FIRST ANNUAL SATN CONFERENCE
INTERNATIONAL CONVENTION CENTRE, DURBAN
DAY ONE - 22 MAY 2008
NATURE AND CHARACTERISTICS OF SA UoTs

	Opening and welcome **Prof. Roy du Pré** **SATN Chair and VC, DUT**
	Prof. Roy du Pré, the Chairperson of the South African Technology Network, and the Vice Chancellor of the Durban University of Technology, which hosted the event, declared the conference officially opened. He extended a word of welcome to all delegates, and expressed the hope that the conference would be useful in charting the way forward for Universities of Technology.
Session 1	**SATN Project Committees** **Chair: Prof. Thandwa Mthembu** **VC, CUT**
	Prof. Mthembu reiterated the word of welcome extended by Prof. du Pré. He proceeded to introduce the various speakers who provided feedback on each of the SATN Project Committees.
	UoT Typology Project Committee: Prof. M Fowler *'If we operate from possibility rather than from resignation we can create the future into which we are living as opposed to merely reacting to it'* (Jaworski, 1992) The Typology Project Committee has been active for a period of two years. Various stakeholders, including comprehensive universities, are represented on this committee. Two points of departure were identified for the work of this Committee, namely the core functions of a university, as well as satisfying labour market and industry needs. The conclusion the Committee drew was that it is not what UoTs do that distinguish them from traditional universities, but how they go about fulfilling this brief. The difference lies in the unique PQM of UoTs, and a combination of learner attributes. The point of departure for determining the identity of a UoT included characteristics, attributes, criteria, benchmarks and performance indicators, which will inform an implementation plan.

Curriculum Project Committee: Prof. A Staak

The Curriculum Project Committee met three times over the past six months. The Committee undertook an analysis of the HEQF and its implications for the UoT sector, and advised a way forward for UoTs to SATN.

The recommendations made on the HEQF include:

- None of the current UoT qualifications feature on the HEQF
- A new suite of HEQF-compliant qualifications need to be designed and developed
- These need to be approved by the DoE, accredited by the HEQF and registered by SAQA
- UoTs will have to engage in a major curriculation exercise to ensure that their offerings are HEQF compliant.

An overview of the current binary system, in which articulation and progression is possible, was provided.

On postgraduate programmes the HEQF's impact will be more severe. Students in the Diploma track will need at least one more year to progress to postgraduate degree level. Students with Diplomas articulating to the Degree track will need at least 18 months to obtain the degree since 'Maximum of 50% of credits used for one qualification can be transferred to another qualification' (CAT requirement of the HEQF).

Factors limiting UoT options for offering Degree programmes:

- In terms of approved UoT enrolment targets headcount enrolments are limited
- The majority of students do not meet admission requirements for degree studies, in some as high as 80%
- The alternative of offering dual programmes in both diploma and degree streams will be resource intensive
- Programme approval process takes into account the following factors:
    - PQM of neighbouring institutions
    - Institutional capacity
    - Past enrolment trends

The way forward proposed to the SATN:

- Challenge aspects of the HEQF that hamper progression of diploma students to postgraduate studies
- Status of the Diploma – suggest a 360-credit diploma at Level 7, or a 240-credit diploma at Level 6
- Suggest direct articulation from Diploma to postgraduate Diploma
- CAT – a more flexible approach must be adopted
- Lobby for funding support from DoE as the need to curriculate all

	qualifications will have major resource implications for UoTs • Institutions will have to make strategic decisions about inappropriate PQMs The Committee's role going forward will be to: • Play a coordinating role in the design of qualifications that are HEQF compliant • Assist the curriculation process, developing best practice guides and position papers • Seek clarity on transitional arrangements, programme approval process, impact on funding, and implementation matters • Monitor the programme approval process, since bottle-necks are foreseen • Help fast-track the approval process
	Research Outputs Project Committee: Prof. P Nevhutalu The Committee on Research Outputs was tasked to develop a concept document that would feed into the discussion between SATN, HESA and the DoE. Although progress so far has been limited, some insights into the document were provided. The ToR of this committee include the following aspects: • Develop a discussion document on differentiation between HEIs • Focus on research and innovation • Benchmark research policies and practices at UoTs • Planning of research focus • Promotion and advocacy The discussion paper was followed by a framework for the accreditation of other research outputs from UoTs, and research indicators. The outline of the document tracked the history of the development of UoTs, providing historical perspectives as well as making a case for research at UoTs from a political perspective. The document would also investigate policies, a conceptual framework for research and current research activities. International models would also be incorporated. All these will be combined into a report to the Minister of Education. Initially Technikons did not have a mandate to do research, but started undertaking research projects, with no special funding from the State, in the 1980s. The Technikon mandate was expanded to offer Masters and Doctoral degrees in 1994, once again not supported by additional State funding. Since 2001, the FRD and NRF started providing support for research at Technikons. In 2001 the Technikons Act was repealed, and in 2004 Technikons became UoTs. The debate on differentiation commenced in 2006. The progress made

	by UoTs in this limited space of time should indicate that there should be more funding. SA is experiencing a serious shortage of high level skills. All resources, expertise and skills should be put to work to address this endeavour to provide service to industry through technology stations, SMEs, and innovation fund projects. The greatest participation by black students is occurring at UoTs – the DoE should be made aware of the political significance of this occurrence. The Minister of Education should be made aware of the following aspects, among others: • The need to set minimum standards for UoTs • Increase redress and capacity development funds • Partnerships between the sector and DTI should be encouraged
	Data Sharing Systems Project Committee: Prof. A Jordaan Each of the 5 UoTs was assigned a specific focus area that will feed into the work of the Data Sharing Systems Project Committee. The objectives of this Committee include: • To create a context of the role and position that UoTs fulfil within the educational sector of SA • Sharing information and data on common issues such as technology, expertise, system performance, tracking and improvement • Technology stations – an expertise database should be established • Innovation centres • Disciplines – once again an expertise database should be established Milestones achieved include, among others: • Define depth and scope of data to be shared • Identify local and international role players and beneficiaries • Define scalable and streamlined relational data structures • Ensure high-speed, accessible, relevant and secure data
	Information Technology Project Committee: Prof. A Jordaan The role of this Committee is to tap into the knowledge and expertise at UoTs to govern and direct research projects for the benefit of the educational and technological sectors in South Africa. Government is concerned about the skills shortage in South Africa. The Committee is working closely with the State Information Technology Agency (SITA) to address the technological skills shortage. SITA requested the Committee to participate on the establishment of an Integrated Financial Management System (IFMS). IFMS deals with the integration and migration of government finance, HR asset management, logistics and other line of business solutions into a single distributed transversal system, across SA's

	provincial and national government structures. The project will cost R 10 billion over 10 years. According to tender specifications, IFMS is to be implemented in 39 national and 91 provincial departments. 17 000 jobs will be created, including 16 000 procurement practitioners and 1 000 middle and senior managers. SITA compiled a roll-out plan and assigned the first phase of implementation, estimated at R 4 billion, to IBM. IBM will use IFMS as a catalyst to assist in driving the establishment of a sustainable software industry in the SA economy. The UoTs, through the SATN, will become closely involved in the IFMS project through knowledge transfer, and assist IBM in the development of a sustainable local software industry in SA. The SATN IT Project Committee tasked HEICTA to investigate the feasibility of incorporating IBM academic initiatives into the IT curricula at UoTs. After key information was secured from SITA, HEICTA submitted a draft business case to the Committee. CPUT also worked with HEICTA to see how curricula at postgraduate level could be addressed. The IT Project Committee will work closely with the SATN Curriculation Committee to see how this project can be maximised.
	Prof. Mthembu congratulated the Project Committees on the work achieved to date.
	SIGNING OF SATN TRUST DEED
	The SATN Trust Deed was signed by the Vice Chancellors of the South African Universities of Technologies. Prof. Chris van Rensburg, Director of the SATN Secretariat, confirmed that the SATN will be the vehicle through which the objectives set by the UoTs will be achieved.
Session 2	**Introduction to Work Integrated Learning** **Prof. Duma Malaza** **CEO, HESA**
	Work Integrated Learning is integral to skills transfer in higher education. Universities deal with this notion from different perspectives. It is through understanding this difference that the notion of skills applies in higher education. Do universities have a primary purpose? Knowledge is an article of great intrinsic value, essential to satisfy curiosity and needs. There is a spectrum ranging between these two needs – knowledge for esoteric and arcane purposes, and knowledge needed to promote development. Knowledge becomes more relevant towards the latter end. The appreciation of knowledge is supported by an understanding of the various practices of which it consists. Knowledge is accessible through academic

