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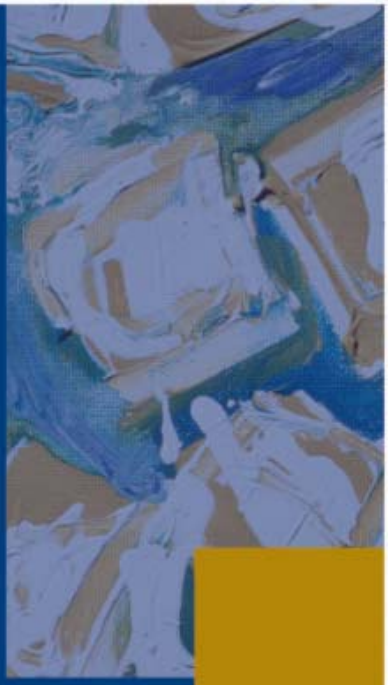
KAGISANO

Universities of technology



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FOREWORD

One of the processes set off by the restructuring of higher education initiated in 1995 with the work of the National Commission of Higher Education was the repositioning of higher education institutions within the higher education system. This process included the requirements for a redefinition of institutional missions which were either driven from outside, as in the case of the creation of comprehensive institutions, or which were driven internally by institutions' own analyses of the environment within which they operated. More often than not, in the last decade mission redefinition took place as the result of a combination of both internal and external pressures and imperatives.

The overall process of the repositioning and redefinition of institutional missions has had different manifestation depending on the nature and history of each institution and whether it was affected by the mergers and incorporations which followed the publication of the National Plan on Higher Education in 2001.

A particularly good example of mission redefinition in the context of restructuring is the response of the former technikons to the change of their designation to that of universities of technology in 2004. This change has a long history of discussions, lobbying and interventions by the Committee of Technikon Principals and individual institutions. The fact that on the surface the change of designation of the South African technikons marked the point of arrival of a ten year long discussion among and between the institutions and the Department of Education obscures a number of issues worth reflecting on.

Firstly is the extent to which this change has implications for the definition of institutions' missions, and their conceptualisation of the three core functions of teaching and learning, research and community engagement. Secondly, is whether there is just only one conceptualisation of universities of technology on which the newly designated institutions can draw and how different conceptualisations of universities of technology might relate to differentiated human resources and infrastructure capabilities as well as to institutional history. Thirdly is the extent to which the change in designation, accepted by the Department of Education, is indicative of a consensus among institutions and government about the nature of the academic and research profiles of these institutions. Finally, is the broader and more complex issue of the success that the restructuring of higher education is having in creating a more diversified higher education landscape in which mission differentiation plays

an important role in directing institutions' ability to respond to a variety of socio-economic and cultural demands put to them by a number of stakeholders.

This issue of *Kagisano* brings together four different inputs that attempt to illuminate some aspects of the debate about universities of technology. Contrary to the usual modality of the CHE Discussion Series, this issue of Kagisano does not include a central piece to which the others constitute a response. Each piece included in this issue is a stand alone contribution.

Some of the pieces included in this publication were originally presented at a workshop on universities of technology organised by the Quality Promotion and Capacity Development Directorate (QPCD) of the Higher Education Quality Committee in 2004. The main person responsible for initiating this project and delivering a number of follow up activities was Dr Prem Naidoo, who was then Director of QPCD.

The Council on Higher Education hopes that this issue of *Kagisano*, will add to a debate about universities of technology that needs to be broadened and deepened in a way that is an ongoing testament to Dr Naidoo's deep concern for engagement with a reflection of key elements of the restructuring and transformation agenda in South Africa.

Council on Higher Education

THE PHILOSOPHY OF A UNIVERSITY OF TECHNOLOGY IN SOUTH AFRICA: AN INTRODUCTION[1]

Roy du Pré*

PREAMBLE

In October 2003, the Minister of Education announced that some technikons would be redesignated 'universities of technology'. Others would merge with universities to form comprehensive universities. The South African higher education sector was therefore introduced to two new categories of institutions to be added to the already complex education landscape.

While the concept of a 'university of technology' is new to South Africa, the Committee of Technikon Principals (CTP) had already grappled with this concept as far back as 1997. In 2001 the CTP set up a task team to draw up a position paper on 'Universities of Technology in South Africa' and to 'develop criteria for classification/categories of such universities in the light of the opportunities afforded by the CHE Size & Shape Report (2000) including, inter alia, philosophy, ethos, research focus, the adult market and centres of excellence'. This document was intended to petition the Department of Education to consider changing the name `technikon' to that of `university of technology'.

After the Minister's announcement in October 2003, the CTP revised the document to clearly spell out the position, role and function of universities of technology in the South African context. This document was subsequently published as a book in November 2004: *Position, role and function of universities of technology in South Africa* (Du Pré, 2004). Concurrently, the same was being done to spell out the meaning, role and function of comprehensive universities. Thus within a year of the creation of the two new classes of universities, steps had already been taken to position them.

This article seeks to describe, from the viewpoint of the CTP, the philosophy that underpins a university of technology. There were of course many detractors of the old technikon sector, and there are just as many of the newly-created university of technology sector. Critics of the comprehensive university model are also plentiful. However, these new establishments are already with us and it is how we go forward from here that matters, so that the higher education sector can best do what it is designed to do.

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INTRODUCTION

There are powerful forces driving an increasing societal demand for higher education services in South Africa. The challenge as set out in the National Plan for Higher Education is to increase the participation rate in higher education from 15 per cent to 20 per cent over the next ten years. These additional students will have a major impact on our current system. But beyond the needs of a growing higher education population, there are even more fundamental forces at work that will almost certainly affect the scope and focus of higher education in South Africa.

As we move further into the age of knowledge, the workforce will require more sophisticated education and training to sustain its competitiveness. The need and demand for advanced education and learning opportunities will grow rapidly. Increasingly, the education and skills of individuals are seen as the key to both their personal quality of life and the broader strengths of their society. Furthermore, the need for ongoing education of the existing workforce has created a rapidly growing market for adult education.

People have always looked to education as the key to prosperity and social mobility. But now more than ever people see education as their hope for leading meaningful and fulfilling lives. One's level of education has always been a primary determinant of one's economic well-being. Today this may still be the case, but the fact that the marketplace is being flooded with people with degrees, many of which are irrelevant to the marketplace, will lead employers to set additional criteria for gainful employment. Criteria such as relevance of knowledge and applicability of skills are increasingly becoming important determinants of employability. In fact, a certificate of competence is in many cases more sought after than a degree or other higher education qualification. Employers also want ongoing training of staff. Thus, just as a high school certificate became the passport for participation in the industrial age, today, a higher education qualification which is relevant, provides transferable skills and ensures competence, will become the key requirement for economic security.

