited in number to have an effect. The number of Focus Areas will not be prescribed in advance but will be kept under active review. A guideline for the development of R&I focus areas as well as the current TUT process for development and approval of R&I focus areas is illustrated in Appendix 3.

The success of the R&I Strategy depends on the development and implementation of R&I focus areas and the relevant niche areas. In the development of R&I focus areas the following are considered as important criteria:

- Strategically selected, approved and managed by the institution.

- Relevance to national and regional needs, priorities and opportunities.
- Consolidation of R&I expertise and infrastructure.
- Critical mass of staff and students.
- A recruitment strategy that is directed towards building capacity in the R&I focus areas.
- Potential to develop into a centre of excellence.
- Potential for sustainability.

By considering the above criteria during the R&I focus area development process, the R&I focus area construct will aid TUT in contributing notable value to the South African socio-economic climate through its R&I output.

R&I focus areas should ideally be involved in, and measured against, the three primary process groupings of the R&I chain, namely, research, prototype development and implementation and commercialisation. Therefore R&I focus areas should ideally comprise three sectors:

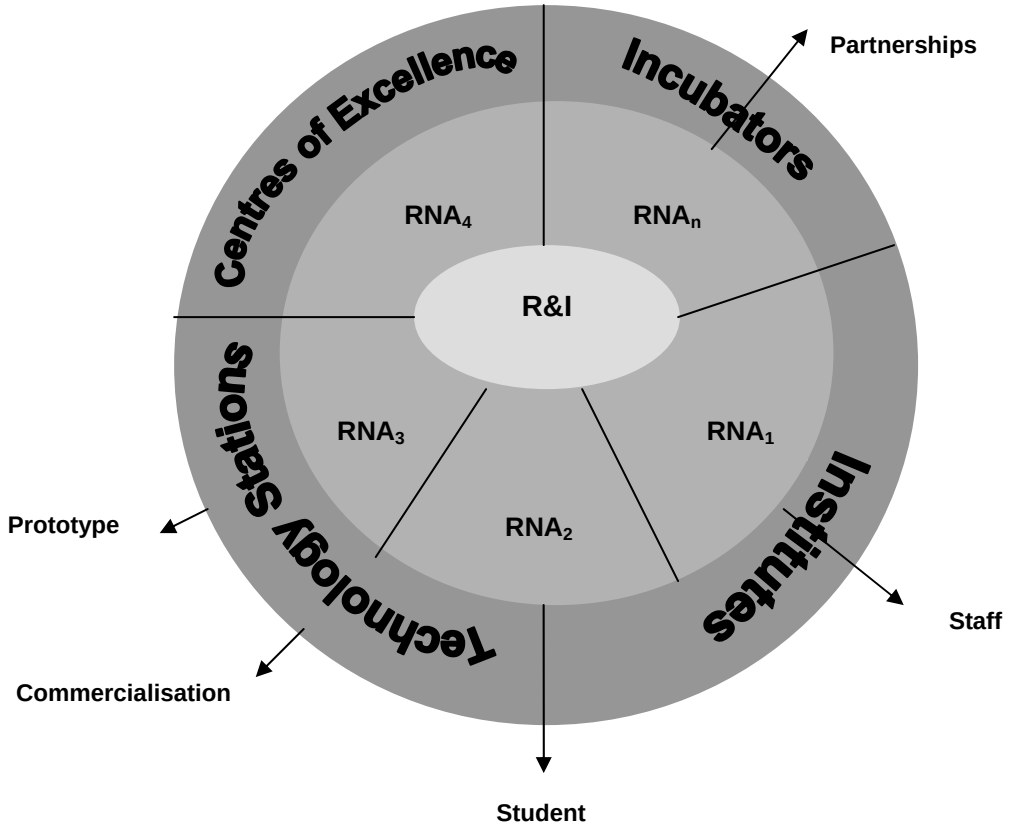
(a) Research – involved primarily in the creation of new knowledge and theoretical validation of early-stage concepts through strategic research.

(b) Development Incubator – involved primarily in the development of tangible R&D property and the practical validation and implementation of research findings.

(c) Business Incubator – involved primarily in the commercialisation of tangible R&D property and intellectual property.

Critical to the success of an R&I focus area is that it should be measured across the entire spectrum of the R&I chain. Also, in order to ensure full collaboration between the research domain, the development incubator and the business incubator, sector leaders will be accountable to an R&I focus area steering committee, which will enjoy representation from the relevant faculties and industry partners, and will be chaired by the Executive Dean of the faculty leading the focus area.

The fostering of internationally excellent R&I outside the scope of the Focus Areas will continue to be important.



It is, however, important for the institution to recognise the diversity of people's capabilities in the areas of teaching and learning and research and innovation. Individual projects in the focus area may, in its lifecycle, run through the full research and innovation chain, while others will fall into different stages of the chain at different times. Alternatively, an idea may be taken through the full chain by different individuals, at different times. Thus different people can make different inputs at different stages.

3.4 Intellectual Property Development and Commercialisation

In knowledge-driven economies, innovation is the key driver of economic growth and wealth creation. The attainment of a sustainable competitive advantage is dependent on the ability to rapidly develop and deploy new product, processes and service. Critical in this regard are, amongst others, a functional and productive knowledge generation infrastructure and availability of requisite human resources, absorptive capacity of firms, and adequate protection of intellectual property rights. Evidence from other systems worldwide indicate that a functional and clear intellectual property rights framework promotes innovation as inventors are afforded adequate opportunity to commercially exploit their inventions. The protection of intellectual property rights has been identified in the National R&D Strategy as one of the structural constraints within South Africa's National System of Innovation.

In an attempt to rectify this structural deficiency, the Department of Science and Technology, released the National Framework for Intellectual Property Rights from Publicly Funded Research to primarily ensure

that intellectual property from publicly funded research is protected and exploited for public good. There is also a draft bill currently under discussion to give credence to this framework. These initiatives aim to support and entrench the culture of innovation within the publicly funded higher education institutions and research facilities.

Universities as knowledge generators are therefore expected to play a pivotal role in promoting and enhancing innovation. This is predicated on mutually beneficial partnerships with industry partners. The development and securing of intellectual property fundamentally determines the university's potential to engage in technology transfer. Technology transfer is a precursor to commercialisation, which in turn is a requirement for innovation.

There are different scenarios (see Appendix 4) under which intellectual property within the university can emanate. The ownership of intellectual property will vest in the university if the intellectual contribution to the creation of such intellectual property is made by its staff members and students. This greatly enhances the university's role in the technology transfer and commercialisation space. However, the university may cede its rights to a third party if that is in the best interest of technology transfer and technology commercialisation. The strategy therefore emphasises the university's role in the development of the South African society through the development and protection of intellectual property and its subsequent commercial exploitation.

The strategy emphasises that in order for TUT to be recognised for R&I, it will have to increase its involvement in the development and protection of intellectual property and its subsequent commercial exploitation. This has become an imperative to which the university will have to adhere or else forego potential revenues and goodwill that may accrue from actively contributing to economic development and wealth creation. The later is untenable and inconsistent with the university's vision to be a "quality driven university of technology at the cutting edge of innovation". In line with these imperatives, TUT is required to put in place the requisite infrastructure to ensure that knowledge generated by its researchers is protected and commercially exploited.

The University will employ any of the following mechanisms in its endeavours to commercialise its inventions for public benefit:

- Licencing arrangements
- Joint Ventures
- New venture creation (spin-outs and start-ups).

