



Cape Peninsula
University of Technology

*Multi-disciplinary focus Excellence Unleashing potential of staff and students Service in
Research Uptake Strategic partnerships Service and Research Uptake Multi-disciplinary
Unleashing potential of staff and students Strategic partnerships Unleashing potential of*



Research, Technology Innovation and Partnerships



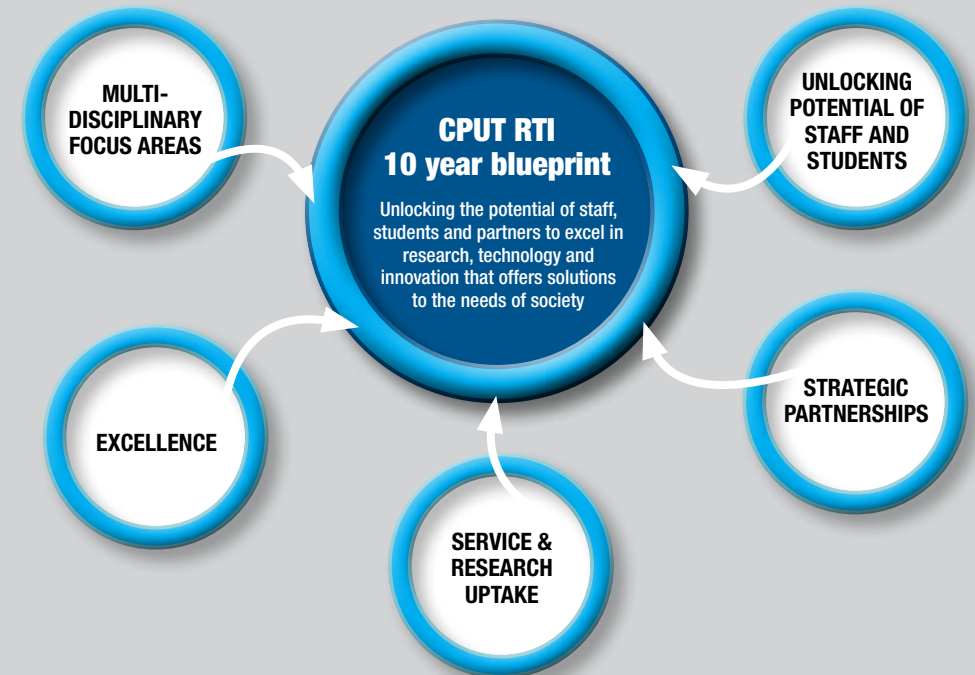
10-year blueprint

NOVEMBER 2012

key pillars

Vision

Unlocking the potential of staff, students and partners to excel in research, technology and innovation that offers solutions to the needs of society.



CPUT RTI RANKING BY 2022

- Within the top 10 publicly-funded universities within South Africa
- Within the top 500 ranked universities internationally

foreword

In 2010, the Cape Peninsula University of Technology (CPUT) adopted an overarching 10- year plan. It is aptly named Vision 2020 and seeks, inter alia, to strengthen research and foreground innovation and best practices effectively across the institution. The Research and Technology Innovation (RTI) blueprint underpins Vision 2020, and supports our transition from a “good” towards a “great” university of technology. The blueprint is underpinned by six strategic imperatives, viz., Excellence, Strategic partnerships, Unlocking staff and student potential, Service and Research Uptake, Multidisciplinary RTI focus areas, and Continuous measurement and evaluation. It is in this context that the RTI blueprint provides CPUT with a strategic frame within which we seek to produce research and innovation which is relevant and which is aligned to the needs of the province, the country, the continent and the world through knowledge discovery, excellence in teaching, and service. The blueprint also provides a foundation upon which we aim to attain a cohort of post-graduate students which comprises at least 7% of total enrolment, across the institution.

As the Deputy-Vice Chancellor (Research, Technology Innovation and Partnerships), I am aware of the need to act with vision and decisiveness to ensure that we enhance our profile and competitiveness within the realms of research, innovation and development. This ten-year blueprint has strong programmatic and practical intervention strategies for breakthrough improvement in research at our institution and includes a number of objectives. These include, inter alia, the establishment of Research Chairs in each faculty; the appointment of senior researchers in niche areas; the creation of a dynamic academic exchange programme; the establishment of a thriving postdoctoral fellowship programme which actively encourages students to consider postgraduate study; and the improvement of systems which relate to the entire spectrum of support services to ensure seamlessness and effectiveness in service delivery at all stages of the RTI cycle.

The RTI blueprint ushers in a renewed phase in my portfolio and marks the beginning of a second transition of research and innovation at CPUT. The blueprint aims to build on our strengths through the following seven (7) focus areas:

- Bio-economy and biotechnology
- Space science and technology
- Energy
- Climate change and environment
- Human and social dynamics, including issues related to service delivery
- Economic growth and international competitiveness
- Design for sustainability



Within the ambit of these focus areas, the RTI blueprint provides a framework within which we will make strides towards bridging the proverbial “innovation chasm”. This “innovation chasm” has been identified in the South African national research and development strategy as a key challenge facing the National System of Innovation (NSI). Our second transition is thus premised by a realisation that a sustainable future depends on investment in research and development in new technologies and capacity development.

Finally, since the inception of the portfolio of the DVC (RTIP) in 2008, we have seen an upward trajectory in DHET-subsidised research outputs (Figure 1).

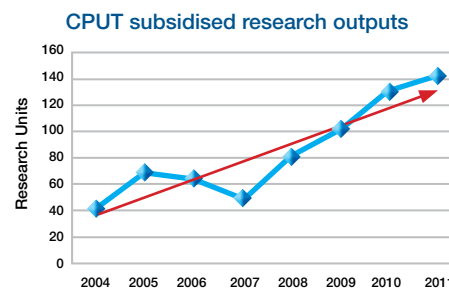


Figure 1: Positive trend in CPUT’s research outputs over the past seven years

The 2011 DHET- approved units have been especially encouraging. I anticipate that with the operationalisation of this blueprint that the positive trend will continue, and that we will achieve our goal of being among the top 10 South Africa publicly funded universities.

It is therefore with great pleasure that I request you to join us in placing our shoulders to the wheel in our Research and Innovation effort as we commence our ten-year odyssey towards becoming a great UoT.