Diversity, quality and *relevance* of higher education qualifications are fast becoming the deciding factors. Clearly, a different type of institution is needed to take South Africa into the 21st century to meet the challenges outlined above. Such an institution will become an important player as far as the strength of our economy and competitiveness of our country are concerned.

A university of technology seeks to draw on a greater diversity of people as scholars and students. It has a new role in making knowledge useful. Furthermore, it aims to provide for the inclusion of underrepresented groups so as to tap reservoirs of human talent

and experiences from which universities have not yet fully drawn. Indeed, universities of technology will strive to obtain and sustain high levels of growth and distinction in a pluralistic world society through diversity and openness to new perspectives, experiences, and talents. Universities of technology, having a different focus and ethos from traditional universities, will not only make the higher education scene more varied and diverse but will also contribute meaningfully to greater technology transfer and international competitiveness. Because they specialise in making knowledge useful, they will, alongside the traditional and comprehensive universities, constitute a dynamic and excellent higher education system for South Africa.

Value of and uniqueness of universities of technology in a diverse HE system

Although a unitary system, the diversity of South Africa's higher education system should form the basis of its strength: diversity not only in the three main categories of higher education institutions in South Africa (universities of technology, comprehensive universities and traditional universities) but also within each of these categories.

Diversity is fundamental to the ethos of a university of technology. Unless we draw on a greater diversity of people as scholars and students, South Africa cannot hope to generate the intellectual vitality needed to respond to a changing world. The burgeoning complexity and rapidly increasing rate of change will force us to draw on a broader and deeper human knowledge and understanding. The inclusion of underrepresented groups will allow universities of technology to tap reservoirs of human talent and experience from which they have not yet fully drawn. Indeed, it is clearly apparent that universities of technology will not be able to reach and sustain high levels of growth and distinction in a pluralistic world society without *diversity*, and *openness* to new perspectives, experiences, and talents. Recognition of Prior Learning (RPL), flexible and pragmatic entrance requirements and creative ways to identify latent talent and skill should be key characteristics of a university of technology.

Core academic functions of universities of technology

Shift in emphasis

For decades, universities have defined academic quality in terms of inputs – student and faculty quality, resources, facilities – rather than outputs such as student performance. Rethinking the core academic functions of a university requires a shift in perspective from *resources* to *results*. This turns the institutional focus from *faculty productivity* to *student productivity;* f*rom faculty disciplinary interests* to *what students need to learn;* from *faculty teaching styles* to *student learning styles*. It reconceptualises the

university as *learner-centred* rather than *faculty-centred.* It grapples with the most fundamental processes, such as the way decisions are made, how information is shared, how students are taught, how students learn, how faculty work, how research is conducted, and how auxiliary enterprises are managed. The ethos of a university of technology should also be defined along the above lines.

Providing greater learning opportunities

Universities of technology should provide what students need to make them more skilled, more competent and more employable. They should be more employer-centred, provide constant upgrading through short courses, take the institution into the workplace, and liaise regularly with employers to ensure that prospective employees receive a relevant education.

Work-integrated learning

Experiential Learning (work-integrated learning) was regarded as one of the key strengths of technikons. A university of technology should find creative ways of drawing in employers to provide practical problems which students can solve during their training period.

Continuous upgrading of knowledge and skill ('Just-in-time' education)

In a world of constant change, career education cannot provide sufficient knowledge to suffice for a substantial portion of a lifelong career. Universities of technology should become specialists in 'just-in-time' education – experts in providing a continuous upgrading of knowledge and skills: This practical knowledge will be provided to graduates in a variety of modules and variations in contact- and distance-learning programmes when and where they need them. Such 'just-in-time' education will in future become the trademark and strength of universities of technology. Theoretically both students and employers will know and be able to judge quite accurately the value of such programmes. They will be far more willing to pay tuition at levels that reflect the true cost and value and to associate in new and positive ways with the institution.

In a very real sense, learning, working and living will become increasingly interwoven, inseparable in character and content. In this new developing culture of learning, basic degree training as it now exists will be replaced by more immediate measures of knowledge and skill acquisition, and universities of technology will have to provide leadership in this respect. 'Re-skilling', 'up-skilling' and 'multi-skilling' activities

will have to be creatively distributed over the careers and lifetimes of students. In this process, new and interactive relationships will have to be forged with local and international employers and knowledge providers.

Social responsibility

Universities of technology should be seen as institutions with a greater commitment of service to and uplifting of the community than has previously been the case with higher education institutions in South Africa. In the teaching, research and development undertaken the uplifting and transfer of skills to the community are of paramount importance. Because of their focus on relevance and applicable skills many students will be able, while still studying, to offer a valuable contribution to community training and uplifting. This form of 'service learning' should be expanded and developed to allow students to play a meaningful role in the community service activities of a university of technology. It is important to note that this form of 'service learning' does not replace the Experiential Learning components of courses. Experiential Learning is, and should always be, an integral part of a university of technology's education programmes.

Criteria and definitions of a university of technology

A university of technology as a concept and institutional type is not new. Such institutions exist in many countries, for example, the 'technical universities' and 'universities of applied sciences' *(Fachhochschulen)* in Germany, 'universities of applied technology' in some countries in Europe, 'universities of technology' in Australia and Hungary, 'universities of applied science and technology' in Iran, and 'institutes of technology' in the US and Australia. While retaining a particular focus, each institutional type has developed according to its own unique environment and in response to local and international demands.

Because a university of technology is essentially a new institutional concept in the minds of most South Africans, clear definitions and criteria will not only manage the process of redesignating technikons as universities of technology, or merging technikons with universities to form comprehensive universities, but also to provide credibility to and acceptance of the name.

Reasons for establishing universities of technology in South Africa

The binary divide which has existed for decades in the South African Higher Education sector is not in line with world trends. Previous *White Papers* and the CHE Report of 2000 came out strongly in favour of a unitary, but differentiated system. So, within such a system, there can be a unitary system of universities, but with institutions differentiated in focus. Universities of technology are characterised by the following:

- A strong corporate orientation;
- Service to industry and the community;
- Own characteristic roles and values;
- Relevance of programmes;
- Responsiveness to and fulfilment of the needs of industry, the community and society;
- Appointment of experts acknowledged by industry (not necessarily by academics);
- Strong attention to niche areas;
- Emphasis on scholarship, innovation and R&D (research and development);
- Transfer of technology; and
- Preparation of a new generation of knowledge workers, (focusing for example on work ethics, ability to work in multicultural teams, being students-for-life, etc.).