4 STRATEGIES FOR R&I DEVELOPMENT

OBJECTIVES	STRATEGIES (2006-2010)	CURRENT	TARGET (5 YEARS)
1. Development of human capital for R&I	**1.1 Postgraduate students**		
	1.1.1 Create a new postgraduate drive by recruiting full-time postgraduate students and postdoctoral fellows by increasing values of internal scholarships and attracting increased bursary funding from the private sector and accessing sponsorship for postgraduate student support	3.9% of enrolments (2031 masters and doctoral students)	6% of enrolments (3057 masters and doctoral students)
	1.1.2 Increase R&I output from postgraduate students by providing requirements that masters and doctoral students need to have a concept publication and/or tangible R&D property when submitting dissertations/theses.		
	1.1.3 Develop postgraduate recruitment strategies that will: (a) retain our own students (b) attract more students from "feeder" sources other that own students		
	1.2 Staff development		
	1.2.1 Upgrade postgraduate qualifications of teaching staff within the R&I focus areas	12% doctorate 33% masters	15% doctorate 40% masters
	1.2.2 Assist Heads of Departments to upgrade qualifications to doctoral level		
	1.2.3 Develop an institutional plan to provide comprehensive sabbatical leave and teaching replacement support for staff development		
	1.2.4 Develop an integrated R&I capacity development strategy by consolidating existing expertise residing separately with the DRIP, the Centre for Entrepreneurship, the Centre for Marketing Development, the Business School, Higher Education		

		Development and Support (HEADS), Centre for Continuing Professional Development, the UNESCO Chair in Technological Entrepreneurship etc. This programme will include training, focused separately at staff and students, as well as other interventions required to assist R&I staff at all levels to develop. The main objective is to develop the next generation of R&I leaders and to grow and transform the current profile of active R&I staff		
	1.3	**Strengthening leadership for R&I**		
	1.3.1	Appoint R&I professors, with clearly defined roles, within the R&I focus areas	21	30
	1.3.2	Establish DST/NRF research chairs within R&I focus areas with highest potential for housing chairs	1	7
	1.3.3	Attract and appoint extraordinary professors from academia industry, commerce and science councils through strong partnership agreements with relevant parties	10	100
	1.3.4	Develop a policy on the appointment of R&I Fellows to retain senior academic staff for R&I		
	1.3.5	Attract visiting researchers, developers and postdoctoral fellows through the creation of infrastructure and the optimisation of administrative support	7 fellows	30 fellows
	1.3.6	Attract other academics to do sabbaticals at TUT		
	1.3.7	Provide research leaders with appropriate training and support		
	1.3.8	Create opportunities to develop researchers in the system to become R&I leaders		

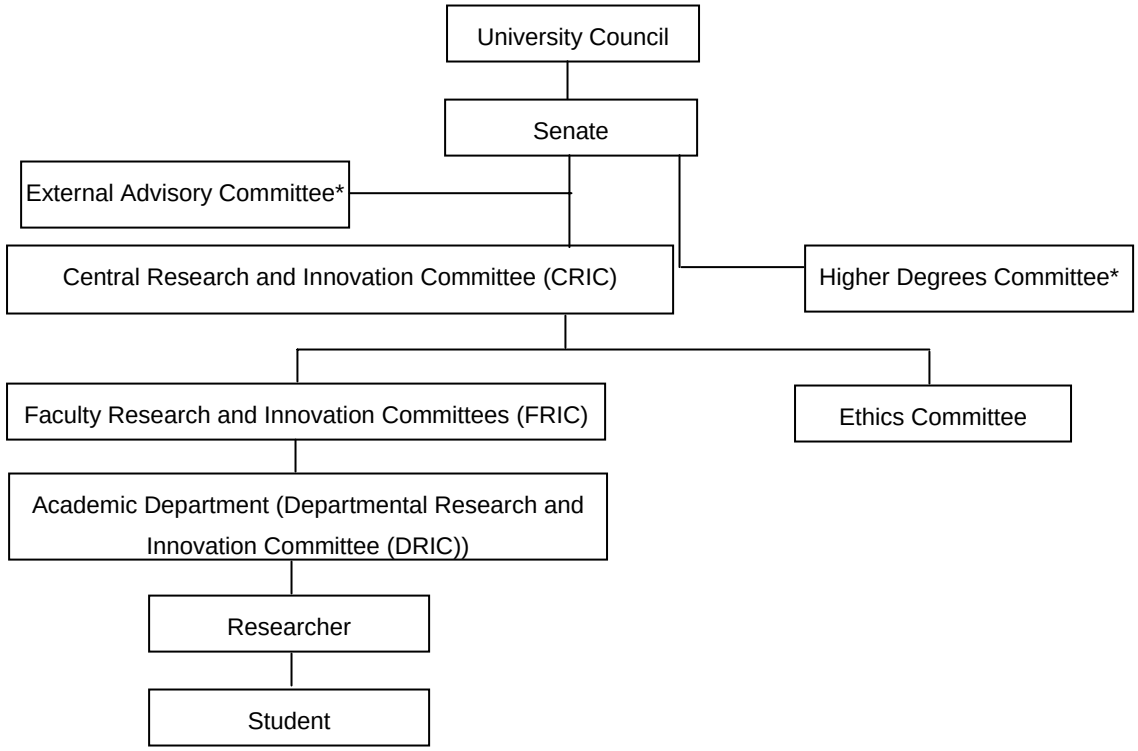
2. Developing and strengthening R&I platforms	2.1 Employ an institutional management approach to the R&I focus areas		
	2.2 Review of R&I focus areas to ensure relevance and sustainablility	14 focus areas	8 focus areas
	2.3 Create and implement new development and business incubators in R&I focus areas and incorporate existing stations, institutes, centres and pre-incubators in the R&I focus area construct		10 develop incubators linked to niche areas 3 business incubators linked to focus areas
	2.4 Incorporate other partners and programmes such as Science Councils, Higher Education Institutions, SEDA, Tshumisano, TABEISA, Innovation Fund, THRIP, industry and commerce in R&I focus areas: (a) at the outset of the R&I focus area development process for new areas; (b) in assessment of R&I focus areas before institutional approval; and (c) on the advisory committees of existing R&I focus areas		
	2.5 Develop an institutional R&I Infrastructure Strategy		
3. Building an enabling environment and institutional culture for R&I	3.1 Ensure that within the portfolio of activity, research and teaching are appropriately balanced.		
	3.2 Provide delocalised R&I project management support to faculties that have high project management loads	1	4
	3.3 Create platforms for R&I promotion		
	3.4 Provide a nurturing environment for R&I participants through an internal funding framework which caters for researchers at different levels of their careers and responds to a variety of developmental needs		

	3.5 Strengthen the incentive mechanisms for rewarding R&I behaviour by: establishing peer-review criteria for evaluating artistic output, artefacts and commercialisation criteria for tangible R&D property creation		
	3.6 Limit unnecessary bureaucracy and administration with good scientific and administrative support to researchers		
4. Developing and strengthening partnerships	4.1 Increase the interaction with other research institutions and the private sector in ascertaining their needs for R&I projects and for leveraging resources and expertise		
	4.2 Establish privately-funded R&I chairs		
	4.3 Form a coherent link between TUT Advancement Office and DRIP for finding a workable solution to allow for multiple points of private sector interaction without conflict-of-interest		
	4.4 Enhance internationalisation and networking through participation in international networks. Hosting international conferences and other interactions with leading people will greatly enhance the national and international recognition of the institution.		
	4.5 Review the current formal partnerships to establish whether a portfolio of this nature is effective in enhancing R&I		
5. Increasing R&I funding	5.1 Diversify the R&I funding base (see Appendix 5), especially through the increased participation in NNEP, NEP, Innovation Fund and EU Framework 7 schemes	6%	10%
	5.2 Increase the amount of private sector funding in the form of contract R&D	15%	35%
	5.3 Create a discretionary seed funding to support R&I projects that are close to completion	0.8%	1.0%
	5.4 Dedicate an increased allocation of internal funds towards the development of R&I infrastructure	6% – 7%	20%

	5.5 Increase exploitation of intellectual property		
6. Increasing R&I output	6.1 Postgraduates		
	6.2 DoE accredited outputs (publications, proceedings, books)	0.089	0.18
	6.3 Patents, measured separately in the categories of:		
	• Provisional patent application (SA or foreign)	5	100
	• SA complete patent application	3	100
	• Foreign (examinable) complete patent application	0	25
	6.4 Out-licenses to established companies and newly created ventures	0	24
	6.5 Tangible R&D property including prototypes, models, inventions, works of art, etc		200
7. Revising R&I quality assurance management	7.1 Centrally co-ordinating all externally-funded activities such as R&I grant funding, R&D contracts and professional consulting		
	7.2 Centrally co-ordinating all postgraduate applications		
	7.3 Centrally coordinating all self-funded R&I activities		
	7.4 Revise the definitions and management of all academic workload criteria		
	7.5 Measure an benchmark against competitors on an ongoing basis		
	7.6 Peer screening mechanisms for external funding applications		
	7.7 Annual self-evaluation and peer review of TUT approved Niche Areas		

5 GOVERNANCE OF R&I

The governance structure for R&I at TUT is depicted below. Please note that the structure does not necessarily refer to reporting lines:



• Proposed additions to the current model currently under debate are: (a) A Higher Degrees Committee reporting to Senate. It is envisaged that this committee will play a vital role in quality management of postgraduate research and will advise Senate on postgraduate issues. (b) An External Advisory Committee that could advise Senate on R&I matters.