Dr Chris Nhlapo
Deputy Vice-Chancellor (Research, Technology Innovation & Partnerships)

2 vision and objectives

2.1 Research, Technology and Innovation Vision

The RTI vision aims to contribute to the overall Vision 2020 for CPUT, which is **“to be at the heart of technology education and innovation in Africa”**.

CPUT’s RTI vision is therefore:

To unlock the potential of staff, students and partners to excel in research, technology and innovation that offer solutions to the needs of society.

2.2 Principles and objectives

The key principles and objectives to support achieving this vision over the next 10 years are as follows:

Excellence: To develop cutting-edge facilities, RTI capabilities and outputs that gain recognition nationally and internationally.

This therefore includes setting of high-quality standards for research and innovation outputs, rewarding excellence, and provision of world-class research and innovation facilities.

Multi-disciplinary approach: To support multidisciplinary efforts which cultivate versatility of thinking, and place an emphasis on integrated problem-solving. To further promote an environment without silos that actively supports trans-disciplinary approaches and research.

Unlocking potential: To Create an environment that catalyses the potential of our students, staff and society to address challenges, through supporting mastery and empowerment to take action and achieve.

This principle and objective draws on Amartya Sen’s capability approach,⁷ which shows how human potential can be more fully realised when conditions are created that motivate people to move beyond being passive recipients to having a sense of active choice and capacity to shape the world around them. This can be referred to as “freedom to achieve”, acting to bring about change aligned with one’s own values and objectives, and ability to participate in economic, social, and political actions.

CPUT is ideally positioned to enable people to create an environment that helps people to realise their human potential, building on our existing empowering approach to create supportive and motivating systems and mindsets across the institution.

As part of this objective, CPUT will also strive towards a demographically representative research workforce that will address historical imbalances in the South African research base, and thus better serve the diverse needs of our society.

Strategic partnerships: To build meaningful, well-functioning and focused partnerships with communities, industry, government, other universities and research institutions (locally and internationally) to ensure the relevance of research and uptake of solutions in practice.

This will include building on the primary research of other institutions, actively supporting applied research and technology collaborations, as well as creating linkages to support commercialisation and innovation more widely.

Service and research uptake: To focus research, technology and innovation efforts on producing tangible benefits in response to key social and economic challenges facing staff, students and communities in the Western Cape region, the country, the continent and the world. Furthermore, to foster a culture of research and innovation practice whereby equal emphasis is placed on all components of the research and innovation life cycle, from project inception to its conclusion, to ensure effective research uptake and utilisation.

⁷ For example, see Amartya Sen (1999), *Development as Freedom*, Oxford University Press; Sabina Alkire (2005), “Why the Capability Approach”, *Journal of Human Development* 6(1): 115–33.

3 what strengths do we have to build on?

CPUT has numerous strengths and assets on which we can build in order to achieve the RTI vision. These include:

- Strong relationships with the world of work and industry**
 Our focus on the employability of graduates, including through research into work-integrated learning and student placement in industry, makes us more aware than many other higher education institutions of the day-to-day realities and wider strategic challenges faced by organisations. This serves as a solid base to succeed in providing applied research and in supporting innovative solutions to real-world problems.
- Applied approach to research, technology and innovation**
 The nature of many of our faculties and research centres, as well as the orientation of our researchers, ensures that we already have an applied approach to research. For example, our faculties – Applied Sciences, Business, Engineering, Education and Social Sciences, Health and Wellness Sciences, Informatics and Design – all incorporate applied research and/or production of tangible product and service outputs. Similarly, our Technology Stations provide valuable practical research and technology support to industry.
- Pockets of excellence that are nationally or internationally recognised**
 CPUT has various recognised areas of specialisation which can be built upon to form areas of focus and niche areas. Examples⁸ of these areas as at 2012 are, amongst others: oxidative stress and rooibos; Unmanned Aerial Vehicles (UAVs); space initiatives; food technology (including natural supplements and food enrichment); work-integrated learning research into knowledge and practice transfer between university and workplaces/communities; teaching methods (including multi-grade classroom learning techniques); community water supply and sanitation; environmental toxicity and remediation; biocatalysis; low-cost housing; adaptronics; power systems; energy efficiency and solar water heating; instrumentation; material flow; clothing and textiles; tooling; tourism in Africa; sport; ergonomic technology; clinical epidemiology and healthcare in underserved communities; web search engine optimisation; ICT for development; e-government; green design and biomimicry; design for sustainability; computation and mathematical modelling.
- Existing partnerships and robust regional, national and international collaborations**
 CPUT has built a strong base of partnerships and collaborations. Individual research

centres already collaborate with public research institutions, all three spheres of government, other universities, and industry. An example of successful support for collaboration is Erasmus Mundus. With our focus on being at the heart of technology education and innovation in Africa, many of these partnerships are in Africa, including Botswana, Gabon, Kenya, Malawi, Mauritius, Namibia, Nigeria, Sudan, Tanzania, Uganda and Zimbabwe.

- A large and diverse student base**
 With the largest student numbers in the Western Cape, and a student profile that is a microcosm of South African society – including many black South Africans and students from disadvantaged backgrounds – we are well positioned to address the national strategic imperative of transforming the profile of researchers. The connection of our students and staff to diverse communities, both urban and rural, also increases the likelihood that our researchers will be willing and able to understand and address the key social and economic challenges facing our communities.
- Values of social inclusion and engagement with the community**
 The historical perspectives of our university provide a rich foundation upon which we have already built well-entrenched values of social inclusion and community engagement. These values have already been integrated into programmes of the university.
- Demonstrated success in building research capacity and increasing research output**
 Over the past few years, we have shown that we are capable of improving our research and innovation performance. This progress demonstrates that we can go from strength to strength to transform from a “good” to a “great” university of technology.
- Central structures to champion research, technology and innovation**
 We have a core leadership team and structures to champion and support our vision for research, technology and innovation in the organisation. These include the Deputy Vice-Chancellor: Research, Technology Innovation and Partnerships, and the Directors for Research, Postgraduate Studies, Technology Transfer and Industrial Linkages, International Affairs, and Community Engagement. In addition the Directorates of Finance, Marketing and Communications, and CPUT Libraries services have a critical role in supporting the core research and innovation structures.
- A base of research, technology and funding is available**
 We have a base of both internal and external financial resources, including subsidies, incentives, research grants and fee-paying services, which can be used to leverage additional resources.