	disciplines, or higher learning. The primary purpose of universities is to keep this knowledge, and the codification and dissemination thereof. The discourse on skills in higher education encounters difficulties in this area – there is a disjuncture between the generation of knowledge and the imperative of skills transfer for development purposes. A differentiated higher education system provides a good framework for higher learning and imparting vocational skills for development. There are a number of issues impacting on where the emphasis for a developing country like SA should be. The larger and more serious attention should be on vocational and technical learning. At this juncture, the pursuit of knowledge for its own sake, while important, should not be the only imperative driving the higher education agenda. The benefits likely to accrue from the creation of comprehensive universities have to be determined – issues like the importance of research and the loss of perceived status have to be debated. It was suggested that in the SA context the provision of technical and technologically focused provision resides with the UoTs, from where graduates are most likely to enter the world of work. The integration of work experience in curriculum and learning programmes is the most effective arrangement for the realisation of this goal, resulting in strong relationships between HEIs and business. The HE sector needs to ensure a strong and viable UoT sector, providing a valuable and indispensable kind of training. Technologically focused components of comprehensive universities should not be lost due to academic drift. The sector also needs to promote and strengthen WIL through robust policy and practice, and strong partnerships with business and industry.
Session 2	**Work Integrated Learning** **Keynote Address: Mr Brian Forbes** **Vice President, SASCE**
	In an attempt to summarise the outcomes of the conference in relation to cooperative learning and work integrated learning, the following issues were highlighted: Cooperative education is founded on cooperation between industry, communities and higher education institutions, integrating theory and practice in authentic work settings. A range of methodologies and practices have evolved over the years to encompass the notion of work integrated learning – the common denominator is the need for cooperation between supply and demand to achieve competent workers to feed into all economic sectors. A wider community committed to student growth and development through work integrated learning is needed. A recent baseline study through HESA found that newly employed graduates lack basic critical skills. This reveals that there is a possible mismatch between the supply and demand of suitable graduates in certain disciplines. In 2005 the higher education sector was slated for not producing enough higher education graduates. The objectives of the

	NSDS and JIPSA are also not aligned, according to a recent report. The fact that there is no funding support for WIL, despite the fact that over 22 000 students were successfully placed and completed WIL experiences in 2007, is of concern. This conference focuses attention on the need to address this issue, but also the need to integrate learning with practice. WIL is defined in the HEQF by very clear criteria – the HEQF is also specifically obligated to place, assess and give credit for WIL. The HEQF document presents an opportunity for HEIs to engage the DoE and prove that the management of WIL is a viable and necessary educational technology and can withstand scrutiny for funding purposes. The different perceptions, institutional practice and methodologies that emerged as part of the transitional period during which UoTs were established have to be understood. Cooperative education through WIL will become a distinguishing feature for most UoTs. Institutions that practice WIL are increasingly becoming institutions of choice internationally. Getting back to the opportunities presented by the HEQF, cooperative education is not acknowledged as having learning outcomes benefits; it is seen merely as a mechanism to secure possible future employment. If we are committed to prepare graduates for careers, then WIL should be seen as an imperative. Institutions should ensure that the necessary infrastructure and support is given the same priority as the remainder of the academic programme. The re-curriculation of programmes in line with the HEQF should be clearly understood and coordinated. Learning outcomes and assessment criteria should be measurable in the work place. Academic credits should be aligned with level descriptors. WIL should be seen as a teaching mechanism that will lead to knowledge creation, transfer and implementation. Capacity and resource provision at the level of programme delivery should take note of aspects like staff quality, student support and presentation. WIL also serves as a means to address high dropout rates. At the level of institutional preparedness and stakeholder preparation, synergies between WIL and other modes of learning should be found to increase HEI participation in this practice. SASCE, as the recognised body to oversee WIL, is confident that all stakeholders focused on cooperative education can be encouraged to participate in furthering WIL throughout South Africa.

Discussion	**Chair: Prof. Vuyisa Mazwi-Tanga** **VC: CPUT** **Panel:** **Prof. Roy du Pré, VC: DUT** **Mr Alpheus Maphosa, Director: Co-operative Education, VUT** **Dr Paul Stonely, ED: WACE** **Representatives from DoL, DoE and Industry**
	Prof. du Pré emphasised the importance of industry input in terms of WIL. Some issues that arose from the presentations should also be revisited. **Mr Maphosa** stated that South Africans continue to be marginalised while the debates on skills development continue. A number of HEIs and institutes of Government are set up to deal with the issue of skills development, yet there is an increase in poverty, crime and xenophobia. While the debate continues, there is no input or reference to imperatives such as NEPAD, the millennium goals for eradicating poverty by 2014, or the lack of a skills development strategy in the HEQF document. Another issue that should be addressed is that these imperatives should be driven by their own momentum and not by personalities – resources should be made available to address the issues of importance, and should not be dependent on the goodwill of individuals. **Ms Patterson, Eskom**, highlighted the following issues. Learners produced by UoTs, although supposed to come out of the system 'work ready', are in fact not. A possible thought could be to extend, per discipline, the length of time spent in industry. A period of 18 months to two years could help address this shortcoming. Stronger ties are also needed between UoTs and industry – neither institutions nor industry can drive skills development independently. More needs to be done to market the importance of WIL and cooperative education. **Ms Hills, Bell Equipment Company**, added another dynamic to the discussion. Large corporations and industry cannot absorb everything that needs to be done to support skills development – links should also be created with different levels of business using all networks possible. Every person who can be made work ready is important, and entrepreneurship should be fostered through the establishment of SMMEs.
Discussion	**DDG: DST:** The IFMS data sharing project was noted. The Project Committee was encouraged to liaise with the Research Information Management System (RIMS) to foster synergy between the projects, and ensure that the necessary information is shared between various role players. An annual R&D survey is conducted, recently followed by an Innovation Survey. This information is collected manually from universities, and RIMS is an attempt to make this process automatic.

	The IFMS project for which IBM won the tender to implement the first phase should be linked to the project launched by the CSIR to create synergies. The suggested differentiation between UoTs and traditional universities does not lie in what they do, but how they do it. The DST is struggling to find the role of UoTs, as distinguished, in the innovation chain – more explanation will be necessary. **CUT:** It is interesting to note the distinction of research between traditional universities and UoTs. UoT postgraduate research focuses on industry based research imperatives. Ways also have to be found to ensure that WIL should form part of programmes, regardless of level. **Ms Taylor, UJ:** The HEQF provides an ideal opportunity for HE and industry to craft qualification types that would allow both parties to be equal partners. Re-curriculation exercises could be used to craft qualifications that are educationally sound, but also complemented and supplemented by the necessary soft and workplace skills, integrating learning and real life work. UJ, as a comprehensive university, would also like to be part of optimising the opportunities being opened up by SATN. **Mr Lambert, UJ:** Industry representatives indicated that graduates are often ill-prepared for the world of work. Academics often send students into industry in the belief that they have been exposed to the latest and best practice – this creates conflicts on various levels. What platforms exist to increase synergies between the workplace and industry? Resources and funds need to be made available to acknowledge and address the skills gaps. **Comments from the panel:** **Mr Forbes:** Bridging the gap between what is taught, and practice, is achieved through advisory and liaison committees at institutions. While an excellent platform, the notion of advisory committees may need review on the basis of relevance and representative value. Regarding the length of time needed to produce a competent student, there are a number of challenges – the re-curriculation process should ensure that workplace needs and academic outcomes are aligned. Industry gives an opportunity to assess those skills in the workplace; the industry component need not be extended. **Ms Hills:** WIL should not be lost, and if needs be, duration of qualifications should be extended. Industry partnerships should, where possible, be established at a national level – opportunities should be created to increase the time and exposure and increase the value of the experience for students. Academics should also be given opportunities to keep up to date with new developments in industry, which would also be facilitated through increased partnerships.