As from 2006, a new position for Deputy Vice-Chancellor (DVC): Research, Innovation and Partnerships (RIP), was created within the executive of TUT in order to champion research, innovation and partnerships. A position of this nature gives research and innovation the prominence it needs, and also the impetus and leadership to make it succeed.

The Directorate of Research, Innovation and Partnerships (DRIP) reports directly to the DVC (RIP), who is the chairperson of the CRIC.

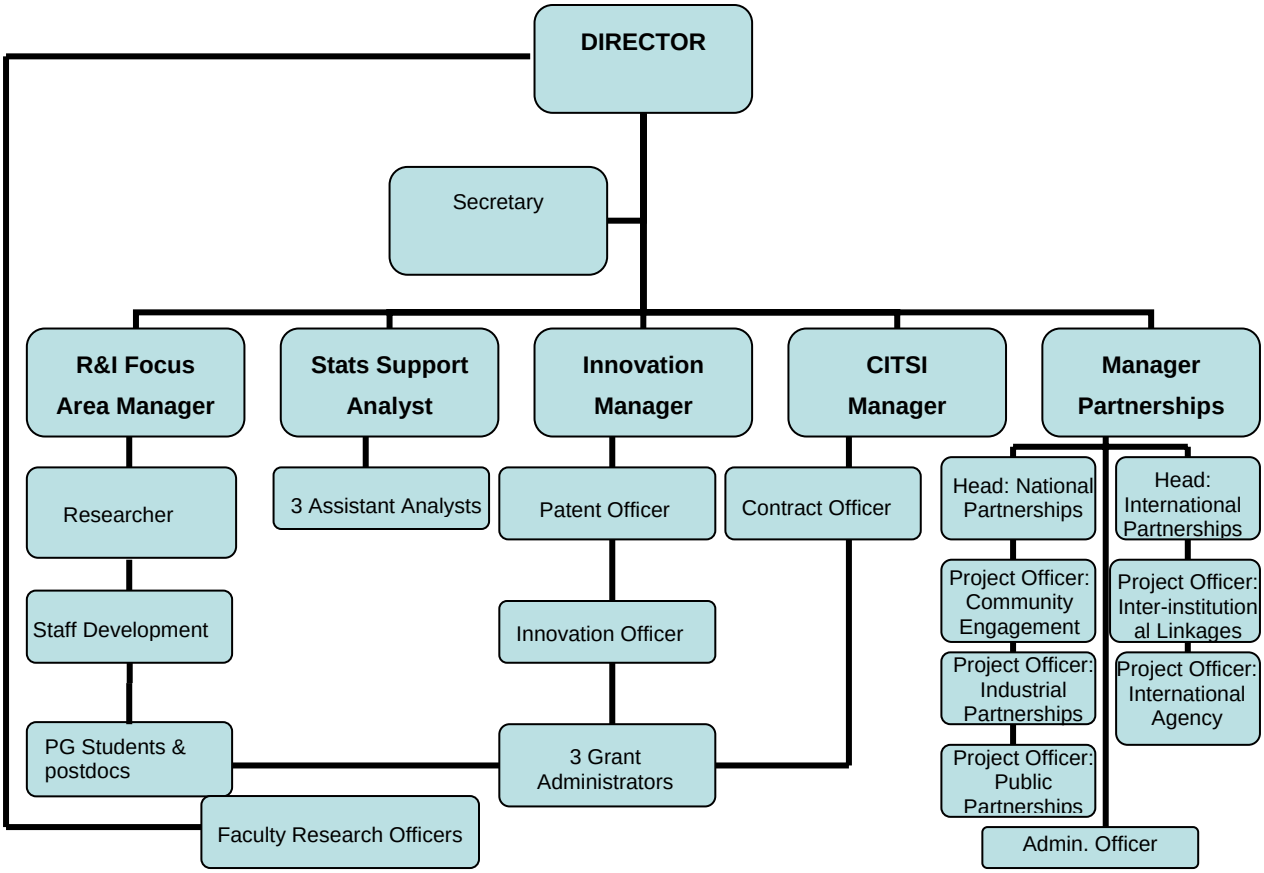
The CRIC determines the R&I Strategy of the institution. The Ethics Committee is an obligatory standing subcommittee of the CRIC; it evaluates and approves all research pertaining to and involving humans, animals and the environment.

6 SUPPORT STRUCTURE FOR R&I

The main purpose of the Directorate of Research, Innovation and Partnerships (DRIP) is to determine and implement strategies for research, innovation and partnerships, to contribute to the achievement of the goals of the university and to create a nurturing environment for these activities.

The structure illustrated in the schematic below draws together various streams of the research and innovation experience and enterprise. The Director of DRIP reports to the DVC: Research, Innovation and Partnerships.

One of the very important factors in creating a positive R&I environment to maximise potential of staff is to provide good administrative support to allow academics to concentrate on R&I activities.



The development of processes and procedures are an integral part of the function of all the support services. In order to best leverage existing capacity, these structures will function as services to allow for vertical input across the support offices. The primary purpose of each service is listed below:

R&I Focus Area Management

- To manage and promote the research and innovation at the university within focus and niche areas
- To ensure the development of individual researchers
- To support post graduate students and post doctoral fellows

Statistical Support

- Statistical support to staff and postgraduate students

Innovation Management

- Participate to develop an innovation and technology transfer strategy and policies for the university
- Manage the innovation and technology transfer activities at the university, with the view of realising value from the university's intellectual property

CITSI Management

- Management of Centres, Institutes, Technology Stations and Incubators at the university

Partnership Management

- To establish partnerships with other institutions of higher education, research institutions, national, provincial and local government, industry and stakeholders abroad related to research and innovation
- Contribute to the efforts of the university to secure funding for research and innovation projects in cooperation with other internal stakeholders

These services will be supported by grants administrators, administrative officers and the Faculty Research Officers. Latter will be based in the faculties.

7 IMPLEMENTATION PLAN

The following activities constitute the rollout sequence for the implementation of the R&I strategy.

1. Finalisation of R&I strategy
2. Finalisation of the placement and structure of R&I support
3. Development of institutional R&I operational plan with targets and timelines

8 APPENDICES

APPENDIX 1: National Developments

National Framework on Intellectual Property Rights arising from Publicly Funded Research

The National Framework on Intellectual Property Rights of 2006 devises a strategy for the creation of an enabling environment and clear regulations for securing and managing intellectual property arising from publicly funded research and recognises the importance of good macro and micro intellectual property management practises for ensuring innovation competitiveness. The framework is focused on the following:

(a) Benefit distribution of proceeds derived from the commercialisation of intellectual property

(b) Obligation on inventors to declare potential intellectual property

(c) Institutional obligation to centrally manage intellectual property management and commercialisation processes

(d) Government walk-in rights for intellectual property derived from public financing

(e) Preferential licensing of intellectual property to SMMEs, BEE firms and South African firms

(f) Criteria under which business financed research can be managed and an associated mechanism for the proper determination of research costs

(g) Establishment of a national agency to audit and ensure compliance of intellectual property developed under public financing

National Advisory Council on Innovation Act

The National Advisory Council on Innovation (NACI) Act of 1997 makes provision for the installation of a council to advise the Ministry of Science and Technology on the role and contribution of innovation in promoting and achieving the following national objectives:

(a) Improve and sustain the quality of life of all South Africans

(b) Develop human resources for science and technology

(c) Build the economy

(d) Strengthen the country's competitiveness in the international sphere

National Biotechnology Strategy

The National Biotechnology Strategy of 2001 recognises the importance of and provides a framework for stimulating the growth of biotechnology activities in South Africa. It makes specific provision for the address of the following:

(a) Proactive development of human resources and SET capacity for biotechnology

(b) Alignment of biotechnology activities to national priorities in the areas of human health, food security and environmental sustainability