⁸ This is an illustrative list of CPUT pockets of excellence, and is not intended to be comprehensive. There are many other pockets of excellence, details of which are contained in annual research reports of CPUT.

4 how will CPUT contribute institutionally and beyond through research, technology and innovation?

As a higher education institution, and more particularly a university of technology, CPUT has a vital role to play in supporting technology development and access, as well as the system of research and innovation.

Key contributions at different levels are set out below.

4.1 Contribution to CPUT's Vision 2020

Succeeding in Research, Technology and Innovation (RTI) is core to the vision of being at the heart of technology education and innovation in Africa. RTI could be a key tool to unlock the potential capabilities of staff/researchers, students, and society.

Various cross-cutting themes have been identified within the CPUT Vision 2020 Strategic Plan, including innovation, work-integrated learning, partnerships, quality and sustainability, social transformation, and the people of our university. While RTI makes a direct contribution to the success of the theme of innovation, it will also support the other cross-cutting themes, for example:

- **Work-integrated learning:** inclusion of applied research and problem-solving in projects, simulations, workplaces and communities
- **Partnerships:** Developing relationships to support identification of research needs, participating in collaborative research, commercialising primary research from other universities, and working with end-user partners to commercialise CPUT's own applied research
- **Quality and sustainability:** Building a reputation for research and innovation excellence, focusing on areas that will support social and environmental sustainability, and developing revenue streams to contribute to financial sustainability through intellectual property, royalties, and spin-off companies
- **Social transformation:** Developing focus areas that address some of the major social and community challenges facing the city, province, country, continent and world, building a diverse pool of researchers, technologists and innovators, and supporting the Transformation Charter and Strategy
- **The people of our university:** RTI can provide a new basis for partnerships between students, academics and administrative and support staff; it can also help to attract and retain staff by providing new opportunities to develop and grow

The RTI blueprint can also help to:

- Introduce innovation in all aspects of our operations
- Support development of our desired graduate characteristics, including being technologically adept, having the capacity to apply knowledge to real-life issues, and being socially responsive and innovative in their thinking and actions
- Ensure that teaching and learning are supported by industry-standard technology and learning environments

CAPE TOWN AND WESTERN CAPE STRATEGIC IMPERATIVES

CPUT intends to play a key role within the Regional Innovation System (RIS) of Cape Town and the Western Cape, in order to strengthen the National System of Innovation (NSI). As indicated in the Western Cape Regional Innovation System strategy, the system of innovation includes "the institutions and actors that affect the creation, development, and diffusion of innovations ... a system of interconnected institutions to create, store and transfer the knowledge, skills and artefacts which define new technology".

Cape Town, as part of the Vision 2040 process, has recognised the potential future shifts in social and economic systems, and the need to equip ourselves to respond to these future possibilities. These include geo-economic shifts (with new geographical centres of power), shifts to digital media, a resource-constrained world, and risk and uncertainty related to climate change. Symptoms of systemic challenges include structural unemployment; reduced exports; violence and crime; lack of social cohesion; low-quality and disconnected neighbourhoods; and the high cost of infrastructure. Potential areas of response include transition to a clean economy, excellent public transport, energy security, liveable human settlements, institutionalised growth management, and social transformation through building liveable communities.⁹

Similarly, the Western Cape has identified 12 Provincial Strategic Objectives, as follows:

⁹ See Future Cape, "Thinkpiece for Discussion" presentation, February 2012, Edgar Pieterse

Figure 1: Western Cape Provincial Strategic Objectives

- 1 Creating opportunities for growth and jobs
- 2 Improving education outcomes
- 3 Increasing access to safe and efficient transport
- 4 Increasing wellness
- 5 Increasing safety
- 6 Developing integrated and sustainable human settlements
- 7 Mainstreaming sustainability and efficiency
- 8 Promoting social inclusion
- 9 Reducing poverty
- 10 Integrating service delivery for maximum impact
- 11 Increasing opportunities for growth and development in rural areas
- 12 Building the best-run regional government in the world

Our areas of research and innovation at CPUT link to many of these challenges. We therefore have a significant contribution to make in building researcher capacity in these areas, producing applied research, enabling new technologies through spin-off companies, licences for new technologies and by transferring knowledge to existing businesses. We can also help to develop spatial clusters of capacity, and align innovation outcomes to regional socio-economic development strategies, for example, through the development of a design and innovation hub.

4.2 South African strategic imperatives

Various national plans and strategies have contributed to identifying the strategic imperatives for the country.

The Department of Science and Technology's **Innovation Ten-Year Plan** for South Africa (2008 to 2018) identified five "grand challenges" around which to focus innovation efforts. These include:

Figure 2: DST Grand Challenges

- a "Farmer to Pharma" value chain to strengthen the bio-economy
- b Space science and technology
- c Energy security
- d Climate-change science
- e Human and social dynamics, including issues related to service delivery

Also in relation to innovation, the "Youth into Science" strategy seeks to nurture young talent to support a stronger national system of innovation, by developing the "next generation of productive and representative researchers". Amongst other initiatives, the strategy aims to mentor learners and place new graduates into key sectors of the economy.

The **New Growth Path** (2010) identified growth drivers for the country that will defeat poverty, reduce inequality and support the creation of 5 million jobs by 2020. These drivers include infrastructure, focus sectors (such as agriculture and agro-processing, mining and downstream and sidestream minerals beneficiation, as well as high-level services such as tourism, business and logistics), and seizing the potential of new economies (such as the green economy).

The **National Development Plan (NDP)**¹⁰ (put forward in 2011 by the National Planning Commission and finalised in 2012 after extensive consultation) sets out a vision for the country for 2030. In order to address poverty and inequality, the approach focuses on capabilities, both of individuals and the country's systems (including the state and societal leadership). Enabling milestones include the following:

Figure 3: National Development Plan: enabling milestones

- Increase employment from 13 million in 2010 to 24 million in 2030
- Raise per capita income from R50 000 in 2010 to R120 000 by 2030
- Increase the share of national income of the bottom 40% from 6% to 10%
- Establish a competitive base of infrastructure, human resources and regulatory frameworks
- Ensure that skilled, technical, professional and managerial posts better reflect the country's racial, gender and disability makeup
- Broaden ownership of assets to historically disadvantaged groups
- Increase the quality of education so that all children have at least two years of preschool education and all children in Grade 3 can read and write
- Provide affordable access to quality health care while promoting health and wellbeing
- Establish effective, safe and affordable public transport
- Produce sufficient energy to support industry at competitive prices, ensuring access for poor households, while reducing carbon emissions per unit of power by about one-third
- Ensure that all South Africans have access to clean running water in their homes
- Make high-speed broadband internet universally available at competitive prices
- Realise a food trade surplus, with one-third produced by small-scale farmers or households
- Ensure household food and nutrition security
- Entrench a social security system covering all working people, with social protection for the poor and other groups in need, such as children and people with disabilities
- Realise a developmental, capable and ethical state that treats citizens with dignity
- Ensure that all people live safely, with an independent and fair criminal justice system
- Broaden social cohesion and unity while redressing the inequities of the past
- Play a leading role in continental development, economic integration and human rights

¹⁰ National Planning Commission (2012) "National Development Plan 2030: Our future – make it work"; available at <http://www.npconline.co.za/>

Education and the national system of innovation are seen as key tools to achieve a long-term shift for the country. Innovation, and the ability to solve problems, need to permeate the whole society, right from the learning feedback loop from the shop floor in organisations through to research institutions. An important role is to enable firms to be more agile in order to adapt to more rapid cycles of technological redundancy, either within their own industry or by shifting to higher growth industries. Greater alignment of R&D activity with national priorities is also considered key.

The NDP recognises the key roles of universities in providing education, generating and applying knowledge, and contributing to the national system of innovation.¹¹ Some relevant targets and recommendations include the following:

- Increase the number of Masters and PhD students, by supporting partnerships for research (target that over 25% of enrolments should be postgraduate by 2030)
- International exchange partnerships should be pursued and encouraged
- More than 100 doctoral graduates per million per year by 2030
- Double the number of graduate and postgraduate scientists and increase the number of African and women postgraduates
- Create a learning and research environment that is welcoming to all
- Strengthen universities that have an embedded culture of research and development, including assistance to access private sector research grants, attract researchers, form partnerships with industry and be equipped with the latest technologies. These universities should support postgraduate students from their own and other institutions
- All sites of research and innovation (including higher education, industry, government departments, public research institutions, parastatals, NGOs) should work within a common framework, be coordinated and function coherently across disciplines and be aligned to national priorities. Support for partnerships will be critical.
- Special consideration should be given to dedicated programmes in water, power, marine sciences, space and software engineering
- Transform the demographic composition of researchers
- Relax immigration requirements for highly skilled science and mathematics teachers, technicians and researchers

The **Green Paper for Post-School Education & Training** notes that it may be appropriate to focus on niche areas, given the cost and lead times involved in developing research expertise.

Together these plans and strategies point to both the nature and content of CPUT's potential contribution. Our focus on unlocking potential, as well as a focus on niche areas, resonates with the imperatives and recommended roles of higher education.

4.3 African strategic imperatives

There are widespread expectations of the 21st century's becoming the African century, with role players across the world looking to Africa for economic growth and sustainable social and environmental solutions. The African Union has identified the following objectives as part of its strategic plan to support sustainable development on the continent:

Figure 4: African Union objectives

- 1 Reduce conflicts to achieve continental security and stability
- 2 Achieve the necessary continental security and stability as a prerequisite for Africa's development and integration
- 3 Promote sustainable economic development
- 4 Promote sustainable social and human development
- 5 Formulate frameworks for developing and sharing Africa's statistics, and research & development capacities
- 6 Enhance continental integration
- 7 Build and foster continental and global cooperation
- 8 Promote good governance, democracy and human rights
- 9 Strengthen the Africa-wide humanitarian response and action
- 10 Promote inter-African solidarity
- 11 Promote the African Cultural Renaissance and the protection of Africa's cultural heritage
- 12 Promote the active participation and contribution of all segments of the African society in Africa's development and integration
- 13 Promote the ratification and entry into force of all outstanding legal instruments adopted by the Assembly of the Union
- 14 Promote gender equality
- 15 Strengthen the capacity and enhance the operational efficiency and effectiveness of the African Union Commission
- 16 Promote synergies, linkages and good working relations with all AU organs
- 17 Promote effective cooperation and collaboration with Member States and the RECs
- 18 Promote strategic partnerships for leveraging sustainable sources of funding and comparative advantages

The launch of the African Union Commission (AUC) recognised the vital contribution that education, research, technology and innovation could play in improving wellbeing and quality of life for African citizens. In order to support alignment with strategic imperatives, a focused department was established. The Human Resources, Science and Technology department of the African Union has identified areas to develop within the African system of innovation, including:

- Increased exchange of information and good practice
- Human capital development

¹¹ National Planning Commission (2012), National Development Plan, Chapter 9

- Research infrastructure to address societal challenges
- Strengthening scientific support to policy making
- Promoting the use of research results

Initiatives include research grants, linking higher education and research in Africa, as well as establishment of the African Observatory for Science, Technology and Innovation.

More widely, the need for continental and international partnerships to drive innovation and technology has been recognised, and various initiatives are underway to realise these partnerships. One example is the LIONS@FRICA partnership to promote innovation and entrepreneurship, involving the World Economic Forum, USAID, African Development Bank, Microsoft, Nokia, infoDev, and DEMO.

4.4 Global strategic imperatives

The **United Nations Millennium Development Goals (MDGs)** are the most widely-recognised global imperatives. The Millennium Declaration of 2000 agreed a deadline of 2015 to achieve these goals. The MDGs are summarised as follows:

Figure 5: Millennium Development Goal summary

- 1 Eradicate extreme poverty and hunger
 - Reduce by half the proportion of people living on less than a dollar a day
 - Achieve full and productive employment and decent work for all, including women and young people
 - Reduce by half the proportion of people who suffer from hunger
- 2 Achieve universal primary education
- 3 Promote gender equality and empower women
- 4 Reduce child mortality
- 5 Improve maternal health
 - Reduce by three-quarters the maternal mortality ratio
 - Achieve, by 2015, universal access to reproductive health
- 6 Combat HIV/AIDS, malaria and other diseases
- 7 Ensure environmental sustainability
 - Integrate the principles of sustainable development into country policies and programmes
 - Reverse loss of environmental resources
 - Reduce biodiversity loss
 - Reduce by half the proportion of people without sustainable access to safe drinking water and basic sanitation
 - Achieve significant improvement in lives of at least 100 million slum dwellers by 2020
- 8 Develop a Global Partnership for Development

The UN is partnering with governments, civil society and other players to develop an agreed post-2015 global development agenda.¹² For example, in August 2012 the UN Secretary-General launched an independent global network of research centres, universities and technical institutions to seek solutions to pressing environmental, social and economic challenges, referred to as the Sustainable Development Solutions Network SDSN).¹³

Many of our research and innovation focus areas at CPUT are well oriented to support these goals, in particular nutrition, education, health, and environmental sustainability.