	Prof. Malaza: HESA has some difficulty in articulating HE concerns regarding the HEQF Document. The sector prepares students for two worlds – the world of scholarship, and the world of work. Traditional universities are clear about their concerns, but the UoT sector should be clear about the areas where the HEQF fails to address its requirements, and those of industry. **Prof. du Pré:** In Switzerland and Belgium the largest SMMEs represent the highest number of companies. The concept of institutions where learners spend equal time in the university and in industry allows adequate time for learners to be fashioned to meet the needs of industry. Big business is no longer the largest employer in SA, there is a growing shift to creating entrepreneurs and SMMEs. In Australia, 25% of the curriculum is based on WIL. Comprehensive universities in SA, where universities merged with Technikons, could also contribute to the debate about the tensions surrounding WIL. There is a fear that WIL will disappear entirely from the curriculum of these institutions. Prof. Malaza referred to the problems of UoTs articulating their concerns about the HEQF proposal. The UoT sector, although being consulted on the HEQF, found that its concerns were totally disregarded. To address these concerns, a meeting will be held with the Minister of Education. **Prof. Mthembu:** The dichotomy between scholarship and the world of work may only be a perceived one. Traditional universities also offer programmes that are vocationally focused and closely aligned to the world of work – if there are difficulties to move from a diploma to a postgraduate degree, universities will be limited to provide high level scarce skills. The scholarship that is the basis of traditional universities could also be found in the world of work – it is important to determine how this could be harnessed for better effect, to benefit society as a whole. The tail end of the R&D process, where technology transfer could be used to grow the economy of the country, should be harnessed to turn basic knowledge into something of value. **Mr Dale:** The shortage of skills in SA is an acknowledged fact. The constant and quick changes that occur in terms of technology should be reflected in curricula – it often occurs that this also impacts on skills shortages. If UoTs had tracking systems, and mentors who had close links with industry and changing technology, institutions would keep abreast with new industry developments. **Belgium Development Corporation SA:** What space has been created for donors to get involved in addressing skills shortages? The Belgium Development Corporation in SA supports the UoTs, but SATN could offer a more expedient way to increase and maximise this support. **Mr Mlangeni, VUT:** Industry is expecting students who can hit the ground running. To place and monitor a single student for purposes of WIL requires huge resources. What is industry able to do to assist UoTs in preparing

	students who will fit into the world of work? **Bell Equipment:** Our current situation is based on the sourcing of in-service trainees from three UoTs. We don't really look at the costs, because we perceive the benefits to be greater to us. The fact that we are helping to train learners (those that we cannot place ourselves) for the world of work, is seen as our contribution to the larger skills development agenda. Representation and partnerships with UoTs to increase the capacity and turnout of in service trainees is essential. WIL is key to how industry can contribute to skills development – the time they spend working with a company is never wasted. It should be an even more integrated part of every learner's experience.
Session 3	**The DoE view of the role of UoTs in SA Higher Education** **Keynote Address: Prof. Sehoole** **Chief Director: Higher Education Policy, DoE**
	The DoE congratulates the SATN on its first conference, and is appreciative of the opportunity to take part in this discussion. For introspection to have value and yield positive results, it should be done to take ideas from today and open up possibilities for tomorrow. The UoT concept is fairly new, following the restructuring of the HE system. The restructuring was needed to change from a fragmented to a unified system with chances for everybody, in which education is central. UoTs emerged from Technikons, a unique concept for South Africa. A defining moment occurred in 1993, when Technikons were granted degree-awarding status. It is important, when doing introspection, to see that history should be used to chart the way forward. Technikons were renowned for their close links with industry, and the focused on applied research. Because of the relevance of their programme content, they produced employable graduates. The challenge for UoTs is to retain the positive aspects of the previous system, while enhancing their possibilities. The debate about differentiation is relevant to UoTs, and it is hoped that this forum would help define this new identity. It is not necessary to reproduce the programme mission of traditional universities – it would not be in the interest of the country, and a duplication of one institutional type is also not supported by the limited resources available. Diverse types of institutions complementary in their missions and offerings will add greater value. Some of the initiatives that are being undertaken nationally include the NSDS, which focus on aspects like design, engineering and technology. The supply of appropriately qualified people to meet HR demands in areas like ICT, manufacturing, fabrication, chemical, pharmaceutical, and tourism is a high priority, and UoTs are best equipped to address this need. Enrolment planning targets apportion a particular role to UoTs. The enrolment targets for the public system are set to increase by 2010, and the planning process was based on data. The shape and size of institutions will change, and throughput and output rates should change commensurately. Dropout rates

	must decline, and success rates should increase. UoTs' ability to respond to skills needs can only be achieved through increased focus on staff development and ongoing professional development. These pressures on UoTs are enormous – and government is aware of the challenges, such as those related to research. The sector struggles with the challenge of throughput in the time allowed. The DoE, in consultation with the sector, is looking at ways to manage the situation. It is hoped that positive and instructive interactions will help UoTs to produce quality graduates at all levels. Resources should be focused where the most impact will be achieved. Another activity of universities is social responsibility – the needs and challenges of society cannot be ignored. HEIs should play a critical role in consolidating social justice, to identify needs and develop projects to address these needs. Political and social stability is enhanced by increased economic activity, which can only be achieved through a successful, productive HE sector. In order for students to benefit from all three the core competencies of HEIs, co-operative governance is needed to enhance the quality of provision and ensure its relevance here and abroad. The previous transitions happened without any substantive changes to curricula, which the HEQF opens up – this opportunity to identify specific niche areas for high-level skills production should be used to open up the scope for UoTs. Concrete proposals of interventions that would help to open up UoTs are welcome.
Discussion	**Chair: Prof. Errol Tyobeka** **VC: TUT**
	Prof. Tanga: For the first time we are able to see the reality of some of the things we've been speculating about. For the first time we've become aware of the status of some of the UoTs. I thought the processes of the CHE in their audits would reveal what the various UoTs are capable of. It is interesting to note that we should focus on our staff members' qualifications, and on the other hand we're limited. We're supposed to be a unitary system, and not lose our career focus, and yet the HEQF does not make provision for that. Are we applying our minds when we formulate policies like the HEQF? I'm totally confused. **DDG, DST:** The first presentation talked about the differences between traditional universities and UoTs – the what and how? I need the how explained to me. We also know that we have a gap, and we've done an analysis in this regard, which indicated that we need to focus on the application of research. **Prof. Nevuthalu:** You quoted interesting data relating to staff qualifications, and I think while the problem is bigger at UoTs, it is not helpful to segment the sector. The country needs a major staff development programme to raise the

	profile of our staff members across the board. I think the DoE could assist us in this regard, to raise the profile of all staff members. The UoT sector accepts the challenges that are put to it by government, but it also wishes to state that its inputs on the HEQF Document have been grossly disregarded. **Prof. Sehoole:** I find myself in an awkward situation. I would not say that UoTs, in terms of their status, is viewed as lesser than traditional institutions. We need to raise the qualification profiles of our UoT staff members in terms of the mission that they will be pursuing. While experience does count, higher qualifications do add value to the quality of our academics. The statistics quoted on success rates focused on the whole sector, and not only UoTs. The whole HEI sector should be encouraged to ensure that our students leave their studies with the necessary knowledge and skills to integrate into the world of work. **Ms Gwele, DUT:** I've got the HEQF in my mind, and I'm trying to figure out how a framework that places a ceiling on peoples' career and educational aspirations actually allows us to be whatever we can be, as UoTs. **Mr Moodley, DUT:** The HEQF was supposed to be a transformed framework accommodating both traditional institutions and UoTs, with movement and articulation between the various sectors. The reality appears much different from the proposed framework – articulation is no longer possible. The framework also does not appear to make credit transfer possible – transfer of credits appears to be severely constrained. I think this is a particular concern. **Ms Parek, UJ:** The UJ and NMMU have received funding from the DoE and the Norwegian Government to look at comprehensive institutions and the complexities they face. We are looking at curriculum and articulation – the issue of articulation is not only about credit transfer, but also about knowledge and the way curriculum is constructed. We'd be willing to share information and lessons learnt about articulation between degree and diploma programmes – it affects the sector as a whole. We commissioned a paper on the whole issue of the Knowledge Divide, which might prove informative to all institutions in this part of the sector. **Prof. Sehoole:** I don't share your view that the HEQF imposes a ceiling – it would however be necessary to think about how programmes are curriculated to open up access.