(c) Establishment of Biotechnology Regional Innovation Centres (BRICs) to act as nuclei for the development of biotechnology platforms to stimulate the creation and exploitation of intellectual property through a newly designated venture capital fund

National Advanced Manufacturing Strategy

The National Advanced Manufacturing Strategy of 2004 recognises that local manufacturing is a key economic driver in South Africa and proposes a way forward to promote and enhance advanced manufacturing in this regard. The strategy focuses on the following aspects:

(a) Creation of new centres, such as logistics and clothing and textile, and the strengthening of existing centres, such as automotive, product development and cleaner production for advanced manufacturing innovation

(b) Establishment of innovation networks for advanced metals, national craft development, ICT in manufacturing, advanced materials, aerospace, capital goods, chemical industry and advanced production

(c) Identification and implementation of projects through the innovation centres or networks

(d) Human resource development in technical support, manufacturing excellence and industry development

(e) Establishment of supporting initiatives for SMME development, SQAM and NePad collaboration

(f) Investment of R650 million over 3 years for implementation

National Nanotechnology Strategy

The National Nanotechnology Strategy is aimed at drawing on the existing strengths of the National System of Innovation to advance nanoscience research and the creation of advanced nanotechnology. The strategy is focused on the following:

(a) Encouragement of multi-disciplinary, multi-institutional and multi-sectorial cooperation to advance nanoscience and nanotechnology

(b) Creation of infrastructure to enhance basic and applied research, technology development and commercialisation in nanoscience

(c) Fostering of inter-disciplinary and inter-institutional postgraduate nanoscience and nanotechnology programmes

(d) Emphasis on new missions in advanced materials for advanced manufacturing, nano-bio materials for biotechnology, precious metal-based nanoparticles for resource-based industries, and advanced materials for ICT

National Strategy on ICT in Education

The Strategy for Information and Communication Technology in Education of 2001 indicate the ICT revolution imposes particular challenges on education systems around the world. The challenges can be classified in three broad areas and the Strategy aims to address all three. They are:

a) Participation in the information society

b) The impact of ICT on access, cost effectiveness and quality of education

c) The way in which ICT changes the education process.

Innovation Hub

The Innovation Hub is the first internationally benchmarked Science Park in Southern Africa. It creates an environment where international businesses can access a regional centre of knowledge creation and provides a gateway for local businesses to launch into the fast moving world of global interconnectivity. The business purpose of the Innovation Hub includes the following:

(a) To support high-tech company formation and growth in the local economy through the creation of a unique space and associated facilities where high-tech entrepreneurs, world-class business, education, research and venture capital can meet, network and prosper

(b) To provide key value-adding business services that support the growth and globalisation of local technology-rich business enterprises, and that contribute to their sustainability over the long-term

(c) To increase the wealth of the local high-tech and “knowledge intensive” community, promote a culture of innovation, and stimulate the competitiveness of both companies and knowledge-based institutions

Innovation Fund Commercialisation Office

The Innovation Fund Commercialisation Office (IFCO) was established with the objective of accelerating the commercialisation of projects emanating from publicly funded institutions and Innovation Fund projects. IFCO has intellectual property and commercial skills including intellectual property strategy formulation, commercial route to market development, due diligence and deal structuring to allow it to structure, implement and manage various interventions with respect to commercialisation support.

Innovation Fund Intellectual Property Management Office

The Innovation Fund Intellectual Property Management Office (IFIPMO) was created to increase the rate of patenting within the publicly funded research institutions and SMMEs, to improve risk management of

contracting, and to increase capacity in the area of intellectual property management. In so doing, it aims to contribute to the process of technology transfer within publicly funded institutions.

The Joint Initiative on Priority Skills Acquisition (Jipsa)

The government has embarked on an intense drive to harness and improve the skills of South Africans to ensure accelerated economic growth. Jipsa, a high-level task team, launched in March 2006, and the skills empowerment arm of the Accelerated and Shared Growth Initiative for South Africa (Asgisa) will identify urgent skills needs and advice on how they can be met. Currently the national skills shortage are especially apparent in areas of engineering, management and planning and teaching.

APPENDIX 2: Fundamental Concepts

Basic Research

Basic Research may be characterised as the process for undertaking experimental and theoretical work of a fundamental scientific nature solely for the sake of the acquisition of new knowledge. Basic Research is motivated by curiosity, not necessarily by a foreseeable practical need for the research output.

Strategic Research

Strategic Research may be characterised as the process for undertaking basic or experimental and theoretical work of a fundamentally scientific nature that is directed into predetermined, focused areas. The expectation from Strategic Research is that the research output will eventually form a broad knowledge base that will be used as a foundation for addressing practical societal needs.

Applied Research

Applied Research may be characterised as the process for undertaking experimental work of a practical nature with a specific or foreseeable application of the research output in view. Applied Research is carried out either to determine possible applications for the findings of basic research or to establish new ways for attaining some specific and predetermined objective.

Development

Development may be characterised as the process for demonstrating a concept and/or scientific finding in a tangible form such as an architectural model, engineering invention, theatre production, art sculpture, software prototype or material compound. Development may be conducted on the basis of existing research or may in itself involve research.

Contract Research and Development

Contract Research and Development (R&D) may be defined as any research and/or development activity that is conducted using the university brand and/or resources under a contractual agreement with another publicly-funded institution or private sector entity.

Professional Consulting

Professional Consulting occurs when a staff member uses the institution's brand and his/her affiliation with the institution to consult to a third party independently in the field of his/her job specification within the institution, for income.

Innovation

Innovation may be characterised as the process of creating new ideas or reconfiguring existing knowledge, and transforming these into novel and inventive tangible R&D property, which are confirmed

to relate to the actual needs of society and involved application in industry, trade or agriculture. Implicit is the understanding that there has been uptake of the tangible R&D property by society.

Technology Transfer

Technology Transfer may be characterised as the process for facilitating the formal mobilisation of tangible R&D output from publicly funded R&D institutions to the private sectors of industry, trade or agriculture for social and/or economic gain. Implicit is the understanding that an intangible asset and/or tangible R&D property has been identified for transfer.

Technology Commercialisation

Technology Commercialisation may be defined as the process for taking new products, processes, services and methods to market for either social or economic gain. Implicit is the understanding that new products, processes, services and methods, even if novel and inventive, are not classified as forms of innovation until commercialisation has taken place.

Tangible R&D Property

Tangible R&D Property may be defined as corporeal items that are produced as a direct result of R&D activities. Tangible R&D Property include items such as biological materials, computer software, engineering prototypes, art sculptures, architectural drawings, circuitry diagrams, etc.

Intangible R&D Output

Intangible R&D Output may be defined as non-material output that is produced as a result of R&D activities. Intangible R&D Output includes output such as journal publications, conference proceedings, books, student graduates, scientific memorandums, etc.

Intellectual Capital

Intellectual Capital is a grouping of two forms of intangible assets, namely intellectual property and know-how.

Intellectual Property

Intellectual Property is a statutory encapsulation of tangible R&D property that is enforceable in a Court of Law. Intellectual Property includes patents, copyright, trademarks, designs, plant breeder's rights, trade secrets and proprietary information.