4.5 Conclusions

An assessment across all these strategic imperatives at different levels shows some areas of common ground and overlap. An initial list of these areas of common priority includes:

- Eradicating poverty and extreme hunger, including food security and nutrition
- Creating opportunities for growth and jobs, including supporting priority sectors
- Improving education outcomes
- Increasing wellness, including maternal and child health
- Developing integrated and sustainable human settlements
- Promoting social inclusion and mobility
- Integrating service delivery for maximum impact, well-functioning government
- Supporting growth and development in rural areas
- Strengthening the bio-economy
- Enabling safe drinking water and sanitation
- Providing energy security
- Supporting environmental sustainability and climate change

¹² See <http://www.un.org/millenniumgoals/beyond2015.shtml>

¹³ See <http://www.unsdsn.org/>

5 implications for focus areas

The concept of focus areas was initiated by the National Research Foundation in 2000. In a review of the NRF focus area landscape, Marais (2007)¹⁴ indicates four reasons which were offered for the radical shift in 2000 from the funding of curiosity – driven to steered problem-orientated research, viz., firstly, the establishment of the ‘new’ National Research Foundation incorporating the natural and social sciences; secondly, the national imperative of directing public resources towards addressing national challenges; thirdly, international reorientation from Mode 1 to Mode 2 in knowledge production; and fourthly, international best practices in public funding of research. All of these reasons are still relevant today, and are equally important to the context and rationale of the CPUT RTI blueprint.

In order to build critical mass and make effective use of limited resources, it is therefore important for CPUT to have clear areas of focus over the next ten years. The bulk of our research, technology and innovation efforts and resources will be concentrated on these focus areas. Each of these focus areas provide a basis upon which research and innovation niche areas will be developed among faculties, centres of excellence and research units over time.

The choices of these focus areas and the associated niche areas will be informed by:

- CPUT’s strengths
- Selecting areas likely to make the strongest contribution to strategic imperatives
- Defining the boundaries of focus areas in a way that supports a multi-disciplinary approach

These focus areas are likely to evolve over time as strategic imperatives shift and CPUT’s strengths change over time. Thus it is important to ensure that sufficient flexibility within focus areas exists, and that periodic reviews are undertaken to assess relevance to CPUT’s growth trajectory, national imperatives, and orientation to Mode 2 research.

It is proposed that the focus areas relate closely to the DST Grand Challenges, with niche areas within these relating to CPUT’s strengths and potential contributions to Western Cape strategic objectives, the South African National Development Plan, and global Millennium Development Goals.

The proposed focus areas are therefore as follows:

1. Bio-economy and biotechnology
2. Space science and technology

3. Energy
4. Climate change and environment
5. Human and social dynamics, including issues related to service delivery
6. Economic growth and international competitiveness
7. Design for sustainability

As an illustration, the table below overlay shows how these focus areas relate to current RTI areas within CPUT (which might evolve into niche areas), as well as provincial, national and global objectives and goals.

Table 1: Focus areas compared to related CPUT RTI areas and societal goals

FOCUS AREA	EXAMPLES OF RELATED CPUT RTI AREAS	RELATED PROVINCIAL, NATIONAL AND GLOBAL GOALS AND OBJECTIVES
Bio-economy and bio-technology	<ul style="list-style-type: none"> • Oxidative stress • Rooibos • Biocatalysis • Functional food research on Omega-3 fatty acids 	<p>MDGs:</p> <ul style="list-style-type: none"> • Reduce biodiversity loss
Space science and technology	<ul style="list-style-type: none"> • UAVs • Space initiatives 	<p>NDP: Space science identified as an area of competitive or comparative advantage for South Africa</p>
Energy	<ul style="list-style-type: none"> • Energy efficiency • Solar heaters • Power systems 	<p>NDP:</p> <ul style="list-style-type: none"> • Produce sufficient energy to support industry at competitive prices, ensuring access for poor households, while reducing carbon emissions per unit of power by about one-third • Power identified as an area of competitive or comparative advantage
Climate change and environment	<ul style="list-style-type: none"> • Energy efficiency • Solar heaters • Power systems • Environmental toxicity and remediation • Design for sustainability 	<p>Provincial strategic objectives:</p> <ul style="list-style-type: none"> • Mainstreaming sustainability and efficiency <p>NDP:</p> <ul style="list-style-type: none"> • Transition to a low-carbon economy <p>MDGs:</p> <ul style="list-style-type: none"> • Ensure environmental sustainability

¹⁴ Marais, H.C. 2007. The focus area landscape programme of the National Research Foundation: A review. Final report submitted to the Vice-President (Research and Innovation Support and Advancement) NRF: ST&I Network & NRF, p. 10.

FOCUS AREA	EXAMPLES OF RELATED CPUT RTI AREAS	RELATED PROVINCIAL, NATIONAL AND GLOBAL GOALS AND OBJECTIVES
Human and social dynamics, including issues related to service delivery	<ul style="list-style-type: none"> Teaching methods Multi-grade classrooms ICT for development Home-based health care E-government Community water supply and sanitation Low-cost housing Nutrition Clinical epidemiology Sports science Ergonomic technology Work place learning and professional education Socio-technical advancements, for example, through technology assessment. 	<p>Provincial strategic objectives:</p> <ul style="list-style-type: none"> Improving education outcomes Increasing access to safe and efficient transport Increasing wellness Increasing safety Developing integrated and sustainable human settlements Promoting social inclusion Reducing poverty Integrating service delivery for maximum impact Building the best-run regional government in the world <p>NDP:</p> <ul style="list-style-type: none"> Ensure that skilled, technical, professional and managerial posts better reflect the country's racial, gender and disability makeup Broaden ownership of assets to historically disadvantaged groups Increase the quality of education so that all children have at least two years of preschool education and all children in Grade 3 can read and write Provide affordable access to quality health care while promoting health and wellbeing Establish effective, safe and affordable public transport Realise a food trade surplus, with one-third produced by small-scale farmers or households Ensure household food and nutrition security Entrench a social security system covering all working people Realise a developmental, capable and ethical state that treats citizens with dignity Ensure that all people live safely, with an independent and fair criminal justice system Broaden social cohesion and unity while redressing the inequities of the past Play a leading role in continental development, economic integration and human rights <p>MDGs:</p> <ul style="list-style-type: none"> Eradicate extreme poverty and hunger Achieve universal primary education Promote gender equality and empower women Reduce child mortality Improve maternal health Combat HIV/AIDS, malaria and other diseases Develop a Global Partnership for Development