The above will make a university of technology a distinct type of institution, markedly different from the traditional universities in existence in South Africa today.

Defining a university of technology

What makes a university of technology different from the classical concept of a university? It is not the use of technology that makes it a technological university, but rather the interweaving of technology with the typical pursuits of a university. At a technological university the focus is on technology from the viewpoint of various fields of study, rather than technology itself as a particular field of study. 'Technology' means the human arrangement of nature, with the help of tools, for human purposes. In essence it is the know-how for fabricating things. It originates in the Greek word *techne,* meaning 'skill' or 'proficiency' and is also related to the words *episteme,* meaning 'understanding and skill' and *poeisis,* meaning 'working, creating' and, once again, 'skills'.

Technology therefore straddles two skills; firstly, the skill to fabricate things and, secondly, the skill to manage the fabricated products. At a university of technology all teaching and learning programmes and research projects are related to technology. It is thus the qualifying factor inherent in all academic activities. Although in principle all academic fields should be studied at a university, in practice this might not be the case at a technological university due to the nature of the different fields of study. At such a university, Science, Engineering and Management should have top priority.

Positioning of universities of technology within a knowledge society

The emerging knowledge society has tremendous consequences for the university, regardless of its focus of specialisation. Conceptually three consequences can be identified:

- First, universities have to accept the fact that they have lost their monopoly on knowledge development. The most innovative research and best laboratories are often found outside universities (for example, Silicon Valley). This new development forces universities to reconsider the way knowledge is being developed.
- Second, universities can *sell* their knowledge. In doing so, the universities are acting like enterprises competing on the open market. This calls for universities to position themselves with regard to knowledge transfer.
- Third, universities should deliver *programmes contributing towards knowledge-based professions*.

The way for the university of technology to meet these demands is to make the teaching and research programmes meet *the needs of the society* but also to *identify new possibilities* for the knowledge society's development. The main focus is to create a learning organisation through engagement with business and industry. The university of technology serves as a learning laboratory for experimenting with new approaches and practices for the design and delivery of learning and research initiatives. It delivers on-site education and research enriched by industrial and business experience. It delivers employees ready for the world of work, and the curricula and research programmes are both theoretical and applied. It brings the academic activities into close contact with the needs of the working place. Academic activities can therefore enrich the world of work. Universities of technology are becoming more effective in their managerial approaches and interaction with business and industry.

They should, however, be careful that business principles do not become more important than academic paradigms. To be engaged with the world of work does not mean that you have to lose your academic characteristics and take on features that do not belong to this kind of life form. Engagement rather means to take the unique characteristics of an institution and interact through them with other life forms. In the process the fundamental principles of the life form are not changed but the way in which they are put into practice is changed.

Teaching and learning as pillars of a university of technology

Relevant higher education programmes

A university of technology must deliver appropriately qualified graduates to the labour market and should therefore be closely allied to the business sector to ensure relevant curricula. This must entail a major revision of educational programmes at undergraduate and postgraduate levels to better address the needs of industry, business and communities. Curriculum and course design must be linked to an outcomes-based type of education and modes of delivery must be more flexible.

As part of the internationalisation of higher education, institutions abroad are also being redefined. For example, the *Hogescholen* in the Netherlands are becoming 'universities of (higher) professional education' and the *Fachhochschulen* in Germany are being renamed 'universities of applied sciences'.

Flexible learning models

The use of Information and Communication Technology (ICT) for a variety of flexible learning modes and online learning has broadened access to programmes of higher education institutions as part of a worldwide lifelong learning philosophy. This covers the total spectrum of distance learning (e.g. technology-enhanced) as well as a variety of modes used on campus as part of a course. Flexible learning makes individualisation of learning and courses for a variety of prospective learners (such as mature working persons) possible by means of wider access, recognition of prior learning and telematic learning methods.

Entrepreneurial institutional culture

A new generation of innovative and entrepreneurial institutions has recently been established. Clark (1998) identifies and analyses five very successful institutions in Europe: the University of Warwick in England, the University of Twente in the Netherlands, the University of Strathclyde in Scotland, Chalmers University of Technology in Sweden and the University of Joensuu in Finland. Common characteristics of these institutions include:

- A strengthened steering core with central faculty involvement and an administrative backbone that fuses new managerial values with traditional academic ones.

- A strengthened managerial core which consists of agents who work to find resources for the institution as a whole.
- A lesser dependency on and greater autonomy from government.
- An enhanced development periphery where outreach units promote contract research, contract education and consultancy. These include new units and centres that are generally multi- or trans-disciplinary in nature. The institution moves into a matrix-type structure of basic units in which traditional departments are supplemented by centres linked to the outside world.
- A revised diversified funding base created by constructing a portfolio of patrons to share rising costs. As new patrons contribute, their expectations of what they should get in return readily become new constraints.
- Academic departments which have bought into entrepreneurial change, even if the shift for social science departments (excluding economics and business) was more difficult.
- Successful entrepreneurial beliefs, stressing a will to change, which can, in time, spread to become a new culture.
- An organisational identity and focus to solve the problem of severe imbalances and to define anew their societal usefulness.

Emergence of centres for research and development

There is a move towards the development of R&D centres of specialisation with common features such as being multidisciplinary in nature and linked to a thematic approach in general, with the areas of specialisation directly linked to the needs of industry and business, and the participation of staff and students from various departments and faculties in the activities of the centre. These include educational programmes, R&D projects, industrial consultancy, innovation, incubation, the transfer of technology and product development. These centres frequently interact with business people, venture capitalists, patent lawyers, production engineers and researchers located outside the institution. R&D outputs may not always be reported in the traditional way through scientific conferences and journals, and are sometimes confined to reports closely held by commercial sponsors, and patents and licensing agreements.

Strengthening industry partnerships

Industry linking and partnerships are new dimension in higher education. Institutions have realised both the potential and need for cooperation, partnerships and joint ventures with industry and business, linked to an entrepreneurial approach.