Science Push

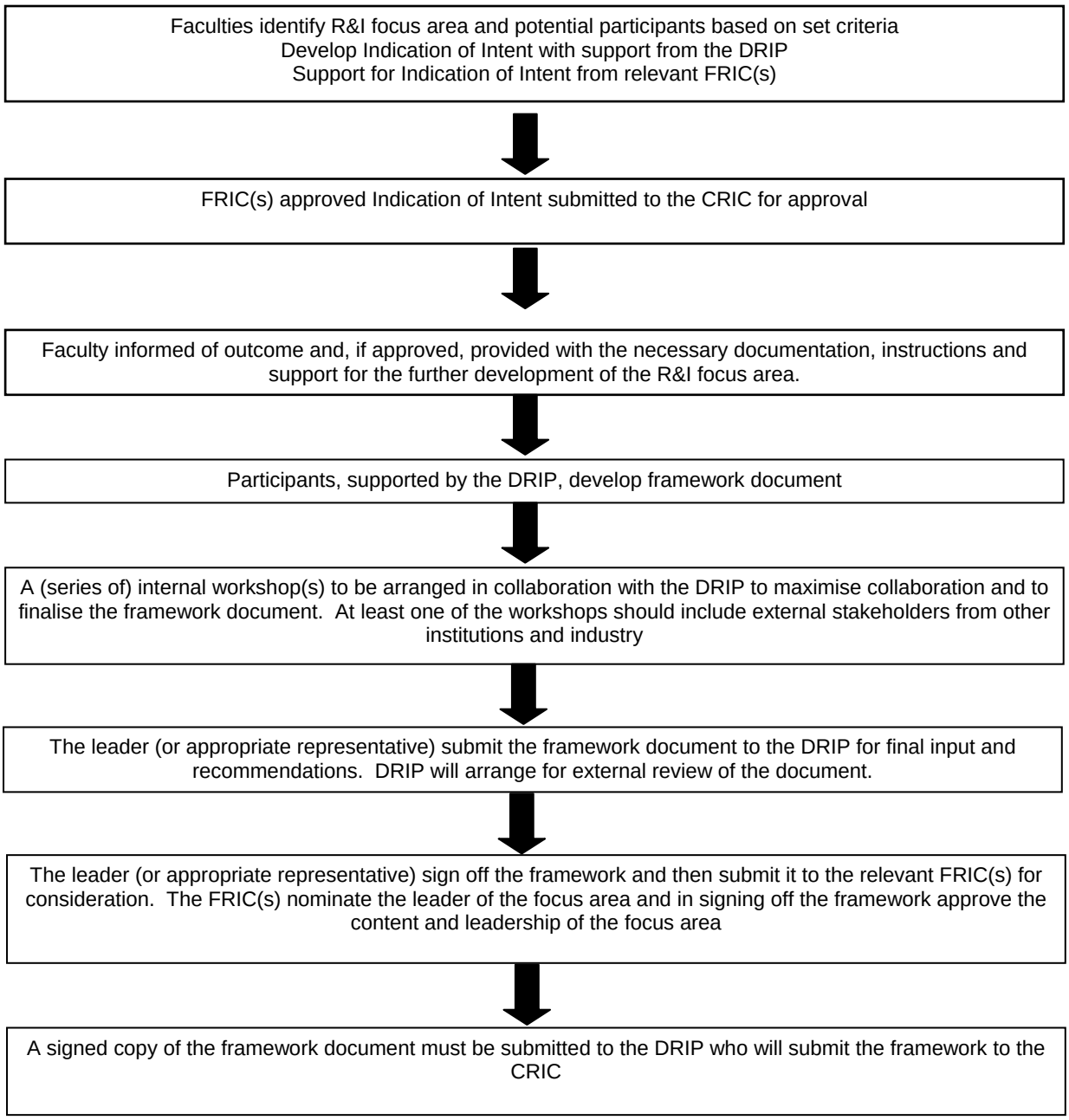
The concept of Science Push departs from the premise that it is advancements made in science that drive market developments. The implication is that innovation is launched from a solid knowledge platform, which is in turn driven by an appropriate knowledge creation vehicle.

Market Pull

The concept of Market Pull departs from the premise that it is the requirements of markets that ultimately determine the uptake of scientific developments by society. The implication is that innovation is driven by market dynamics, which is in turn governed by the needs of the real world.

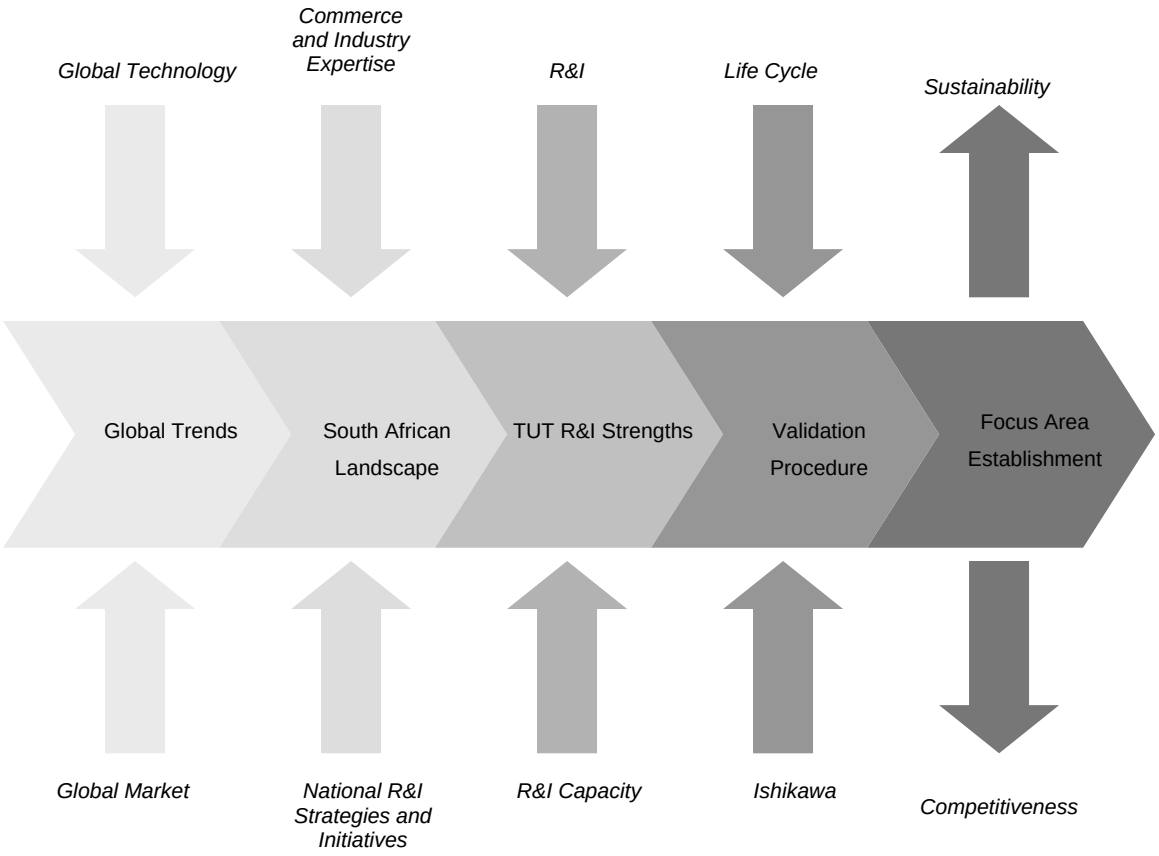
APPENDIX 3: Guidelines and Process for R&I Focus Area Development

A) TUT process for the development of R&I focus areas



B) Guidelines for the R&I focus area development process

A process proposed for the development of R&I focus areas is depicted graphically in the flowchart below. The flowchart represents a chain of exercises that need to be conducted in order to establish R&I focus areas that will be relevant, competitive and sustainable and so being, will assist in the favourable positioning of TUT within the higher education system by ensuring that TUT contributes significant value to the South African socio-economic environment through the research and innovation output from its R&I focus areas.



(a) Global Trends

In order to obtain a R&I focus area construct that will be relevant to society at large, it is firstly necessary to assess the global trends that are evolving at both the back-end with regards to technologies and the front-end with respect to markets. This means that in order to become a competitive R&I player within the global knowledge and innovation economies, it is important that, as a first point of reference to obtain an appreciation of future science pushes that will significantly alter the way in which the world currently functions and conversely, future market pulls that will influence the strategic direction of global research and development. Global trends may be scanned on an annual basis using sources of global technology insights and global market insights.

(b) South African Landscape

The South African socio-economic landscape should be profiled in order to assess, firstly, the exact needs and challenges that South Africa is confronted with in the business, industrial and social arenas and secondly, to pinpoint the current business and industrial strengths within South Africa that can be leveraged to create unique R&I opportunities. Often the best means of sourcing such information is through the collaborative intelligence generated through government economic development strategies and initiatives as well as through close consultation with industry and business experts. The strong effect of geographic location on innovation holds important implications for TUT and creates a broader agenda for the management of research and innovation. The selection of R&I focus areas should not only be driven by costs, taxes, subsidies and wage rates of professionals as is often the case, but also by the flow of R&I investment to regional nodes of greatest capacity for the uptake of R&I output. Taking active steps to harness and extend regional advantages takes on equal weight with R&I process management. Importantly, the insight gained from the analysis of global trends should always be weighed against the South African landscape.