FOCUS AREA	EXAMPLES OF RELATED CPUT RTI AREAS	RELATED PROVINCIAL, NATIONAL AND GLOBAL GOALS AND OBJECTIVES
Economic growth and international competitiveness	<ul style="list-style-type: none"> Tourism in Africa Clothing and textiles Food technology Web search engine optimisation Tooling Instrumentation Material flow Adaptronics ICT for development 	<p>Provincial strategic objectives:</p> <ul style="list-style-type: none"> Creating opportunities for growth and jobs Increasing opportunities for growth and development in rural areas <p>NDP:</p> <ul style="list-style-type: none"> Increase employment to 24 million by 2030 Raise per capita income to R120 000 by 2030 Increase the share of national income of the bottom 40% from 6% to 10% Establish a competitive base of infrastructure, human resources and regulatory frameworks Make high-speed broadband internet universally available at competitive prices <p>MDGs:</p> <ul style="list-style-type: none"> Achieve full and productive employment and decent work for all, including women and young people
Design for sustainability	<ul style="list-style-type: none"> Alternative energy Healthcare Biomimicry Low-cost housing solutions Sanitation 	<p>NDP</p> <ul style="list-style-type: none"> Provide affordable access to quality health care while promoting health and wellbeing Establish effective, safe and affordable public transport Produce sufficient energy to support industry at competitive prices, ensuring access for poor households, while reducing carbon emissions per unit of power by about one-third Ensure that all South Africans have access to clean running water in their homes Make high-speed broadband internet universally available at competitive prices <p>Provincial strategic objectives:</p> <ul style="list-style-type: none"> Developing integrated and sustainable human settlements Promoting social inclusion Reducing poverty <p>MDGs</p> <ul style="list-style-type: none"> Ensure environmental sustainability

6 what challenges do we need to overcome?

In order to achieve our vision, a range of challenges will need to be overcome. These are set out below:

- **Perceptions and culture:** With some exceptions, our external “brand” is mainly associated with producing employable diploma students rather than focusing on research and innovation and on post graduate throughput; this impacts our attractiveness. Our internal culture is also not optimally oriented to research and innovation.
- **Staff and student profile:** Our current profile has under-prepared undergraduates, limited postgraduate students, a low ratio of staff with PhDs, and a small number of NRF-rated researchers.
- **Facilities:** Not all of our technology and facilities are industry-standard or world class.
- **Specialist research, technology and innovation support systems:** although improved over recent years, we still have gaps in terms of specialist support for research and innovation in order to become a great research, technology and innovation university
- **Institution-wide systems’ alignment to research and innovation:** Given CPUT’s history, our systems are not currently oriented and sufficiently flexible to support research and innovation activity. Systems are also not equipped to be responsive to client, partner and other stakeholder expectations in terms of speed, efficiency and availability. These systems include financial support, procurement, human resources, recruitment, maintenance, IT, marketing, communications, and quality management.

7 what are the implications for CPUT policies?

In order to achieve our vision and objectives, we need to align policies, which will in turn align our strategy, systems and operations. Our policies should reflect the principles and values underpinning our research, technology and innovation approach, including:

- 1 Promoting excellence
- 2 Supporting multi-disciplinary focus areas
- 3 Unlocking potential of staff and students
- 4 Working strategically through partnerships
- 5 Instilling a culture and systems of service and uptake

We should also recognise that our policy should **integrate the methodologies of innovation and process design internally**, creating space to adapt as we learn, **continuously improving**, and constantly striving to find workable solutions.

The two overarching policy decisions are:

- a To **empower** the Research, Technology Innovation and Partnerships DVC’s office to bring about the necessary changes within RTI systems and operations, and to provide ongoing leadership and management to RTI within the organisation
- b To create mechanisms and adapt policy where necessary to bring about an **alignment of the systems, approaches and processes of the institution as a whole to support achievement of RTI objectives**, in turn supporting the overall Vision 2020 for CPUT

These two overall policy decisions are spelled out in further detail in the sections below.

7.1 RTI-specific implications

The section below sets out RTI-specific areas that would be led by the Research, Technology Innovation and Partnerships DVC’s office in relation to each of the 5 objectives.

7.1.1 Promoting excellence

- a Developing draft guidelines for attracting and retaining excellent researchers, research support and innovation specialist staff
- b Coordinating development of industry-standard research, technology and innovation

- facilities, including laboratories, trials, prototyping and demonstration facilities, including support for rural research and innovation reach through facilities and infrastructure
- c** Oversight of a research code of conduct and quality management system
- d** RTI competitions and awards

7.1.2 Supporting multi-disciplinary focus areas

- a** Audit of all existing RTI-related policy, strategy and activity
- b** Finalising RTI focus areas
- c** Identifying initial niche areas within focus areas in consultation with faculties and centres
- d** Joint identification of flagship projects within faculties and centres to support the new focus areas and niche areas
- e** Building and maintaining a database of CPUT's existing relevant research, technology and innovation (and researchers, technologists and innovators) within each focus area
- f** Applications for additional research chairs, centres of excellence and technology stations within focus areas
- g** Support to faculties and centres to align RTI activities with focus areas
- h** Identification of research leaders and managers
- i** Establishment of an oversight and advisory body, similar to MIT's "The Corporation" which has 75 leaders in science, engineering, industry, business, education, and public service

7.1.3 Unlocking potential of staff and students

Building systems and procedures that empower and support the harnessing of staff and student potential, including:

- a** Student, staff and partner/potential partner surveys to understand interests, capabilities and motivation
- b** Infusing a spirit of innovation into all our teaching and research
- c** Refining supervision systems, guidelines and capacity
- d** Developing research fellow policies and systems
- e** Research management and administration processes
 - Simplified and decentralised where needed
 - Support for contract research
- f** Internal or outsourced training and capacity building around RTI management and teaching RTI linkages
- g** Streamlined management of the post-doctoral experience
 - Post-doctoral policy
 - Recognition system for post-doctoral fellowships, Benchmarked post-doctoral stipend level and system
- h** Supportive RTI funding and financial management systems