This development ranges from formal education and training programmes and short courses to R&D projects and programmes. For example,

- the success of Silicon Valley is directly attributed to the extensive linkages with four major universities;
- the Warwick Manufacturing Group of the University of Warwick plays a key role in the development of Warwick Science Park, a hothouse environment which nurture's high tech companies; and
- the University of Twente uses the Twente Business and Science Park to ensure a vibrant economic development of the region.

Practical contributions towards regional and economic progress

Higher education institutions now have an extended and revised role in contributing towards the regional and economic development of the community they serve. The UK Dearing Report (1997) strongly promotes the establishment of more technology incubator units within or close to an institution for fostering start-up companies and supporting staff and students in taking forward business ideas developed in the institution. In the case of Silicon Valley in California it has been calculated that more than 1500 companies have emerged as spin-offs from the work of staff and students from the engineering schools of Stanford University. The current value of the IT companies in this group exceeds $90 billion. In 1996 sales from technologies licensed by academic institutions in the USA were estimated at $20.6 billion for that year.

Establishment of institutional support structures

Effective institutional support structures for institutions' revised role and linking with industry and business are being established. These groups help promote and facilitate projects and business development. Structures differ in order to accommodate institutions' specific needs.

Experiential learning (Work-integrated learning)

Experiential Learning (or work-integrated learning) is a strategy of applied learning which involves a structured educational programme that combines productive relevant work experience with academic study and 'professional reflection'. It provides students with relevant work experience. Students are required to undergo a period of on-the-job training as part of their degree studies. This period of work placement varies from a few weeks undertaken throughout the period of study, to six months or a year in

some programmes, in the final year of study. The principal advantage is that students gain experience in a professional field during their formal studies and begin working life with knowledge of the marketplace, its organisational structures and employers' expectations. Students are provided with practical and creative scope, and potential for advancement and personal growth in their chosen field.

The private and public sectors have consistently singled out the former technikons for their career-focused, hands-on approach to education and training and the delivery of graduates with knowledge that is immediately relevant in the workplace. The added advantage of Experiential Learning for both students and employers is that students 'hit the ground running' when they enter the workplace. Employers do not have to waste time and resources training employees who only have theoretical background knowledge.

Research and development in universities of technology

The 'research' university

Universities of technology acknowledge the world-wide negative impact on the higher education system caused by more and more institutions trying to adopt the culture and value system of 'research' universities. In fact, many institutions claim a 'research' mission, declare themselves 'research universities' and 'first team' players, but are nowhere near the basic norms set for such institutions. With many institutions seeking or claiming this distinction, the public is understandably confused. The long-term result may lead to an erosion of the willingness to support or tolerate the research role of our most distinguished universities. Universities of technology are wary of falling into this trap by not clearly defining what a 'university of technology' should be, and what it should not be. At their present stage of development they make no claim to be 'research universities'.

There is a perceptible swing in public attitudes toward higher education that will place less emphasis on values such as 'research excellence' and 'élitism' and more on providing cost-competitive, high-quality services – a move from a 'prestige-driven' to a 'market-driven' philosophy. While quality (i.e. fitness for purpose) is important, relevance and cost are even more important. The marketplace seeks low-cost, tailor-made, quality services rather than 'prestige'. The public is increasingly asking, 'If a Volkswagen will do, then why buy a Mercedes?' It could well be that the culture of 'excellence' which has driven both the evolution of and competition among research universities for over half a century will no longer be accepted and sustained by the general public, and

that 'new era' universities could well become the mode. It is however imperative that universities of technology clearly know where they are going, what the prerequisites are, and most of all, what the expectations and outputs of such an institution are and should be.

As South Africa's higher education system has evolved and changed, specialisation within the academic disciplines, driven by the explosion in knowledge that has occurred in the past twenty years, has been one of the most important trends. Today, as the speed of change increases, it is evident that some changes need to be made to the discipline-focused culture and structures of traditional universities. New funding policies in commerce and industry have started to support, to an increasing degree, multidisciplinary teams and scholars. In a period of rapid intellectual change in higher education the need for a different type of institution, specialising in multidisciplinary teaching and research as well as the application of knowledge, has become evident. Universities of technology are well positioned to address this need. Not only are they strong in multidisciplinary teaching but their ethos and origin come from the multidisciplinary world of commerce and industry.

Institutions with a clearer ethos and mission geared towards innovation and development will form an invaluable ally and partner for the traditional basic research institutions. Our country's future strength lies in the variety and scope of research approaches. The university of technology will focus mainly on applied research and innovation, and on ways and means of solving commerce and industry's specific problems. It is important to underline, however, that universities of technology do not aspire to be 'research' universities in the form as discussed above. The emphasis should be on teaching and learning, responsiveness and innovation.

Globalisation and democratisation

The changes taking place globally as well as within our own national context have a profound impact on the higher education sector and therefore great influence on how the sector responds to the changing environment. Globalisation as reflected by the interdependent world economy, together with rapid developments in information and communication technologies, has put knowledge at the centre of the new economy. The demand made by globalisation on higher education institutions is that they should go beyond providing learners with necessary cognitive skills and competence and, more importantly, prepare them for working in a knowledge society.

In the South African context, over the past 30 years, there has been a dramatic shift in the economy, and consequently also changes in labour market trends. The primary

sector of the economy has consistently declined, whereas the service sector has grown rapidly. It should be noted that with the establishment of a new democratic government in 1994 many of the technology missions of the apartheid era were downscaled, which partly resulted in a reduction of national research and development expenditure. These circumstances have required specific responses from the higher education sector.

A plethora of policy and legislative frameworks has been developed by the democratic government to ensure that the higher education sector, like all other public institutions, functions in line with the norms and values of the new dispensation and, more importantly, meets the pressing needs of our society. The National Plan for Higher Education outlines the key goals and objectives necessary for achieving transformation within the sector. These and other policy documents form an essential guide for the universities of technology to determine their role and scope in and contribution to national research and development.

The nature of research and development

Prior to the restructuring process in higher education, which led to the reclassification of some technikons as universities of technology, the Technikon Act of 1993 classified technikons as institutions concentrating 'on the application of scientific principles to practical problems and to technology and thus preparing learners for the practice, promotion and transfer of technology within a particular vocation or industry'. The National System of Innovation proposed in the Science and Technology Policy requires that a set of functioning institutions, organisations and policies interact in pursuit of common social and economic goals. Given that some of the key objectives of this policy are to promote competitiveness and employment, improve the quality of life and work towards environmental sustainability, it is therefore understandable that universities of technology, by virtue of offering training often linked to industry, are strategically placed to contribute significantly to innovation. This will remain a characteristic of significant universities of technology, as their core function will still be education and training in the career and professional streams.