Session 4	**Opportunities for Universities of Technology** **Keynote Address: Prof. Cheryl de la Rey** **CEO: Council on Higher Education**
	Three areas are pertinent to the work of UoTs and SATN. The general HE context, in SA and internationally, must be taken into account when identifying opportunities for UoTs, and should also take note of the challenges faced by all HEIs. Policy direction after 1994 focused on restructuring. The outcome of the restructuring is the current system, wherein 23 PHEIs and a growing number of accredited private higher education institutions operate. UoTs fall within the public system, comprising institutions that are seen as traditional and comprehensive institutions. The sector should however be seen as a whole. The broad debate is shaped by the needs of the knowledge economy in the 21st century. A long-term time horizon is needed in planning the HE system overall, and for each institution. Issues of high-level skills development, and SA as an emerging economy in an international and globalising knowledge economy, should inform the debate. The increasing dominance of knowledge and technological development means that our context has changed over the past four decades. These issues are seen in the labour market – there is a growth in the rate of employment and remuneration of employees in the labour market. Qualifications required for employment is much higher recently. The ascendancy of the knowledge economy is associated with particular technologies that have grown in significance, including ICT and biotechnology. These issues should be borne in mind by all HEIs. Knowledge, unlike other resources, is much more transferable. The sites of research and development have also changed – the recent history of R&D has shown that HEIs are no longer the sole players in this arena. Many HEIs are simply participants and no longer the major players. Other formulations of research centres have evolved, and must be taken into account for longer term planning. Advances in ICT increased investment in technology and technology development. Most innovations and advances often happen in private laboratories, R&D sites in industry, or research institutes, a shifting pattern of knowledge development that must be taken seriously in developing policy going forward. Participation rates across the system, affordability and responsibility are crucial when thinking about opportunities. Industries are investing more in R&D, and the demands on HEIs are growing and have changed qualitatively. While the core business for HEIs has remained the same, the expectations associated with them have shifted – HEIS are expected to produce large numbers of learners with skills that would be useful to the labour market. The expectations around community engagement and research also focus on issues like poverty

	alleviation and addressing other societal needs. The relationship between institutional type, the degree of differentiation and the perceived correlation between these issues and output is tenuous. There are enormous variations in terms of the different HEIs, and their effectiveness. Enormous variations also apply within different faculties within institutions. As far as strategic opportunities for UoTs go, a niche strategic opportunity for UoTs should be identified, without losing sight of all other opportunities. By the mid-90s the Technikon sector had a reputation for the production of students well-grounded in technical skills, who were also work-ready. The work-readiness of such graduates was frequently noted, especially in areas like engineering. At present the work-readiness aspect is a concern throughout the HE sector – while learners may attain qualifications, they are not necessarily employable. The consequence of this for the knowledge economy is that companies are spending more money on training than ever before. Given the positioning of UoTs and the historical context mentioned earlier, this could be an opportunity to partner with industry. When an institution takes seriously the work-readiness of its graduates, strong relationships with industry stakeholders should be encouraged to create leverage. Workplace training is not only advantageous for students, there are numerous other advantages. In talking about technological training, the importance of staff development should not be overlooked. When staff development is discussed, there is a focus on higher qualifications only. There needs to be a broader understanding of professional staff development. Interactions with industry and business should not be limited only to large corporations – an entrepreneurial focus is needed, and SMMEs and other operations should not be overlooked. JIPSA identified a skills shortage in a range of occupational categories like engineering technicians. Throughput is another area that requires focus. Applied research and technological innovation are not the only areas where research takes place. The good work that is done in terms of research should be publicised more widely. There has been a move to interact more fluidly with business and industry. UoTs should explore these as a niche areas – it should also be acknowledged that the distinction between research and applied research is blurred. UoTs should maximise areas of research, and should look carefully at the meaning and interpretation of technological innovation. Using an inappropriate framework would be problematic – technological innovation should be used to enhance and open up traditional understandings of the concept. Using existing knowledge to produce new technologies is necessary. While we sometimes think of a hierarchy of knowledge, this is a mindset that closes us

	off from meeting the demands of the 21st century. Should UoTs pursue any of these issues, the most important task would be to develop appropriate performance indicators and benchmarks thinking of technological innovation and its impact on society. The new research quality assessment may need to be controversial – as a country in transition; we need to understand what is meant by societal impact. A tweaking of traditional measures might not work. It is important to recognise that the diffusion, transfer and use of knowledge, and how this is assessed, should be discussed. The whole sector should talk about quality improvement, and the impact that the work we do is making on society.

Discussion	**Chair: Prof. Alwyn Louw** **VUT** **Panel:** **Prof. Anthony Staak, DVC: DUT** **Mr Jan Smit, Director: Curriculum Development, VUT** **Prof. Ansu Erasmus, Senior Director: HEDS, TUT**
	Prof. Staak: The current binary system distinguishes between traditional and UoT qualifications, but articulation is possible. The HEQF complicates this situation considerably, since none of the UoT qualifications feature. It is difficult for students in the Diploma track to progress to postgraduate study. A new suite of HEQF compliant qualifications would therefore have to be developed, and submitted to the DoE, CHE and SAQA. Tremendous resources, in terms of time and money, will be needed. Unless UoTs are able to offer undergraduate degree qualifications, it will be difficult to sustain and develop a postgraduate offering. Currently all UoTs are restricted in what they can offer. In addition, the majority of students do not meet admission requirements for degrees. The alternative of offering dual programmes in diploma and degree streams will be resource intensive. Programme approval will have to take into account the PQM of neighbouring institutions, institutional capacity, and past enrolment trends. The HEQF creates a number of barriers for diploma students to progress to postgraduate education. The development of a new PQM also presents an opportunity for UoTs to realign its offering with the vision and mission of the institution. At present a number of disciplines have been pro-active, and started developing a new suite of qualifications to meet the needs of the sector. If postgraduate degree qualifications feature in the PQM, it will be necessary to identify appropriate undergraduate degree qualifications that articulate with postgraduate qualifications, and curricula providing articulation pathways.

	Opportunities for collaboration with the FET sector on offering higher and advanced certificates that could articulate into degree programmes should also be explored.
	Mr Smit: The HEQF will impact on students – the approved UoT enrolments targets, and the fact that the majority of students will not meet admission requirements have to be kept in mind. Minimum admission requirements apply to diploma and degree programmes. Credit accumulation and transfer will also be affected. Level descriptors provides another area that will have to be debated in great depth once the HEQF is implemented – the levels of competence expected from students will be different. The HEQF document is not forthcoming in terms of defining WIL. The placement of students is the responsibility of institutions. What about aspects like service learning and community engagement? The HEQF does offer some opportunities. Three different streams of qualifications are to be offered by all. The certificate stream could fill a gap created by FET Colleges, which no longer offer HE type qualifications. WIL could be restructured to incorporate a range of new facets. All programmes could be redeveloped and re-designed.
	Dr Erasmus: What happens to our students when they have to move from a Diploma to a postgraduate degree? The HEQF talks about using 50% of credits from a completed qualification, meaning that it could take a student 5.5 years to get to a Masters degree. In the case of an incomplete diploma, any and all credits could be transferred. Three other issues that would have to be kept in mind regarding the implementation of the HEQF are: • A lengthy transitional period – this would have associated uncertainties and chaos, due to unfinished business such as level descriptors, a list of primary qualifiers for qualifications, guidelines for standards setting • Dual and parallel admin systems within institutions, as 'old' qualifications are phased out and new ones are implemented • Capacity concerns – not only is the capacity within institutions limited, but bodies like the DoE, SAQA and CHE also lack the necessary capacity Opportunities provided by the HEQF: • Review of strategic direction – what route are we taking, and what will our final PQM look like • Viability of programmes at various levels throughout the institution. Identify duplication and over-specialisation; consolidating some programmes • Develop a PQM responsive to labour-market needs – using a framework for labour-market analysis, and using advisory boards