- Dedicated fund raising to support research, technology and innovation
- Guidelines and support for proposal writing and grant fund request writing
- Funding systems that recognise and reward RTI contributions (individually and as units, centres or departments)
- Research and innovation-focused scholarships and bursaries
- Systems to deal with and support third-stream revenue generation
- Incentives that encourage people onto a sustainable research path, for example, incentives for first research paper
- i** World-class research, technology and innovation information technology systems
- j** Supportive, modern library facilities, and expanded curation functions
- k** RTI input into human resources development
 - Researcher, technologist and innovator mentorship, training and development support
 - Accelerated development for HDI staff and students to support diversification of researcher, technology and innovator base
 - Early identification system of staff and students with high RTI potential
 - Accelerated development programme
- l** Ongoing enhancement of research, technology and innovation performance measures, including:
 - Diverse measures of research and innovation (in line with NRF & TIA measures as far as possible, including research and innovation outputs, partnership, research management, supervision quality)
 - Customised performance measurement for research-, technology- and innovation-oriented staff
 - Inclusion of recognition for third-stream income

7.1.4 Working strategically through partnerships

- a** Leadership / input into RTI partnership database development and maintenance
- b** Guidelines on strategic RTI partnerships, including criteria for partnerships, partnership approaches, and scanning for prospective industry and other partners to form potential target markets for CPUT RTI
- c** Development of RTI marketing strategy to partners
- d** Support for RTI partnership management
- e** Policy on third-party use of RTI facilities

7.1.5 Building a culture of service and systems to promote research uptake

- a** Enhanced RTI knowledge management, including databases and web access to focus areas, staff and student interests, patents and technology licences
- b** Technology transfer support, and further strengthening of the TTO
- c** Enhanced commercialisation and IP support, including:
 - Support with registering patents, trademarks, designs, copyright and know-how
 - License agreements

- Support for business incubation and development of spin-off companies, potentially also including establishment of a CPUT innovation holding company
- d** Contract research support and systems, potentially including full-cost operating model to deal with IP allocation issues
- e** Legal compliance support and monitoring, including IP from Publicly Funded Research
- f** Develop and implement a Research Uptake and Research Uptake Management (RUM) strategy, including:
 - A focus on the entire research cycle to focus on uptake from the research conceptualisation phase through to all subsequent phases
 - Building internal capacity for uptake management
 - Integration of user participation into processes
 - Encouragement of action research paradigms, including that of living laboratories
- g** Development, coordination and continuous updating of RTI marketing strategy (updating [draft] innovation marketing strategy):
 - Identification of target markets for uptake
 - Identification of key messages
 - Marketing channels strategy (including both conventional and social media)
 - Support for customised marketing strategies in relation to uptake (including from research concept development through to research and technology transfer)

7.2 Overall institutional policy implications

The section below sets out areas that will need to be aligned across the institution in order to allow for achievement of the RTI vision and objectives. The office of the DVC Research, Technology Innovation and Partnerships, and the associate directorates, will have the primary responsibility and mandate to champion this alignment via the executive of CPUT and through the appropriate channels and processes. This therefore implies that all decision makers will ultimately be jointly responsible to create an institutional environment that will enable the RTI vision of CPUT to be realised, and therefore Vision 2020 overall.

7.2.1 Promoting excellence

- a** Supporting an organisation-wide culture of excellence in research, technology and innovation
 - including through internal communication and leadership
- b** Change management and awareness-raising to support the transition to a great university of technology, as well as building and sharing an identity that includes research, technology and innovation at its heart
- c** Alignment of human resources policies and operations, including:
 - Adoption of RTI-supporting recruitment approaches, including incorporating research and innovation interest and experience into advertisements and selection criteria
 - Staff appointment policies (including the status of research fellows) to favour the appointment of seasoned researchers in CPUT focus areas and niche areas

- Excellence in research, technology and innovation must be added to the job specifications and performance management of deans, directors, and department heads.
- d** Alignment of admissions requirements with RTI objectives (incorporating quality, research/innovation interest and interest in focus areas at both undergraduate and postgraduate levels)

7.2.2 Supporting multi-disciplinary focus areas

- a** Alignment of service offering with RTI vision and objectives (including focus areas and multi-disciplinary approach), including – postgraduate, doctoral programmes suitable for research focus specialisations, centres of excellence, research chairs, etc.
- b** Alignment of coursework in terms of preparing students for multi-disciplinary research, technology and innovation
- c** Alignment of organisational design with a multi-disciplinary approach, including overcoming silos, building multi-disciplinary teams, and integration of focus areas and niche areas

7.2.3 Unlocking potential of staff and students

- a** Promoting freedom to choose and building of specialised capabilities
 - Flexibility in allocation of staff time and teaching load
 - Provision for specialist teaching and research, research management and innovation posts
 - Well-functioning sabbatical system
- b** Alignment of institutional budgeting and financial management systems, including:
 - Budget allocation in line with focus areas
 - Systems that can deal with revenue-generating research and commercialisation activity
 - Authorisations, invoicing, payments, ring-fencing of funds, and high speed response time to accommodate researcher and partner timeframes (where not decentralised)
- c** Building linkages between work-integrated learning and RTI (including incorporation of problem-solving and applied research)
- d** Staff development, advancement, performance management, remuneration, and incentive systems
 - Including performance systems and advancement aligned with a focus on teaching or RTI, based on student and peer feedback on areas of strength (which may require updating of *ad hominem* promotion guidelines to allow for greater specialisation, and greater consideration of technology, innovation, service and uptake, as well as RTI management aspects)
- e** Internal learning and innovation, with systems for research to inform teaching, and teaching to inform learning
- f** Internal communication strategy relating to RTI to ensure high levels of buy-in, understanding of options, and motivation to make use of the potential of RTI

- g** Information technology, including fixed and wireless access, mail and document storage and sharing systems keeping pace with latest technological developments
- h** Collaboration to enable world-class library research and innovation systems and infrastructure, including:
 - Enhanced library research support systems and services, including access to information, digital platforms, support for research skills
 - Expansion of library infrastructure and resources which align with the vision of the RTI Blueprint
 - Curation, dissemination and promotion of the traditional outputs of research in terms of articles and theses, and curation of research data and innovation output, including enhanced research data management systems (which can also support collaboration around RTI focus areas)
- i** Infrastructure maintenance that supports well-functioning facilities with high availability and low down-time