(c) TUT R&I Strengths

Like every higher education institution, TUT has its specific R&I strengths. It is important that these areas of strengths be leveraged and the necessary developments take place to align such strengths with national imperatives. Therefore it is important that a strategic plan be developed indicating means of building R&I capacity around global trends and the South African landscape and not vice versa. The two key considerations here are the current TUT R&I competencies including research, development, incubator and technology transfer competencies, and strategies for R&I capacity development.

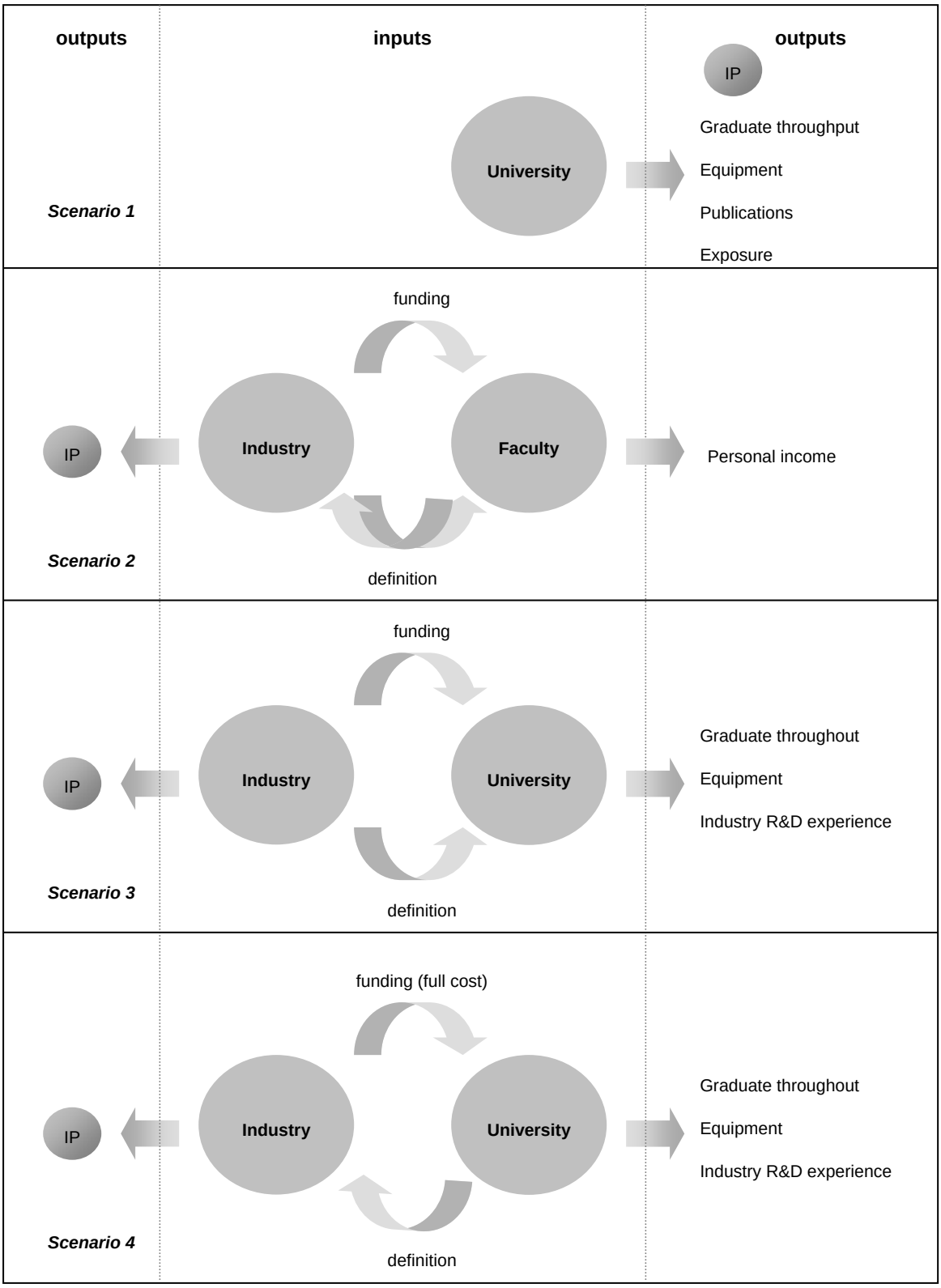
(d) Validation Procedure

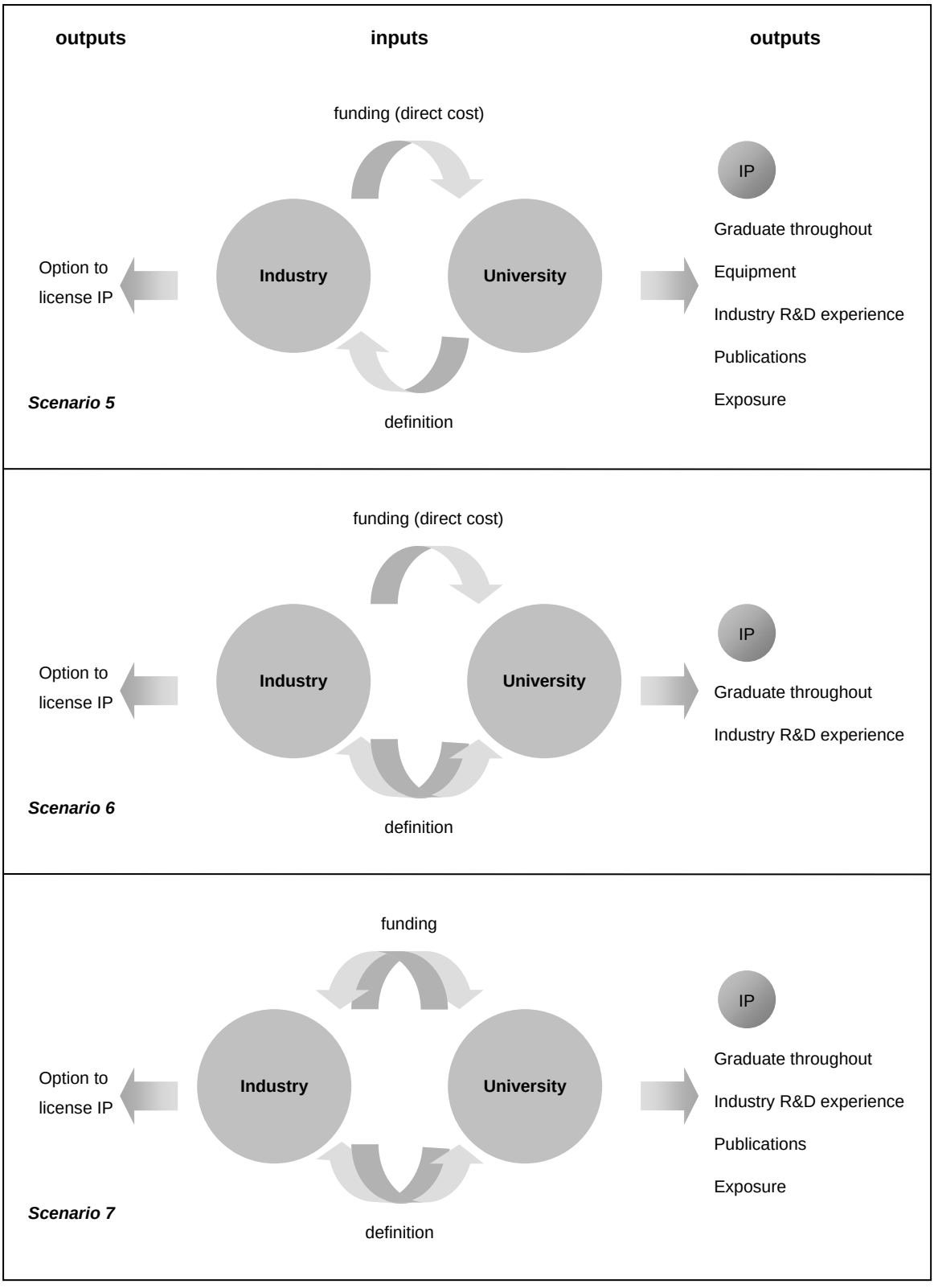
The entire R&I focus area development chain is consolidated at the front-end by an assessment process which will assist in validating the establishment of a focus area by taking into account the key considerations emanating from the Global Trends, the South African Landscape and the TUT R&I Strengths. The Life Cycle and Ishikawa Analysis are two diagnostic tools that will aid in evaluating whether the prospective focus area would be suitable and competitive.