These institutions, apart from having close links with industry, will also need to be responsive to other societal needs. Whilst recognising the importance of the complete continuum from basic research to commercialisation of research outputs, universities of technology will focus on research that is of a more applied nature (strategic and applied research), solving problems of society and implementing practical solutions. This does not necessarily preclude involvement in basic research.

The National Research and Development Strategy, in addressing weaknesses in research and development, recognises the problem of the innovation 'chasm', which is a gap between human capital and technological innovation activities. Through applied research and working directly with industry on incremental problem-solving and consulting, the universities of technology will make a significant contribution to the innovation chain. Furthermore, in the National Research and Development Strategy, a number of new technology missions are proposed to be pursued and these include poverty reduction, the knowledge-intensive new industries (ICT and National Biotechnology Strategy), advanced manufacturing and leveraging resource-based industries and developing new knowledge-based industries from them. These platforms provide an opportunity for universities of technology to function within and be part of the national system of innovation.

In the experience of the National Research Foundation (NRF), whose mandate is to promote and support research and research capacity building, the following issues are critical to creating a sustainable research effort:

- A long term perspective is required to build sustainable research capacity.
- Each institution needs to take responsibility for and ownership of its research endeavour.
- A critical mass of no less than four active researchers working on a common theme is necessary to create a sustainable research programme.
- Staff development is an essential prerequisite for research capacity development and therefore research should not be an end in itself, but translate to further involvement in research at levels beyond doctoral studies.
- There needs to be sustained pressure to produce appropriate quality research outputs.

The above issues need serious attention from universities of technology if they are to make a meaningful contribution to the national research effort.

As a mechanism of accelerating research development, universities of technology would be engaged in collaborative research. Because of the emphases in the area of strategic and applied research it is expected that universities of technology will develop strong cooperative and collaborative networks with industry. Since the focus of universities of technology is only on one area in the research and development continuum, it becomes imperative that they collaborate with other institutions of higher education, especially the traditional universities whose emphasis tends to be fundamental research.

Developing leadership in technology

An important characteristic of a university of technology is the relevance of its curricula and research programmes, which are related to the problems and concerns of industry, the community and society at large. These real-world problems are seldom neatly contained within the confines of any specific discipline. They are inherently complex in nature, cutting across a range of disciplines and requiring multidisciplinary teams to develop solutions. Usually there are many possible solutions to this type of problem, some more appropriate than others. Invariably technological choices have to be made.

If it is the objective of universities of technology to educate and develop students who can engage effectively with real-world issues to the benefit of society at large, then these institutions cannot adopt a narrow focus and equip students only with technological competence and practical skills to deal with these issues. It will be necessary to broaden the educational approach, to expose students to a range of disciplines, including those from the humanities and social sciences, to enable them to make intelligent decisions and choices about a range of issues involving technology.

Unprecedented changes, accompanied by unexpected opportunities and consequences, have been distinctive features of modern technology. While technology has brought with it unparalleled benefits, it has also had far-reaching implications, many of these undesirable. Students of a university of technology must be in a position to appreciate the impact of technology on society, and understand the broader social, political and economic consequences of a particular technological solution.

Technology is perhaps the most powerful agent impacting on the environment. Technological development, particularly in the realm of biotechnology and genetics, has raised a number of ethical questions as well. Students of a university of technology must be aware of the ethical and environmental implications of their technological choices, and able to determine the most appropriate solutions given the societal context. They should be encouraged to think about the broader issues of technology, so they will be prepared not only for a more meaningful role in technology development and innovation but also for a more responsible role in society.

With its strong focus on technology development, innovation and technology transfer, a university of technology will have to promote a better understanding of these phenomena among its students. Topics relating to the management of technology, how it can be effectively used to create competitive advantage for the industry, and how technology interacts with other key business areas will also have to receive attention.

While universities of technology will be actively engaged in technology development, technology transfer and innovation, it is also important that their staff and students develop a deeper understanding of these processes, and how best to promote these in a variety of contexts.

In this manner universities of technology will not only equip students with the technical skills to engage effectively with real-world issues, but will also educate them for leadership on the important technological issues facing society.

Technological innovation and technology transfer

An international perspective

Higher education institutions worldwide have realised the importance not only of generating new knowledge through R&D programmes but also of actively participating in applying and using the knowledge and technology for new products, processes and services. Entrepreneurial institutions have formulated and implemented strategies to ensure that 'flow through' of new technology into the market place actually takes place. The emergence of new modes of knowledge production, more geared towards addressing the needs of government, industry and communities, and the need for higher education to stimulate economic growth have caused strategies to be revised.

In the 2003 report of the International Intellectual Property Institute in Washington, US, on technology transfer systems in the US and other countries, the report stresses the key role that universities play in National Innovation Systems. This role has traditionally been confined to training the human capital involved in R&D. However, universities are increasingly making a direct and substantial contribution to innovation, and thereby to regional economic growth through the development of new technologies.

Both developed and developing countries are seeking to increase the contribution university R&D makes to national economic growth. This has led governments to restructure the institutional environment, usually through establishing an intellectual property ownership policy in favour of universities, and by providing support programmes for the commercialisation of technology. In countries where this approach has been followed, universities take technology transfer seriously and have policies in place governing intellectual property rights for their inventions. Furthermore, the necessary support structures have been created to facilitate the commercialisation of university R&D, usually in the form of technology transfer offices.

The spectrum of technological innovation and technology transfer

Technological innovation is the process that transforms new knowledge into wealth. It covers the various steps of the innovation chain, from the creation of new ideas, to the development of technology in the form of products, processes and services, to the ultimate successful commercialisation and/or implementation.

Technology transfer is the formal transfer of new discoveries, innovations and technology, usually resulting from R&D activities at universities, to the commercial and industrial sectors in the economy. Implicit in the term is the understanding that a tangible 'intellectual asset' has been identified for transfer. The literature also refers to *technology interchange,* emphasising the two streams for technology transfer – one emanating from within the university and the other an external stream of opportunities being brought into the university for joint development and exploitation.

At a university of technology, the five essential components are

- enhancing R&D 'downstream' activities such as the patenting, licensing, commercialisation and marketing of intellectual property (IP) and R&D results in the form of products, processes or services;
- promoting and marketing a corporate culture for technological innovation, entrepreneurship and technology transfer;
- developing appropriate policies, strategies and models for technological innovation and technology transfer;
- promoting and developing knowledge and technology-intensive enterprises; and
- participating in the establishment of technology and business incubators and related support structures.