	The HEQF could be providing a good opportunity to embrace change.
Discussion	**DUT:** I was pleased to hear that labour market needs should be used to link the HEQF to what is happening in the economy. The policy formulation process within the DoE should take note of what is happening economically. Government launched JIPSA and ASGISA, but there is little evidence that the HEQF is linked to these areas. If UoTs were to scrap Diplomas a huge gap will be left in our country's skills base. If it turns out that UoTs find it difficult to offer Masters programmes, what will happen to fields like Biotechnology that are typically not offered by conventional universities? There are huge issues, and it is extraordinary that the HEQF is not linked to the economic imperatives in SA. **Mr S Isaacs, SAQA:** A lengthy transition period may be desirable, because there is a number of systems that need to be put in place, and a teach out period to be accommodated. We must guard against a re-curriculation exercise that is just about superficial change. The 10-level level descriptor model has not been officially accepted, but has been developed. The PQM is a different issue from the one-stop-shop approach to getting re-curriculated programmes approved. One aspect that needs to be considered is the Quality Council for Trades and Occupations (QCTO) – this body could also have a role to play in terms of UoTs' offerings. On the positive side, the HE sector is probably in the best position to oversee the transition. **Prof. Mthembu:** Every HEI has three focus areas – we heard this morning that it is not what we do, but how, that is important. Our focus as UoTs gives some indication of how we will go about it. Entrepreneurship, for example, forms part of our curriculum. Talking about research, there has been talk of innovation, research and development and seeing industry as part of the community that we reach out to. If we are going to change the quality of our universities, we have to do more and more with industry and SMMEs. Lastly, we've been told that we need to focus on masters and doctoral degrees, but how do we align our capacity needs with the need to increase WIL? **Dr Hinoul:** You spoke about the knowledge economy – a country cannot be a knowledge economy, it works better in regions. To build a knowledge economy you need money, capacity, networks, instrumental governments, good infrastructure, and much more. These ingredients are important, but most important is the individuals that will make a difference. **DUT:** I think we need to move to a common understanding and unified approach that will not let us confuse the matter. UoTs still grapple with an interpretation of the HEQF – we need to arrive at a shared point of view. **Mr Smit:** We should take into account that we're dealing with a process that

	everyone should be engaged in. As with all the other projects that the SATN is dealing with, this one will need careful deliberation. Mr Isaacs also made the statement that a lengthy transition may be more desirable. The role of the Quality Council for Trades and Occupations (QCTO), which would also be responsible for qualifications that fall within the ambit of UoTs, also has to be debated. **Prof. de la Rey:** I want to reiterate the point about the transitional process and time frame. One of the projects that came out of the Presidential Working Group on HE is a project focusing on the four year degree and undergraduate degrees. As we undertake this task, it will have implications for postgraduate qualifications. We've only begun looking at this issue, and I think this type of discussion is beneficial to the broader task of the CHE. Another reason to return to the HEQF is the status of the Masters degree – there are various discipline specific formulations of this qualification that may need to be debated.
Session 5	**The Impact of Technology Higher Education Institutions on Society** **Keynote Address: Dr Vicki Thomson** **Director: Australian Technology Network**
	Higher education in Australia changed dramatically over the past 20 years. The landscape in Australia is broadly the same, with only two private higher institutions. There is wide diversity in terms of levels of research, engagement and teaching delivery. Access to higher education was encouraged over a five year period, with the emergence of six Technology Universities. Government is committed to an education revolution, an investment in Australia's future. The HE sector was concerned about the most recent change in government, but the increase in focus on productivity has been positive. A holistic approach, from ECD through to secondary and post-secondary education is encouraged, and was backed by some significant investment. An HE Endowment Fund, of A$ 5 billion instituted by the previous government for the HE sector, was increased by A$ 6 billion and now also provides for the FET sector. The legacy of under-funding is quite stark – massive skills shortages are evident, and many workers lack the skills to support innovation and change. In the midst of a resources boom, a lot of students are tempted to take up jobs and earn money, rather than complete their tuition. Time is of the essence, and government initiatives do not really have the time needed to gradually mature. Australia has the means to almost immediately add to the pool of talented and qualified people to meet its needs. Unfortunately, the debate about world-class universities has focused on the international rankings of a few universities. Rankings may tell much about the qualities of a particular university, but does not say much about overall quality. No ranking system addresses quality, since no international benchmarks exist for this aspect. Two of the top-ranked universities provide tuition to 6% of the national total. It is therefore necessary

	to focus on the larger group of universities – a revolution is needed to arrest a slide into mediocrity. The government is therefore committed to building a Top Ten group of Australian universities. To achieve this, a decision was made to focus on three important issues – scale, international exposure, and quality. How many graduates are needed in future, how research focused should we be, and what is needed to be recognised as a research entity? Sufficient graduates are needed to drive a sophisticated economy. The final element lies in Australia's performance in international education – Australia hosts 6% of the world's international students, an Australian 'export product' ahead of wheat and wool. A third of students stay on as skilled migrants once they finish their studies. Ambitious goals and aspirations are needed, and are being negotiated with Government. These involve increasing the enrolment of foreign students to 25%, increasing postgraduate enrolments, and addressing access for disadvantaged groups. The ATN is part of a grouping consisting of Universities Australia, Innovative Research Universities Australia, and the Group of Eight (a highly successful marketing brand, but not politically strong). The ATN represents all but one Australian University of Technology. One of the strengths of the ATN is that it is a loose alliance of universities with common interests that evolved into a highly respected network. Since the establishment of ATN it has forged strong political alliances to lobby on behalf of the sector as a whole. The ATN is able to work productively and cooperatively with partners across the country, and internationally. Pro-active international linkages have been undertaken, and focus on the notion of a world class university. The ATN has various areas of strength, such as environmental sustainability. The fact that there is a strong industry focus helps to further this agenda. A new programme might be developed for use by all five partners of the ATN. The ATN also audits its own carbon footprint to demonstrate its commitment to local, national and international environmental sustainability. The network is managed by each of the five VCs, using working groups to address various operational aspects. Defining characteristics include: • Partnerships with industry • Relevant and applied research • Work ready students • ATN universities employ 13 000 staff, to teach around 180 000 students, or 19% of the total figure – the ATN has critical mass in terms of delivery Engineering is experiencing critical shortages worldwide. A strategy to entice more learners into the field targeted pupils at school, encouraging them to take

	maths and science – special projects were set up with schools to create excitement about science and maths. Industry input on curriculum was also critical to ensuring that the output matches industry's expectations. ATN is also working with the Education Department, industry and employers to increase the scope. The combined efforts of a collective group of universities help to increase the impact. 2 300 research active staff, with approximately 5 700 PhD students, operate within the ATN network. ATN universities are responsive to industry – being a university of technology defines our history, it does not reflect our future. Communication, project management, and basic maths are the most important skills needed by industry. ATN works collectively with government and other stakeholders to address particular issues. The ATN has the goal of contributing to the wellbeing of the country by undertaking economically targeted research – while other institutions are sitting in their ivory towers the ATN has its feet firmly on the ground, and very often in the dirt.
Discussion	**Chair: Prof. Thandwa Mthembu** **VC: CUT** **Panel:** **Prof. Jean-Pierre Steger, Professor at the Department of Electrical and Communications Engineering of the School of Engineering and IT of University of Applied Science, Switzerland** **Dr Engela van Staden, Director: Strategic Management Support, TUT**
	Prof. Jean-Pierre Steger: In Switzerland we have a similar system as that here, and the one in Australia – we refer to Universities of Applied Sciences. In principle they are about the same. As institutions, we should care about the effect of our education on society. Of all the engineers that graduate from the Swiss system, two thirds come from the universities of applied sciences. As an engineering institution, we have a large number of students and graduates, and therefore responsibilities. We give our students a code of ethics, which expects them to be responsible members of society. We may not always succeed, but that's the starting point. Sustainable energy is another focus area in our system. Through the mechanism of continued education, we hope to continue serving our society. Graduates are also encouraged to become entrepreneurs. It is not always the best students who create an enterprise. People at all levels of the institution can make a difference, through belonging to professional societies. Research and development projects always involve industry. An area that could be improved drastically is the impact that HEIs could have on politics. In Switzerland, very few engineers are involved in the councils and political

	forums.
	Dr Engela van Staden: UoTs are using technology in the broadest possible context, expanding through technological innovation, technology transfer, using technology in the broader context. Technology is the object of study. The impact of a UoT lies in the active participation in, applying and using knowledge and technology for new products, processes and services, being more engaged with the needs of business and industry. UoTs have designed over 100 processes at technology stations and incubators, through its responsiveness to the needs of business. UoTs research real industrial problems to find lasting solutions. They also aim to produce confident and academically strong students who will become entrepreneurs and innovators. The maximisation of the intellectual and economic potential of the region, to achieve economic growth and prosperity, is a particular goal. This can be achieved through regional embedment, and regional cluster mapping.
Discussion	**CUT:** We are grappling with a range of issues – the uncertainty about the UoT's brief, and our HEQF that is new. Did the Australian system have to deal with similar challenges? **Dr Thomson:** We did go through a process like that earlier, and we're going through another round of audits at the moment, where we have to demonstrate the quality embedded in our courses. We are going through a process of benchmarking particular courses, to see what makes them world class. We're looking at universities in Australia, as well as international universities, to inform our quality audits internally. We also take note of what industry says. You're at a very different phase of development than we are. For us it has been productive to go to Government as a group of universities.
	CUT: I would be interested in hearing about the bureaucratic hoops that you have to deal with when instituting a new programme in Australia. **Dr Thomson:** We're quite fortunate across the ATN in that we had to dance through a number of hoops for a previous qualification focusing on the generic competencies of PhD students. We established a Graduate Certificate, which took about three years to develop. This was a test case; it had to go through each ATN university's academic boards and industry advisory boards. We have an Australian Universities Commission which audits our institutions. We have guidelines which our courses have to meet, and our academic boards ensure that our programmes meet these criteria.
	Prof. Tyobeka, TUT: I'm interested in the concept of world-class universities.