Example: The R&I Focus Area Development Process is illustrated here by way of an example of Fuel Cells.

	stage	checklist	comments
Fuel Cells Focus Area	Global Trends	✓	It is well known that the world's fossil fuel resources are continuously being depleted. Geological forecasting and *Market Insights* now indicates that these resources will reach depletion in 90 years and, if the industrial growth in China remains at its current rate, depletion will be reached in 40 years. *Global Technology Insights* reveal that Fuel Cells are being identified as the primary technology platform used to provide an alternative source of energy in the future.
	South African Landscape	✓	South Africa supplies the world with 76% of its demand for platinum, the core element needed in all fuel cells. However, *industrial experts* collectively agree that less than 0.5% of this quantity is actually exported in a processed form. In addition, a new *Government Initiative*, the Beneficiation Bill, has recently been passed in South Africa, which legislates and incentivises mining houses and manufacturing companies to process platinum goods locally prior to exporting. These factors shape the South African Landscape and lends towards some initiative in fuel cells development.
	TUT R&I Strengths	✓✗	TUT possesses the *R&D Competency* in Precious Group Metals (PGM) Metallurgy as well as Power Electronics to make notable inroads to fuel cells development, however, a strategic plan should be developed for both the establishment of an incubator to extent the R&I chain within such a focus as well as the procurement of world class specialist expertise in fuel cells inline with the necessary *R&I Capacity Development* prerogatives.
	Validation Procedure	✓	*Life Cycle Analysis* shows that an R&I environment in Fuel Cells Development would be in the "launching" phase (internationally) and therefore has potential to aid in the shaping the "growth" phase to a level of "maturity". *Ishikawa Analysis* suggests that the market, materials, methods and manpower exist on TUT whilst the machinery (or equipment) can be acquired through appropriate fund raising strategies.
	Focus Area Establishment	?	The *sustainability* of the Focus Area is guarantied provided that a critical mass in fuel cell R&I activity can be achieved, which in turn is dependant on the R&I Capacity Development strategy. The *competitiveness* of the Focus Area cannot be predicted, however, if TUT positions itself strategically in this field, it might find itself in a realistic position to access significant funding through Government for ongoing, cutting-edge R&I activity in fuel cells development.

APPENDIX 4: Intellectual Property Development and Technology Transfer





Scenario 1: This is the simplest scenario under which intellectual property is created. The university works on its own to develop tangible R&D property through R&D that is either grant or self

funded. In this situation the university owns the intellectual property and benefits from a number of other spin-offs such as the training and throughput of postgraduate students, the procurement and ownership of equipment, the freedom to publish its scientific findings, and recognition and exposure for having created the intellectual property. This scenario is termed **"University Funding and Definition"**.

Scenario 2: This is a situation that arises when a faculty member consults directly with industry. Industry pays the faculty member a consulting fee and, irrespective of which party provides the definition for the R&D solution to be provided, the overall result is that industry claims ownership to the intellectual property as the faculty member's time is fully compensated for. The primary gain for the faculty member is personal income generated through the consulting fee. This scenario is commonly termed **"Professional Consulting".**

Scenario 3: This is a situation that arises when a faculty member, or a group of faculty members, through the university, approach industry to collaborate on a project. Industry then funds the project and provides the definition of the R&D solution to be provided. The consequence is that the university will enjoy a number of benefits including the throughput of postgraduate students, obtaining industry R&D experience as well as the procurement and ownership of equipment. Since the university does not contribute meaningfully to establishing a premise for the R&D solution and industry funds the project, the intellectual property will vest in the industry player. Consequently, the university will often not enjoy the freedom to publish or recognition for its contributions due to industry's prerogative to safeguard its intellectual property. This scenario is usually termed **"Contract R&D with Industry Definition"**.

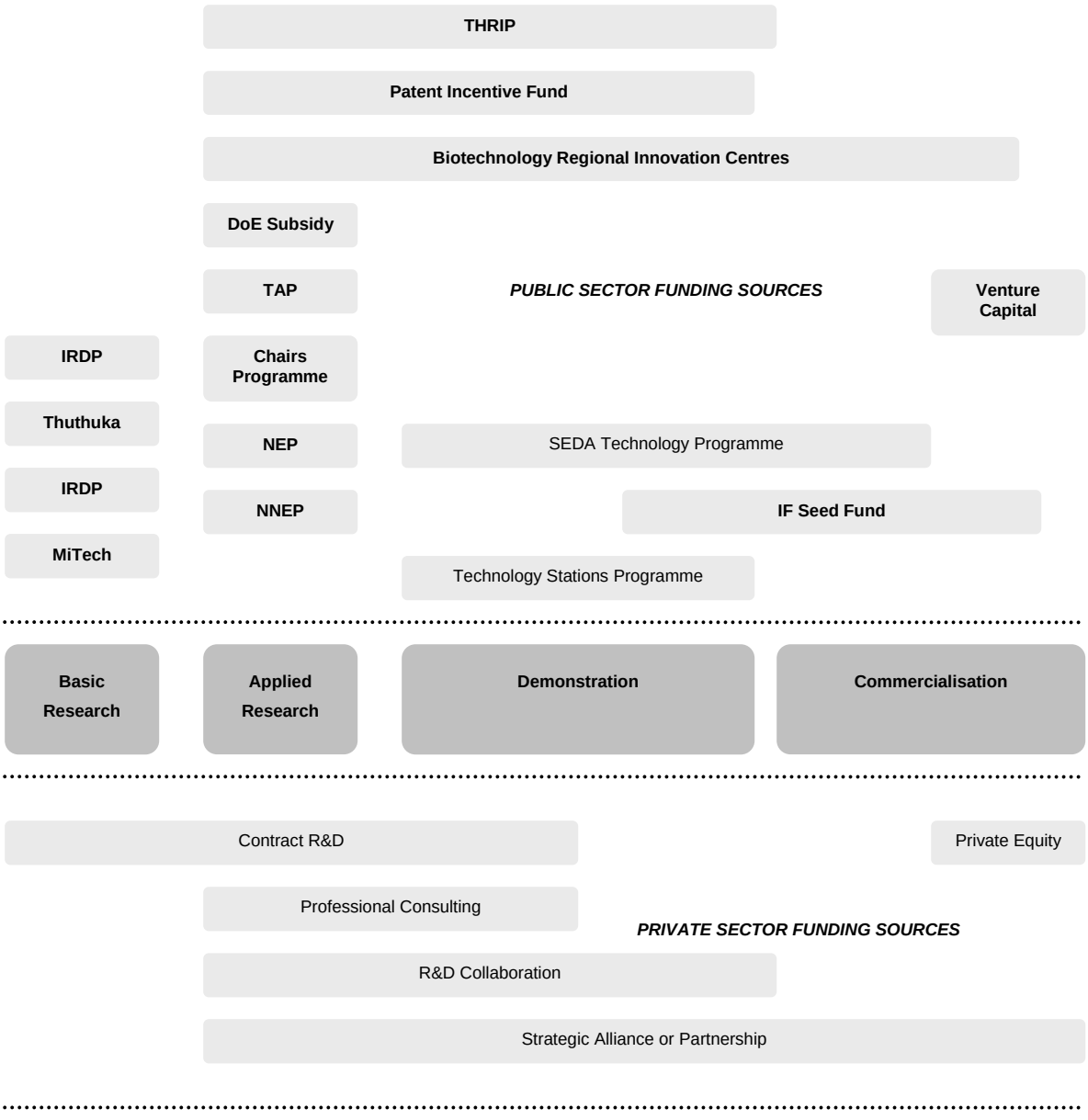
Scenario 4: This is a situation that arises when a faculty member, or a group of faculty members, through the university, approach industry to collaborate on a project. The university then provides the definition of the R&D solution to be provided but industry funds the project based on a full cost model. The consequence is that the university will enjoy a number of benefits including the throughput of postgraduate students, obtaining industry R&D experience as well as the procurement and ownership of equipment. However, since industry funds the full costs of the R&D undertaken, the intellectual property will vest in the industry player irrespective of the fact that it was the contribution from the university that lead to the establishment of a premise for the R&D solution. Consequently, the university will often not enjoy the freedom to publish or recognition for its contributions due to industry's prerogative to safeguard its intellectual property. This scenario is usually termed **"Contract R&D with University Definition and Full Cost Funding"**.