Opportunities and strategies

Universities of technology have to become leading higher education institutions in technological innovation and technology transfer, and the various opportunities mentioned earlier have to be incorporated into the teaching and learning and R&D programmes of the university. Furthermore, it is essential to have the buy-in of staff and students, and in particular the full support of top management.

The following strategies will play an important role in achieving the stated objectives:

- The establishment and promotion of a culture for technological innovation and technology transfer among staff and students to be measured by its incorporation into education and R&D programmes, number of patents, licences, spinout companies and financial benefits;
- The establishment of appropriate technological innovation and technology transfer strategies, systems, incentive schemes, support services and infrastructure, to be measured by the optimal use of intellectual assets and client satisfaction; and
- The development and implementation of specific models for establishing knowledge- and technology-intensive enterprises, incubators and SME (Small and Medium Enterprise) technology centres, to be measured by their outputs and financial sustainability.

Quality as foundation and platform for universities of technology

For the essential components of a university of technology to succeed, it is crucial that quality is seen as their foundation or platform. The effectiveness and success of universities of technology will be judged on the quality of the services and products they deliver, especially in comparison with traditional universities locally and abroad. The transition from technikon status to universities of technology will be watched with keen interest by the traditional academic and research-oriented universities, so it is imperative that what they produce is of high quality. Furthermore, the uniform quality assurance system which the HEQC has implemented will place a critical focus on the quality of services and products of universities of technology.

To effectively ensure quality outputs at the end of the teaching/learning process, all activities, functions and services have to be permeated with, and geared towards quality. Quality assurance should form part of the institutional planning processes, in terms of both academic and administrative functions. Quality should not only be the overall outcome of all the activities and services we engage in, but should also be completely integrated into all the processes and activities which produce those outcomes.

The above view is shared by the HEQC. In its framework document, the HEQC states that all higher education providers are expected to deliver effectively and efficiently education, training, research and community service which are of high quality. The HEQC's approach to quality audits at higher education institutions is also a clear demonstration of the integrated nature of quality. The focus will not only be on the quality of teaching, learning and research but also on the overall management of quality at the institution, including its support functions and processes.

For universities of technology to promote excellence in the delivery of their core function, enhancing quality will need to be viewed as an ongoing process, including improving staff capacity to promote this. A quality culture needs to be developed by infusing quality into all processes, activities and functions of the institution.

Finally, in addition to establishing internal quality mechanisms and processes, universities of technology must engage in benchmarking practices to validate the quality of their courses and products. Such benchmarking should be conducted on a regular basis with local as well as international peers and should lead to continual quality improvements.

An innovative and entrepreneurial culture

An innovative and entrepreneurial spirit and culture need to be instilled throughout the university in the way it operates, plans and strategises. This should be visible in the commitment of all staff and students to developing the institution into an excellent university of technology.

International experience has identified five characteristics institutions need to have to be successful (Clark, 1998). Translated into the South African situation, they are:

- A strengthened steering management core, understanding the specific challenges and taking the lead in directing the institution.
- An expanded developmental periphery, complementing the core programmes of the university, in the form of outreach units and centres, linked to identified needs of the region.
- A diversified funding base, attracting new funding resources, as an integral part of the annual budget and allocation model.
- An augmented and stimulating academic environment, where staff and students can flourish in exercising their innovative mindset, through well-structured teaching and learning and R&D programmes.
- An integrated entrepreneurial culture, which has to be developed as part of a will to change and do things differently.

Responsiveness to communities

One of the major qualities of a university of technology is being responsive and relevant to the needs of the environment. Universities of technology will be institutions with greater commitment to serve and uplift the community. In the teaching, research, and development undertaken, fulfilling the needs of society and industry and transferring skills to the community are of paramount importance. Because of the focus on relevance and valuable applicable skills, university of technology students will be able,

while studying, to contribute to community upliftment. This form of 'service teaching /learning' should be developed and reinforced so that students can play a meaningful role in the activities that serve neighbouring communities. In a further effort to be responsive and relevant, universities of technology should not ignore problems that beset society, such as HIV/AIDS, crime, unemployment, and poverty. Knowledge transfer and technology should be used to develop and implement smarter ways and best methods of solving these problems.

Knowledge transfer and exchange

One of the responsibilities of universities of technology will be generating new knowledge through research. However, their greatest contribution will be in transferring that innovative knowledge to the environment by translating knowledge into artefacts, patents and objects useful for developing and uplifting neighbouring communities.

Today's communities sometimes develop their own locally created solutions to their immediate problems. The technological infusion from universities of technology will make these solutions more efficient. Universities of technology will focus on such technology exchange by design and not by default.

Partnerships

By their very nature, universities of technology should not be stand-alone institutions. To be relevant and responsive, they should work in close collaboration with neighbouring institutions and organisations. Industry has become the main hub where technological knowledge is translated into useful artefacts and thus it has a direct link to universities of technology where that knowledge is generated. This link is inevitable and has to be deliberately reinforced; that is to say, *sometimes there is both knowledge transfer and knowledge exchange between industry and universities of technology*. Partnerships promoted by universities of technology should include cooperation, collaboration and joint ventures to benefit all who are involved.

CONCLUSION

The growing importance of knowledge and applicable skills in the world of today, and the ever-increasing numbers of people being educated and trained at a higher level has increased higher education's responsibility to and its influence within society. To fully assure its responsibility and its role, higher education needs to change, and

universities of technology need to identify and actively fulfil their new and growing role and responsibility in this respect. The labour market has in effect now become the skills market and if education leads only to knowledge it will basically support an outdated system. Only when learning leads to the acquisition of new skills, and the active application of such skills, will the economy benefit and the challenges of change be managed effectively. Relevance in higher education should be assessed in terms of the fit between what society and the modern world of work expect of institutions and what they actually do.

Cognisance must be taken of the full consequences for higher education of a modern economy and sustained development. A modern economy with its high 'technicity' and sophisticated technology has an insatiable need for innovation. This in turn requires continual progress in applied research and development, as well as highly skilled and qualified staff in various fields, especially new fields, who must not only keep their knowledge up to date but also progress, improve, and innovate at a personal level. Developing entrepreneurial skills and initiative should become the major concerns of universities of technology so as to produce employable graduates who will increasingly be called upon as not only job seekers but also job creators.