7.2.4 Working strategically through partnerships

- a** Alignment of overall partnership and network management with RTI blueprint, including international affairs, industry partnerships, public research institutions, government relations, community engagement
- b** Procedures for visiting lecturers, students and exchanges
- c** Provision within recruitment for people with industry, government or NGO backgrounds

7.2.5 Building a culture of service and systems to promote uptake

- a** Align overall CPUT brand building, internal and external communication and marketing, incorporating:
 - Focus areas
 - Relevance and social responsiveness
 - Multi-disciplinary approach
 - Success stories and case studies
 - Managing a message around diploma student focus
 - Consistency of message and style
 - Innovative use of available channels including the CPUT website and external channels (both traditional and new media)

8 RTI implementation considerations

This section outlines some of the considerations for the implementation of the RTI blueprint and provides a framework for the development of a more detailed implementation plan. It is, however, not an exhaustive list of actions, as other key implementation considerations may arise as the detailed planning process unfolds.

8.1 Create an enabling environment for RTI in CPUT

- a** Actively promote buy-in amongst all stakeholders, including support sectors of CPUT
- b** Formally adopt RTI strategy
- c** Develop and implement a ten-year rollout plan
- d** Develop key performance indicators and reporting systems
- e** Identify champions
- f** Determine strategic resource allocation
- g** Review policies which constrain implementation
- h** Engage with support structures, especially HR, Finance, and CTS, using a participatory model to identify constraints, and implement solutions to support RTI objectives

8.2 Proposed actions items over the short to medium term

- a Recruit staff with the correct profile to build RTI**
 - Benchmark minimum requirements for academic appointments at all levels to build a core of reputable and experienced academics, capable of supporting RTI
 - Benchmark salaries competitively to reward rated researches based on incremental output and contribution
 - Train academic leaders to manage and support staff who do research
 - Retain productive researchers after age 65 as adjunct professors and research fellows
- b Develop enabling policies and guidelines**
 - Identify and mitigate constraints in existing policy environment, especially with regard to HR and Finance
 - Develop guidelines to support development of focus areas and associated niche areas
 - Develop monitoring and evaluation policy of RTI activities

- Ratio/percentage of projects that are aligned with CPUT focus areas
- Number of contributions to strategic imperatives (CPUT, Western Cape, South African NDP, AU, UN Millennium Development Goals or their post-2015 replacement)

c Unlocking potential

- **For students:** Percentage successful transition to become applied researchers and innovators, survey responses on perceived level of empowerment
- **For staff:** Number of students supervised to a successful research or innovation output, survey responses on perceived level of empowerment
- **For students and staff:** client satisfaction survey
- RTI-related *ad hominem* promotions using aligned measures

d Strategic partnerships

- CPUT and partner annual survey responses on the value of partnerships

e Service and research uptake

- Citations and impact factor
- Number of conversions into popular media articles
- Number of design registrations and patents
- Percentage of projects designed from the outset with service and research uptake in mind
- Percentage of research, technology and innovation projects actively communicated to internal audiences
- Percentage of research, technology and innovation projects actively communicated to external audiences and partners
- Research income per academic staff member, in terms of the following categories:
 - Income from industry
 - Income from public research institutions
 - Income from international donors and NGOs
- Number and growth rate of spin-off companies established and sustained over 5 years
- Number of start-up companies supported
- Number of technology transfer agreements
- Value of royalties generated
- Number of public and non-profit policies, strategies, plans or initiatives influenced by evidence from CPUT research

The monitoring and evaluation process should feed through into a organisational learning and continuous improvement process.

In addition it is proposed that a tool such as a Logic Model be used in conjunction with a detailed implementation plan to monitor and evaluate progress towards our goals over the next ten years.

APPENDIX 1 CPUT declaration on research and innovation

PREAMBLE

We, researchers, deans and innovators of the Cape Peninsula University of Technology (CPUT), representing all faculties, strategic support units, centres and institutes, having recommended a ten-year rollout plan for research and innovation at CPUT on 30 September 2011 to underpin the institution's Vision 2020 for research and innovation,

Hereby commit ourselves to:	Accordingly, we therefore recommend that:
<ul style="list-style-type: none"> • Affirm to make individual and collective contributions to build and sustain research and innovation at CPUT • Work towards greater input to executing our research policies that govern postgraduate studies at CPUT and improve institutional research cultures for the benefit of all stakeholders and other international organisations to overcome the current research funding challenges • Support research linked to well-defined institutional goals: A Focused Approach to Society's Grand Challenges • Engage faculties, units and centres to individually and collectively continue to seek mechanisms for the improvement of knowledge output • Strive towards a demographically representative research workforce that will better serve the diverse needs of our institution • Facilitate the establishment of appropriate knowledge platforms for purposes of networking, knowledge sharing and acknowledging the importance of communities of practice • Strive towards the positioning of CPUT as a leader in research and technology innovation in Africa 	<ul style="list-style-type: none"> • CPUT management take concrete actions to implement the recommendations of the ten-year roadmap • Researchers and innovators be actively empowered to deliver research and innovation outputs through, for example, Sabbaticals, financial incentives and share in the revenue of patents registered • CPUT formalise and implement the recommended policy, and support initiatives and undertake to review and update technical specifications of the policy every three years • CPUT develop a focused flagship project in every faculty to address international development imperatives as espoused in the Millennium Development Goals • CPUT develop a one-stop shop for IP support • CPUT institute a line function responsibility for research and innovation between the office of the DVC Research, Technology Innovation & Partnerships and faculties • The responsibility for research and innovation is added to the job specifications of deans and directors for performance evaluation purposes • The input of specialist practitioners towards research and innovation be recognised • CPUT provide a vehicle to transform IP and patents into commercially viable products and enterprises

We adopt these resolutions as a basis for advancing, amongst others, research and innovation excellence, and the creation of a representative and productive research community that will advance our institutional imperatives and our competitiveness towards a great and sustainable university as encapsulated in Vision 2020."



Cape Peninsula
University of Technology

Multi-disciplinary focus Excellence Unleashing potential of staff and students Service and Research Uptake Strategic partnerships