	When we look at differentiation in our country, the basis for being considered world class is generally internationally recognised research outputs. Do you look at it in a broader sense? **Dr Thomson:** At the moment it is very much still driven by research output. We're saying as a nation that if we set some targets, looking at expenditure, output, etc. that it should put us in a world class system. We're looking at the systems in Sweden, Norway, Denmark, Ireland, to see what makes those countries world class, and what we can do to adjust our system accordingly. I indicated that we don't just lobby on our own behalf, but in this instance we're lobbying to have a system that will benefit the country as a whole. International students are one of our national growth areas. We compete for the academic workforce, which is ageing. We set some benchmarks to address these aspects in a global environment.
	Prof. Nevuthalu: I have a question about your research network, which has instituted a number of collaborative projects. In our country one of the steering mechanisms is subsidy for research projects – we are all rushing to get accredited publications – if you differ from this, there is no subsidy. We compete amongst each other, which limits our flexibility. To what extent does the Australian government subsidise research, and how does this affect your research projects within the ATN? **Dr Thomson:** Our system was previously based on the British model. The system was based on a system of block grants – each institution gets a proportion anyway, and then there's a portion that we compete for. We got to the point where quality and impact metrics (70/30) was assessed, also internationally. We got there in the end, but the new government instituted a new process of assessing research – so we're back to square one. Our most recent government separated education and research into two separate portfolios. We are in the midst of a review, and at the end of that we'll have a new research funding scheme.
	Question from delegate: How do you include WIL in your learning programmes, and how is it funded? **Dr Thomson:** We have WIL in particular courses – teaching, engineering, nursing – so different funding mechanisms would apply. In some instances it would be a university issue, if it is incorporated in the fabric of the degree. Some universities spread degrees over 4 years, so there is a 12 month WIL component. In engineering we're not funded for WIL by government, while in nursing and teaching we're funded by government, but also not enough and that has to be supplemented. Most of our programmes incorporate WIL, and we have also extended WIL internationally, although it is not a prerequisite.

	UJ: We have a new school curriculum in SA which could benefit our UoT system. Do you have a school system that guides pupils, and how does this impact on your network? **Dr Thomson:** We have gone out to the schools to bring learners into our institutions. We have a partnership with schools to get learners to finish high school first of all – we fund programmes, and have academics going into the school to mentor learners. We have associated degrees which are offered at a dual-focus institution, linked to our equivalent of your FET Colleges. We have a system of aptitude tests whereby kids out of school could enter into the associate degrees, and they could articulate then further into an undergraduate degree. There are challenges – those students need quite a lot of help throughout their course. We can also not pronounce yet on the retention rate at this stage.

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NATURE AND CHARACTERISTICS OF SA UoTs

Session 6	**Research, Innovation and Technology Transfer – 'The Leuven Model'** **Dr Martin Hinoul** **Katholieke Universiteit Leuven**
	UoTs do not only have to do good teaching and research, but have to benefit the region where they are located. I live in Europe, and you live here, but we can learn from each other. The Leuven Model is a very simple one. There is good economic growth in the world, roughly around 4 – 5%. However, the question should be asked whether the rest of the world can continue growing on the shoulders of the West. Challenges lie ahead for the world's divided economy. 'A nation which depends on others for its new basic scientific knowledge will be slow in its industrial progress and weak in its competitive position in world trade.' (Vannevar Bush, 1945) Knowledge economy regions are lining up worldwide. Leuven University is part of a group of 37 European multidisciplinary universities focused on science and research. Leuven has an institute known as IMEC, which specialises in micro-electronics and semiconductor research. IMEC employs 1300 people, and continues to make good progress in terms of research into nano-electronics. Various spin-offs have emerged from the IMEC research capacity. Leuven also has a Materials Research Centre, which incorporates 19 research groups over 3 faculties. This group does multi-disciplinary research. Similar initiatives exist in terms of Medical Technology, creating a globally competitive multi-disciplinary research base. A hospital and health care centre with 2 000 beds was established. The Leuven Technology Transfer Cell was set up at Leuven in 1972. This Cell incorporates experts in contract research and intellectual property – 65 spin off companies work with the Cell to undertake economically driven research initiatives. Leuven has been established as a zone of high technology, slowly attracting companies. The value chain established by this initiative depends on the following:

	• Knowledge centres – in Leuven critical mass in state of the art research has been established. • Entrepreneurs and role models - awareness is the most important word in this context - people should be willing to do what is needed. • Money and capital markets – research and development is dependent on money. Capital markets also have a role too play, especially in terms of IT. • Infrastructure – planning is essential when addressing infrastructural requirements. • Policy – cluster policy focusing on e-security, mechatronica, food health. Clusters represent the driving force for economic development in many regions – they compete and cooperate in the same field, and are in close proximity to centres of research. 20 000 jobs will have been created by 400 companies by 2010. • The presence of international companies – companies that work in clusters are very useful in boosting the local economy. Various small, innovative companies contribute to the larger cluster. Pure innovative companies could be further expanded to create a cluster of mixed innovative companies, all of which increase employment opportunities – high added value jobs are created, and across a range of employment levels. This model was expanded to incorporate disciplines like e-security, feed-food-health and life sciences. These companies started with good, but simple ideas. • Networks – networks are valuable in bringing like-minded people together. • Government – government should play an instrumental role, but should not be allowed to interfere unnecessarily. • Control the quality of life. We, in Leuven, know that we cannot continue growing the way that we are at the moment; therefore we tried to find partners in other parts of Europe. We partnered with institutions in Eindhoven and Aachen, to create a knowledge triangle. This triangle incorporates the same 'right' ingredients that apply to Leuven. This strategy will help us to build some strong knowledge regions in Europe. The knowledge triangle will focus on research in Technology and Materials, Food/Nutrition, and Life Sciences and Medical Technology. Another advantage of clusters is that synergies can be created between the various disciplines. Some conclusions for SA UoTs: • Establish a basis – a critical mass of high quality research is needed • Create an appropriate entrepreneurial climate in a university context • Create a legal framework with respect to exploitation of academic research • Have clear incentives and policies to encourage research • Create a professional research unit • Foster spin offs • Access funding • Clear intellectual property issues

	• Improve awareness among all shareholders • Support a forum for business, academia, government and supporting organisations to build partnerships • Focus on focus, and create and sustain enthusiasm • Keep quality of life
Discussion	**Chair: Prof. Errol Tyobeka** **VC: TUT** **Panel:** **Dr David Phaho, CEO: Tshumisano Trust** **Prof. Deon de Beer, Chief Director: Technology Management, CUT** **Prof. Gerhard Prinsloo, Director: Technology Transfer and Innovation, DUT**
	Dr David Phaho, CEO: Tshumisano Trust Key elements for sustained economic growth: • Human capital • ICT • Innovation – exploiting and diffusion of science and technology • Vibrant entrepreneurial culture, i.e. high growth SMMEs Why SMMEs? • SMMEs generally have higher growth tendencies than larger firms • SMMEs account for a disproportionate number of gross jobs created • Benefit of economies of scope rather than economies of scale – nimble and shielded from exogenous shocks • Tends to be more innovation intensive than larger firms. Tshumisano Trust was established as an agency of the DST to strengthen technology transfer and diffusion initiatives at universities in support of SMMEs. The envisaged role of UoTs is to contribute towards the establishment of an Entrepreneurship Ecosystem, involving Government and its agencies, industry, financing institutions, educational and research institutions, and SMMEs. The outcomes of the focus on SMMEs are envisaged as follows: • Developing world class products, production technologies or services. • Increasing capacity for continuing technology assimilation and innovation. • Within participating universities, it would be necessary to achieve improved and enriched R&D as well as teaching and learning activities, leading to better understanding of SMME needs. DST has set up a Technology Innovation Agency (TIA) to nurture innovation. In SA there is an innovation chasm that needs to be bridged, to grow commercial activity. TIA will focus on basic and applied research outputs, conducted by the NRF and other specialist research funds. Entities like the