South Africa is currently experiencing only the initial growing pains of a modern economy. The question is whether our current higher education system will be able to plan for and proactively meet the highly complex educational needs it is going to be confronted with. This is the challenge universities of technology intend to meet.

BIBLIOGRAPHY

BROOK, D, 2000. The making of a university of technology. In Lategan, LOK (Ed.), *Technikon Free State studies in higher education.* Bloemfontein.
CHE (COUNCIL ON HIGHER EDUCATION), 2000. Size and Shape Task Team – Discussion document, 7 April.
CHE (COUNCIL ON HIGHER EDUCATION), 2001. *Higher Education Quality Committee Founding Document.*
CLARK, BR, 1998. *Creating entrepreneurial universities: Organizational pathways of transformation.* Oxford: Pergamon.
CONFERENCE OF RECTORS, VICE-CHANCELLORS AND PRESIDENTS OF AFRICAN UNIVERSITIES, 1999. Revitalising universities in Africa: Strategies for the 21st century. Arusha, Tanzania, February.
CORREA, CM, 1998. Argentina's national innovation system. *International Journal of Technology Management,* 15(6/7).

DEARING, J, 1997. Higher education in the learning society. Report of the National Committee of Inquiry into Higher Education to the Secretaries of State for Education and Employment, Wales, Scotland and Northern Ireland, 23 July.
DEPARTMENT OF ARTS, CULTURE, SCIENCE AND TECHNOLOGY, 1996. White Paper on Science and Technology. Pretoria.
DOE (DEPARTMENT OF EDUCATION), 1997. *White paper 3. A programme for the transformation of higher education.* Department of Education, Pretoria.
DOE (DEPARTMENT OF EDUCATION), 1999. *First national higher education reflection on the three year rolling plan process.* Department of Education, Pretoria.
DU PRÉ, RH, 2000. SAQA and the NQF: An introduction to outcomes-based programme development. Pretoria.
DU PRÉ, RH (Ed.), 2004. *Universities of technology: Position, role and function.* Pretoria.
DU PREEZ, N, VAN ELDIK, P, MÖHR, M & VAN DER WATT, H, 1998. The development and establishment of technology in South Africa. *Industry and Higher Education,* 12(1).
FOWLER, M, 2001. Report on a university of technology: Implementation plan – 2001. Technikon Pretoria, January.
FRD (FOUNDATION FOR RESEARCH AND DEVELOPMENT), 1998. Final report of the FRD / Singapore delegation visit to Singapore, April.
GIBBONS, M, 1998. Higher education relevance in the 21st century. Paper presented at the UNESCO World Conference on Higher Education. Washington: The World Bank.
LATEGAN, LOK, 1999. The nature of a technological university within the higher education band. *Journal for Christian Scholarship*, 35(3 & 4): 1–36.
LORRIMAN, J & KENJO, T, 1996. *Japan's winning margins.* Oxford: Oxford University Press.
SAUNDERSON, J, VAN ELDIK, P & HOWIE, S, n.d. A national strategy for technological innovation in South Africa: Higher education, government and industry as strategic partners. Submitted to *South African Journal of Higher Education.*
STRAUSS, DFM, 1980. *Inleiding tot die kosmologie.* Bloemfontein: SACUM Beperk.
TECHCAPITAL, 1998. Technology transfer not always an economic panacea. *Academy Today,* December.
TECHNIKON FREE STATE, 2001. Response of the Technikon Free State to the CHE Report on Shape and Size. Technikon Free State, September.
VAN ELDIK, P, 1998. Verslag oor deelname aan 'n internasionale konferensie. Technikon Pretoria, June.
VAN ELDIK, P, 1998. Report on delegation visit to California. Technikon Pretoria, October.

VAN ELDIK, P, 1999. Technikon Pretoria's strive [sic] in becoming a university of technology. A discussion document. Technikon Pretoria, January. Draft.
VAN ELDIK, P, 2000. Report on important aspects of an implementation plan to become a university of technology. Technikon Pretoria, November.
VAN ELDIK, P & FOWLER, M, 1999. Report on positioning Technikon Pretoria as a university of technology: The philosophy. Technikon Pretoria, October.
VAN RENSBURG, D, 1998. Address by rector to staff: Technikon Pretoria in a changing world. Technikon Pretoria, October.
VAN RENSBURG, D, 1999. A critical re-assessment of work, knowledge and technical and/or career education. Technikon Pretoria, March.
WATTS, DW, 2001. A submission to the review of higher education financing and policy. University of Notre Dame, Australia.
WINBERG, C. 2004. Becoming a university of technology. Inaugural professorial lecture. Peninsula Technikon, Cape Town.

THE RECLASSIFICATION OF TECHNIKONS TO UNIVERSITIES OF TECHNOLOGY

Jairam Reddy*

Since the advent of the new democratic government in 1994, the South African Higher Education System has undergone profound changes. The attempt to establish a coherent, unified but differentiated system has considerably narrowed the binary divide between universities and technikons. These institutions are now funded and managed similarly and both enjoy the same degree of autonomy and academic freedom. Arising from the new higher education landscape are three kinds of higher institution: conventional universities with a teaching, research and service function, technikons now referred to as universities of technology, and comprehensive institutions that have resulted from mergers and will combine the roles of both universities and the former technikons. What has led the former Minister of Education to name the former technikons 'universities of technology'? Do they justify being labelled 'universities' and in particular what is the justification for the designation 'technology'?

As far as is known the Minister has not furnished any set of cogent or rational reasons for his decision. Many of the former technikons strongly support the Minister's decision and had campaigned for this designation for many years. On the basis of a literature review and the South African experience this paper explores

- whether the Minister's decision to designate the former technikons 'universities of technology' has any precedents and can be justified; and
- the implications for the HEQC (Higher Education Quality Committee) mandate on quality assurance.

Recent press articles on the newly achieved status of the former technikons as universities of technology (UTs) have raised serious questions about the wisdom of the change. Holiday, of the School of Government, University of the Western Cape, comments as follows, in the *Cape Times:*

> Recently Kader Asmal sanctioned a change of nomenclature which raised barely a ripple on the murky pond of academic politics, but which has fatal implications for the life of the mind in our centres of learning. (Holiday, 2003)

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The author argues that:

- The Minister makes no clear distinction between universities of technology and the traditional universities.
- A technique, and thus a technology, which is no more than an assemblage of techniques, is not valued for its own sake but for the sake of some end to be achieved by applying it; accordingly a technical institute cannot emulate a university.
- The minister is following the lead of the European Union bureaucrats who wish to 'technicise' the traditional conception of a university out of existence.
- A university of technology cannot be compared with the Massachusetts Institute of Technology which can lay claim to a string of Nobel Prizes, a flourishing school of humanities, a visual arts centre and a symphony orchestra.
- Traditional universities will be tempted to 'technicise' their teaching and research projects and neglect fields such as ancient languages and philosophy.
- It is tradition which determines correct usage – a tradition which stretches as far back as Plato's Academy in ancient Athens.
- A university is a place of learning where subjects of cosmic significance are studied and loved for their own sake.