Scenario 5: This is a situation that arises when a faculty member, or a group of faculty members, through the university, approach industry to collaborate on a project. The university then provides the definition of the R&D solution to be provided but industry funds the project based on a direct cost model. The consequence is that the university will enjoy a number of benefits including the throughput of postgraduate students, obtaining industry R&D experience as well as the procurement and ownership of equipment. However, since industry funds only the direct costs associated with the R&D and it was the contribution from the university that lead to the establishment of a premise for the R&D solution, the intellectual property vests in the university and the industry player will be granted an option to license the intellectual property. Therefore the university will enjoy additional spin-offs such as the freedom to publish its scientific findings as well as recognition and exposure for having created the intellectual property. This scenario is usually termed **"Contract R&D with University Definition and Direct Cost Funding".**

Scenario 6: This scenario is the most complex under which intellectual property is created and arises when a faculty member, or a group of faculty members, through the university, approach industry to collaborate on a project. Industry funds the project based on a direct cost model and both industry and the university work together to establish a premise for the establishment of a definition for the R&D solution. The intellectual property then vests in the party that has made the more significant contributions in this regard. In practise, this is often difficult to ascertain and has to be assessed on a case-by-case basis. In some instances the only resolution is joint ownership of the intellectual property. However, the installation of the National Framework on Intellectual Property Rights arising from Publicly Funded Research has created the possibility for the university to claim ownership of intellectual property in such an instance, possibly with an option for an exclusive license to the industry player. This scenario will be termed **"Joint R&D with University and Industry Definition"**.

Scenario 7: This is a situation that arises when a faculty member, or a group of faculty members, through the university, approach industry to collaborate on a project. Industry and the university then both fund the project and both contribute towards the establishment of a premise for a definition for the R&D solution. Assuming that the project is equally funded, the intellectual property will most likely vest in the university. This will also, however, have to be assessed on a case-by-case basis. This scenario will be termed **"Joint R&D with University and Industry Definition and Funding"**.

APPENDIX 5: National Funding Landscape



The schematic above illustrates the core R&I activities (middle), the key public funding instruments (top) and the key private funding sources (bottom). TUT must be fully aware of the complete funding landscape and accompanying to fully take advantage of all funding instruments across the R&I spectrum.

National Research Foundation

(a) Institutional Research development Programme

(b) Thuthuka

(c) Focus Area Programme

(d) South African Research Chairs Initiative

(e) Research Infrastructure Support Programme

DoE Research Output Subsidy Programme

The DoE subsidises universities based on the research outputs. The following are the accredited outputs that the DoE subsidises through the Research Output Subsidy Programme:

(a) journal publications (1 unit)

(b) conference proceedings (0.5 unit)

(c) books (1 unit per 60 pages up to a maximum of 5 units)

(d) throughput of postgraduate students (1 unit per masters and 3 units per doctorate)

Technology and Human Resources for Industry Programme

The Technology and Human Resources for Industry Programme (THRIP) is managed by the NRF on behalf of the dti and supports the development of technology and human capital by creating a working partnership between higher education institutions and the industrial sector. Preference is given to SMME and BEE involvement as well as to the empowerment of previously disadvantaged students. THRIP is a matching scheme where the dti contributes between 33% and 50% of the total funding required for a project which is then matched by the industry partner.

Innovation Fund

The Innovation Fund is a business unit of the Department of Science and Technology (DST) that is managed by the NRF. The Innovation Fund currently has three core funding instruments:

(a) Missions in Technology

Missions in Technology (MiTech) supports the accelerated development of high-risk, market-driven technology platforms in all economic sectors in partnership with industry. MiTech currently provides up to R15 million in matching funds over a period of 5 years in return for a royalty fee to develop new technology platforms.

(b) Technology Advancement Programme

The Technology Advancement Programme (TAP) solicits proposals that aim to build on an existing research or knowledge base, where a real or potential product/process/service/method has been identified. The proposed research and development for TAP has to prove the technical feasibility through a prototype or the equivalent of such. TAP currently provides up to R15 million over a 3 year period in

return for a royalty fee for proof-of-concept funding to consortia containing the skills and expertise required to de-risk the technology.

(c) Seed Fund

The Seed Fund supports the commercialisation of cutting-edge technologies up to R5 million over a 3 year period in return for equity in a commercialisation vehicle or similar instrument. Preference is given to the following opportunities:

i. previously funded by the Innovation Fund
ii. from SMMEs with a significant empowerment or national benefit component
iii. from SMMEs with promising technological innovation and having potential to meet national imperatives
iv. that have arisen in whole or in part from, and have revenue-sharing arrangements with the state-funded research system

(d) Patent Support Fund

The Patent Support Fund is a subsidising instrument that supports patenting activity at publicly funded research institutions and SMMEs, particularly SMMEs with a significant BEE component. Publicly funded research institutions are reimbursed half of their patenting costs annually and arrangements with SMMEs as made on a case-by-case basis. In order for publicly funded institutions to be eligible for the Patent Support Fund, patent applications must have been made through the technology transfer office designated to manage such matters.

(e) Patent Incentive Fund

The Patent Incentive Fund is an incentive instrument to increase the patenting activity at the South African Patent Office by postgraduate students, faculty and researchers at publicly funded research institutions. Currently the Patent Incentive Fund rewards inventors up to R25,000 in the form of a personal cash award for having been responsible for the successful registration of a patent application. In order for individuals to be eligible, patent applications must have been made through the technology transfer office and is subject to a favourable prior-art study.

Support Programme for Industrial Innovation

The Support Programme for Industrial Innovation (SPII) is a national funding scheme of the Department of Trade and Industry (the dti) that is managed by the Industrial development Corporation of South Africa Ltd (IDC). SPII currently comprises 3 core funding schemes:

(a) The Product Process Development Scheme

Financial assistance is provided for SMMEs in the form of a grant of between 65% and 85% of the qualifying cost incurred during the technical development stage with a maximum grant amount of R500,000. For enterprises with less than 25% BEE shareholding the grant is 65%, for enterprises with between 25% and 50% BEE shareholding the grant amount is 75%, and for enterprises with BEE shareholding more than 50% the grant amount is 85%.

(b) The Matching Scheme

Financial assistance under the Matching Scheme is provided to SMMEs in the form of a grant of up to 50% of the qualifying cost incurred during the technical development stage and up to a maximum grant amount of R1,5 million.

(c) The Partnership Scheme

Financial assistance under the Partnership Scheme is provided in the form of a conditionally repayable grant of 50% of the qualifying cost incurred during development activity with a minimum grant amount of R1.5 million, repayable on successful commercialisation of the project. In considering support there should be a clear indication of the causality that will follow from the support.

Tshumisano Technology Stations Programme

The Technology Stations Programme (TSP) is managed and funded by the Tshumisano Trust of the DST. TSP rolls out technology stations that are based at universities of technology in South Africa. The stations then leverage the expertise residing in faculties to offer technical support to existing SMMEs in terms of technology solutions, services and training. In return, faculty and students receive industry experience by working in an environment that is closely synchronised with the requirements and clock speed of industry.

SEDA Technology Programme

The SEDA Technology Programme (STP) is managed by the Small Enterprise Development Association of South African (SEDA) (previously by the GODISA Trust) on behalf of the dti. The STP seeks to contribute to economic development through the creation and support of technology business centres, which include incubators and technology demonstration centres. These centres provide a variety of business support services and office infrastructure to SMMEs.

Biotechnology Regional Innovation Centres

The National Biotechnology Strategy is in part implemented through the Biotechnology Regional Innovation Centres (BRICs), which fund cutting-edge biotechnology-rich projects and ventures. In addition, the BRICs provide proactive management support to funded projects and ventures, including commercialisation strategy and access to technical and business networks.

Venture Capital

Venture Capital is a specialised form of private equity, characterised chiefly by high-risk investment in new or young companies following a growth trajectory in technology and other high-value-added sectors. Venture Capital firms in South Africa include HBD VC, Argil, Bioventures, Business partners, and the Southern African Intellectual Property Fund that is managed by Triumph VC.