	IDC, Venture Capital and SEDA will be approached to provide funding. Anchor tenants within TIA include Tshumisano Trust, Innovation Fund (funding for protection of publicly funded research outputs), Biotechnology Innovation Centres, and the CSIR.
	Prof. Deon de Beer, Chief Director: Technology Management, CUT Latest approaches, methodologies and technologies available for product development are now incorporated in an integrated product development research and technology transfer structure. A research and innovation chain was established on the CUT campus, focusing on aspects like rapid prototyping, research support, commercial work, technology transfer, and community project support - a continuum was created to conduct and support research. In 14 years an amount of R 100 million was raised to support research and innovation, with R 45 million being spent on infrastructure. Various projects, with applications in the automotive and medical technology fields, have been initiated. Research and innovation to support industry can lead to high quality academic research. Research in support of community needs has led to the development of a safer paraffin stove. Medical implant research helps to improve the quality of life of patients. Reverse engineering has been used to positive effect in the field of medical reconstruction. No one can keep us back as UoTs as long as we continue to be innovative and do research that benefit our clients and communities – money will always be made available for research.
	Prof. Gerhard Prinsloo, Director: Technology Transfer and Innovation, DUT Durban harbour is an important place – it allows transfer of products in and out. An analogy could be drawn between the harbour, and technology transfer. Technology transfer does not happen by itself, but has to be driven in a proactive manner. Every unit on campus participates in technology transfer. It relates to the moving, processing and storing of technology. New ideas and income streams are necessary, and new investors have to be courted. International and local partnerships have to be established to ensure that technology transfer works both ways, both in and out. Funding is important, and can be accessed from the DoE, which gives 11% for research, provided 250 research outputs are achieved. The DTI is also a valuable funding partner, but emphasises the need for trading opportunities to be opened up. DST has a 70% budget for technology transfer. SA Government has announced plans for the establishment of TIA, which has a 100% budget

	devoted to innovation and technology transfer, while private funding sources also have to be explored. Technology transfer activities inherently increases postgraduate masters and doctorate student numbers.
Discussion	**TUT:** It is clear that what we see here is not new – cluster mapping and policy has been around. What is the function of the cluster policy and interface unit - who is doing the spadework upfront? **Prof. Hinoul:** The interface started in 1972. They paved the way, but 10 years ago we started again. We are talking about an individual, our VC, who selected six or seven good people with a lot of experience - and a lot of *American* experience - to set up the Leuven Model, based on the Stanford model from the 1930s. Return on investment is important – spin offs and contract research provide mechanisms to track profitability.
	DUT: You mentioned successful companies, but also some that were not – what caused failures? **Prof. Hinoul:** There are more failures than successes, but that is enough. One in ten is a total failure, but in between there are also companies that turn over steadily and contribute, slowly but surely, to a healthy turnover. We have 'sniffer dogs' to go and see what research is being conducted, and would determine what application can be found in industry, after which they draw up a business plan. Then we find a manager to drive the process – we have role models, and 'serial investors', to drive the chain.
	Staak: What is the involvement of academic departments, the actual researchers, in the Leuven Model? **Prof. Hinoul:** When we identify the technology and establish the spin-off company, we install a manager. The researchers continue to do research. Researchers are not at all involved in the daily running of the company. The value chain that I showed indicates that those who are good at what they do should be allowed to do so. The company changes all the time – it is difficult for guys to work with other people sometimes. Once a company lists on the stock market, we're no longer involved.
	Comment from delegate: It seems that in SA UoTs we're almost too afraid to fail – it is difficult to get something going because there are so many people checking to see when you're going to fail. **Prof. Hinoul:** Yes, in America you have to fail, it is part of the process. In Europe we're a little like you are – we're also a bit scared of failure. For us the

	most important lesson learnt over the last ten years was to create awareness, and a willingness to keep trying, regardless of failure. I've stressed the importance of role models – a horizontal network of people who are willing to do things. Kick out those that are too scared to do anything, they only hold you back. Incentives are also important, driven by simple rules in a simple and clear legal structure. And then of course you also need to *hear* about the success stories.
Session 4	**Technology assistance in research and development by UoTs** **Keynote Address: Mr Richard Schulz** **Managing Director: ADEPT Airmotive, Durban**
	This presentation will give an overview of our experience, as a company, with UoTs, to refine a prototype towards industrialisation and commercialisation. It sounds like a simple process – the original concept emerged 10 years ago, when we thought it might be a good idea to develop a new aviation engine. We started from a zero-base financially, and we had to find the right people with the right attitudes and skills. We never had a fear of failure, however. We brought in investors who did not share the same vision that we had, so we failed. It took us two years to recover from that. My partner and I brought in another partner, and each of us came from a different background. We realised that we needed to tap into a skills base that would be willing to work with a small entrepreneurial business. We designed a general aviation aircraft engine – it is the first engine to go into an all-South African aircraft, which was initially developed by somebody in his back yard. We don't have a hierarchy in our business, we're all equal partners. Our engine consists of over 1 300 parts, the majority of which had to be designed and manufactured by ourselves, in a period of just over two years. We worked in conjunction with CUT which shared our entrepreneurial 'get out and do it' enthusiasm for the job. Our engine is very compact, liquid cooled, fuel-injection driven and considerably lighter than other engines. It is fuel efficient, and environmentally friendly. It can run on bio-fuels, on aviation fuel and ordinary motor gas. We feel that if we make something that is efficient but also beautiful, we would also be able to attract youngsters to engineering. Various technologies were used in building the engine, ranging from RP-Simulation-CAD, tooling, electronics and composites. We were able to create moulds before we started tooling, and refine or reject, which helped considerably. We relied on simulation a lot, but we did not have our own computer and simulation programmes so we relied on institutions where these facilities could be found, and we found the UoTs most accessible in this regard. We make use of sub-contractors for some processes, like casting. We work with TUT on electronics, which is the only area where we've had a less than

	satisfying relationship. We are working on composite technology with DUT, and we're looking at patenting some tooling innovations with this institution. We have built up relationships with the CUT, DUT, UJ and TUT for various components of our engine. The interface between industry and these institutions is dependent on the relationships with the staff and students involved in the process. We are hoping to establish a foundry trainee specialist working in the foundry to act as a technical specialist between us and the institution. Our initial approaches to the CSIR were unsatisfactory, since they were too focused on research and not commercially focused enough. Regarding the technology and innovation chasm mentioned earlier – I disagree, there is no such thing, but there is a fault line. I think industry is reticent to engage institutions, and would rather source expertise outside and bring it in-house. We prefer that industry should be encouraged to share, and ways should be found to benefit all partners. Australia has managed to make these partnerships friendly and benefiting all parties concerned. They go out there and make it work, because they have the right attitude to innovate and work. We are excited by the UJ technology station, which is doing good work in reviving the foundry industry in SA. It is also important to ensure that there is continuity from primary school to university – there is no interest being fostered in engineering as a field at school level. People are not encouraged to do that any more. The Technology Network has a huge role to play in raising the profile of technology, and particularly among SMMEs. Academic institutions operate on a very defined calendar driven model – we prefer going to the institution, putting our plan to them, and getting the project going in two weeks time. Our interactions with the CSIR were very frustrating in this regard – a respect for industry requirements is essential. We prefer to interact with one person, who could act as a project manager, within the institution. This interface is essential to fast track our projects. We have such relationships set up with DUT, CUT and UJ, and they all work well. Promotion of awareness and focus of the institution is essential – industry may not be aware of all that is available in the technology stations. I think the PR side of the technology stations needs to be promoted more aggressively. We have world-class facilities and capacity in our technology stations, which should be put to good use. We don't have to stand back in terms of the quality of our people, or the research institutions, but we need financial resources invested into our technology stations on an ongoing basis. They should be commercially viable, and must be able to use the resources that they have to remain sustainable. We have seen instances of amazing pieces of equipment that is not being used. If we want to be at the forefront of innovation, we have to make use of all the opportunities and resources available to us. I have also

	seen a positive change in Government's approach and commitment to the funding of technology. One of the most critical aspects is accurate and rapid product development – the time it takes to develop and get the product to market is vital to maintaining the competitive advantage. Technology stations should provide this type of facility. Total process integration is necessary. A lot of programmes are available to facilitate this, and they help to ensure overall efficiency of a business. I am not in favour of total specialisation; I think sharing knowledge across disciplines is essential. Looking at the financial impact of our product, we are hoping to break into a market where 200 units are sold annually, and we would be able to sell our product at about R 2 million each. That could mean about R 400 million per year for South Africa. All of this could be done using existing computer-aided manufacturing, meaning excellent return on investment. We have to thank our investors, the DST, Tanglewood, the various UoT technology stations and Tshumisano. The encouragement from and work done by the UoTs and Tshumisano should be commended.
Discussion	**Chair: Prof. C Jansen van Rensburg** **Director, SATN**
	UJ: I think this case study is a good example of the research that can be done at UoTs. We need to distinguish between the types of research that UoTs should get involved in. The staff members at these technology stations are required to continue doing research, so the applied research can transform and change industry, but there is also room for research at the B Tech level, as evidenced by a recent project done at this level in jewellery design. **Mr Shultz:** The primary research is important, it does provide impetus for research at higher levels, at a later stage. The fact that the B Tech guys do good work is laudable, but requires strong leadership and mentorship.
	Prof. Hinoul: Can you tell us about the funding mechanisms that you used? **Mr Shultz:** The initial investment was in the region of R 2 million. The biggest supplier of aviation engines in the world indicated that it would cost them over A$ 100 million to have come where we are now. However, our Innovation Fund endowment is R 10.5 million over three years, and we have to raise 25% in equity, which gives some constraints.
	Prof. De Beer: We work with partners, but mostly bigger industry partners. For a small company such cooperation involves massive risks – it is something that

	we as UoTs can drive, to indicate to Government that we need assistance to minimise the risk for them.
	Dr Thomson: The potential networking opportunities that could be opened up through a single contact within an institution is important.
Session 3	**Operation and Impact of the ATN** **Keynote Address: Dr Vicki Thomson** **Director: Australian Technology Network**
	The ATN will shortly be doing a re-assessment of the work that it is doing at present. Our aim is to work collaboratively with industry and professions to influence government policy, foster stronger national and international engagement with industry and professions, and to make higher education more accessible. We will also position for growth internationally and domestically. Our collective action as the ATN has made us operationally quite different from other university consortia in Australia. Whether in terms of policy, teaching and learning or research, the ATN speaks with one voice. We have a strong commitment from our constituent Vice Chancellors to ensure this consistently singular voice. Our Secretariat is based at one of our universities, and I have a small staff. We have one or two consultants to work with us on particular projects. The VCs have continued to commit resources over the years, and we now have a budget of about A$ 2 million, of which about A$ 900 000 is spent on operational activities. We attain our objectives through the following • ATN working groups –19 working groups form the backbone of the work of the ATN, incorporating the following aspects: academic, access and equity, Deans/Directors of Graduate Studies, HR, PVCs International and Directors International. We did an audit, and formalised the working groups, revised their ToRs, and built some accountability into their processes. An example of what the Academic working group focuses on is an online English Language Diagnostic Test; because of our international students this is an important issue affecting throughput. • Political advocacy • Engaging with industry • Media and communications – the most important target audience would be the people within institutions, so they can spread the work to external stakeholders We also have a project focusing on the international standing of our education offerings – we looked at policy in the offing a few years ago, and decided that a comparative analysis with local and international universities would be necessary. There was a lot of cynicism about our international profile, but

	considering our market we thought it important to consolidate, being more powerful as a group of universities than we would be as a disparate group of Australian universities. This strategy has been useful in creating a very valuable partnership with a group of 13 universities in Canada. Without an Executive Director a network like this will not be as effective – a person is needed to coordinate and manage processes. Once the momentum is established, it should also not be allowed to waver. The ATN is currently focused on research in a range of areas, among which the ATN Centre for Metabolic Fitness (an example of a virtual research centre). This virtual centre is run across 5 ATN members, and involves 33 researchers – meaning that it also had to face some challenges. The centre focuses on a national research priority, and involves health, science, and a range of other issues. Another project is e-Grad School, which provides on-line modules available to graduate students from across the ATN. The focus is on generic research capabilities, like ethics, project and risk management, public policy development, technology transfer and commercialisation, leadership and communication. Modules are developed and moderated (on-line) by relevant experts from ATN universities. This programme is very popular with students to enhance their employment opportunities. ATN/ISTA emerging researcher network involves a small number of researchers from identified ISTA and ATN universities coming together to work in key thematic areas of research. This project is targeted at emerging research into networks focused on nanotechnology research. Increased research outcomes, as well as the ability to access funding, are positive spin-offs. It is important to come up with ideas for the working groups to engage in, but it is also essential that they be guided and supported by strong leadership. We have built up significant political clout, and the extent to which we continue to align ourselves will depend on how we align ourselves going into the future. We have to be part of the network, rather than trying to go it alone. I am excited about the challenges that you are facing, and I wish SATN all the best for the future.
Discussion	**Chair: Prof. A Staak**
	Prof. Tyobeka: Your project on obesity could be valuable for us. What is your role in that, and where is it actually driven – at the level of the VCs, or by researchers? **Dr Thomson:** The project was driven by the PVCs responsible for research,

	who are in constant communication with one another. The discussion was focused on what we could do that would be useful research. My role is to get the PVCs together and to identify the gaps, and to steer those with the necessary expertise to take on the right projects. We compiled a comprehensive database of expertise, to help us steer research into the right area. Then it was a matter of doing the logistical kind of stuff, like going to the VCs to get the funds needed, and get the right people on board. The ongoing role of the secretariat is to liaise with the relevant parties – we provide the interface between the different role players. It is also sometimes necessary to appease researchers who feel that they might be giving up control of their projects. We have to make them understand that they are part of something bigger than they are.
	Question from delegate: We appear to be more comfortable fighting and competing than collaborating with one another in SA. How are you compensating those who work in the network so that staff members don't get poached? **Dr Thomson:** We are also very competitive. We also find that a lot of our executives move around among the five universities within the group. My view is of course not the institutional one, but the overall group view. In terms of salaries, one thing we do well is that we share information among us – our salaries are therefore quite comparable. There are of course some exceptions, but in general salaries are commensurate, and have evened out over the last five years. The research quality framework has really brought to the fore the issue of poaching, but it has not really become such a major issue for us. Our researchers tend to stay within the family.
	CONFERENCE CLOSE **Prof. R du Pré** **SATN Chairperson and VC: DUT**
	Prof. Jansen Van Rensburg expressed a word of gratitude to Prof. R du Pré and DUT staff members for hosting the first SATN conference. A special word of gratitude was extended to Mrs Christelle Venter of the SATN secretariat who was responsible for the arrangements of the conference. Prof. du Pré highlighted a number of issues identified over the last few days, namely: • The importance of cooperation between SATN partners, and sharing best practice, was highlighted time and again. • Issues of common concern can be solved collectively, meaning that coordinated and joint responses to the external environment would be possible. • It will be possible to look at broader issues, and lobby on behalf of the various SATN partners. • UoTs are part of the HEI sector, albeit offering diverse programmes. It

	should therefore not be asked to justify its role in this sector, and should be acknowledged for the work it is doing. • UoTs should no longer need to explain the notion of applied research – the achievements of the technology stations, and the number of SMMEs that are assisted through practical and hands-on research projects should be acknowledged and encouraged. • UoTs identify and help find solutions to the problems of society. The local industry representatives and international speakers, Mr Richard Schulz, Dr Vicki Thomson, Prof. Jean-Pierre Steger and Prof. Martin Hinoul, were thanked for their particularly informative and inspirational presentations. Other speakers who shared their inputs, individually and as part of panels, were also thanked for their contributions. The support provided to the SATN by the VCs of the various UoTs was acknowledged, and the hope was expressed that the organisation would continue to flourish under their continued guidance and leadership. Lastly, the role of DUT staff and students, who played an important role in making the conference a success, was acknowledged.