Holiday concludes: 'If Asmal's seemingly innocuous innovation goes unchallenged, he may well have managed to deal a death blow to the life of the mind in his country.' (Holiday, 2003). In another article, Jansen, of the School of Education, University of Pretoria, comments:

> These (technikons) are nothing more than glorified high schools. Under the merger plan they are to be called institutes of technology or technology universities. This is a farce. Research out of the technikons is generally pathetic and standards are not great. If it were up to me I would also take the few good ones with departments that excel and invest heavily in them. The rest I would close. (Jansen, 2004)

These two articles by leading educationists in the higher education system reflect the strong reaction to the Minister's decision to change the nomenclature for higher education institutions. On the other hand the technikons, many of which were campaigning for university status, now feel vindicated. The critical question is why the Minister should at this particular juncture, when the higher education system is in the midst of sweeping changes, have chosen the term 'university of technology'. Less than two years ago, the same Minister accepted the term 'institute of technology', for example the Durban Institute of Technology.

Global imperatives of higher education

When considering the reasons for the names of the higher education institutions being changed, the widespread changes in the external environment of higher education must be recognised – mass higher education, growth of knowledge, reduced public funding, increased emphasis on employment skills, pressure for more accountability and inter-university. Levine delineates these changes as follows:

- Higher education providers will become more numerous and diverse; in addition to the range of public institutions, private institutions both for profit and non-profit, global universities transcending national boundaries, commercial institutions, distance institutions and virtual universities.
- Three basic types of universities are emerging: brick universities (the traditional residential universities), click universities (new commercial virtual universities) and brick and click universities. The most attractive option is likely to be the brick and click type because consumers, while appreciating the freedom of online services, would want the opportunity for face-to-face interaction to seek expert advice.
- Higher education is becoming more individualised; students from diverse backgrounds will have a widening array of educational needs. New technologies will enable them to receive their education at any time at any place. Each student will have the opportunity of choosing from a multitude of knowledge providers.
- The focus of higher education is shifting from teaching to learning, from credit hours to earn a degree to outcomes that students achieve. Time will become the variable and learning the constant.
- The definition of excellence will shift selective admission to the value that each institution will add to the student's learning experience.
- Teaching institutions as the only profitable ones will result in the unbundling of research and community service; financial support for these aspects will be hard to find; yet without research higher education institutions could be intellectually impoverished.

(Levine, 2000)

The restructuring and transformation of higher education in South Africa

In order to transcend the fragmentation and lack of responsiveness of its educational system of the apartheid era, the newly elected democratic government of South Africa, through a sequence of commissions, white papers and legislation, laid the basis for the transformation of the post-secondary sector. New policies during the 1994–98 period resulted in the creation of one national and nine provincial departments of education.

Among the reports and legislation that emerged were the National Commission on Higher Education (NCHE), the Education White Papers 1 & 2, the National Education Policy Act, and the South African Schools Act. A number of regulatory bodies were also established – the South African Qualifications Authority (SAQA), the Council on Higher Education (CHE), the Higher Education Quality Committee (HEQC), the South African Council for Educators (SACE), and the Further Education and Training (FET) Act (1998).

The Education White Paper 3 (DoE, 1997) summarises the main thrust of the transformation of the higher education system:

- Increased and broadened participation.
- Responsiveness to societal interests and needs.
- Cooperation and partnerships in governance.

The White Paper also delineates the role of higher education in reconstruction and development:

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

The National Plan, 2001 spells out the goals and objectives of the higher education system:

- Increase enrolments in career-oriented programmes and in business, commerce and science, engineering and technology.
- Strengthen the provision of technikon programmes.
- Maintain the binary divide in the short to medium term.
- Invert the qualification pyramid – the majority of programmes should be three year undergraduate diplomas and professional undergraduate bachelor degrees.

It is with the above policy directives and challenges in mind that the Ministry has undertaken the restructuring of the higher education landscape through mergers and rationalisation of programmes. Current restructuring proposals will result in:

- 11 universities,
- 4 technikons, now termed universities of technology,

- 5 comprehensive institutions, 3 from a merger of a university and a technikon, two by refocusing their programmes,
- 1 dedicated distance learning institution, and
- 2 national institutes for higher education.

Desirable characteristics of a higher education institution

Although there is considerable debate about what constitutes the core features of a contemporary university, there is emerging consensus on the following:

- Financial viability and stability, critical mass of administrative, management and academic capacity.
- Teaching, scholarly activities and community engagement appropriate to the mission of the university.
- A range of programme offerings covering the humanities, social sciences, science and technology, business and commerce, producing graduates with generic as well as discipline-based competence and skills.
- The capacity to undertake scholarly research and contribute to widening the frontiers of knowledge.
- A minimum of approximately 4000 FTE (full-time equivalent) enrolments distributed across a range of disciplines at both undergraduate and postgraduate level.
- Admission criteria of matriculation exemption or equivalent for degree level programmes; school leaving certificate for certificate and diploma programmes.
- Operation in an environment that is consistent with national interests and policy.
- A role as critic and conscience of society.

Different models of universities

Historically there has never been a single model of the university. The Bologna model, the Paris model, the Humboldt University, the Newman University, the American land grant college, and the research university are some of the variants that have evolved. Bok (1990) expresses a traditional view of a university: 'a place detached from society, uncontaminated by its worldly values, and undistracted by pursuits other than the search for greater knowledge and understanding.' In other words knowledge is pursued for its own sake rather to fulfil a particular goal or end. Yet it is the case that the early universities in Europe were established mostly for vocational purposes – careers in the church, medicine and law were popular (Patterson, 1997). It was in Germany, towards the end of the 19th century, that the idea of the research university with scholarly

dedication was born. Those who subscribe to this view in general consider vocational education to have a lower status.

The devaluing of vocational education appears to have begun in the UK. Thus polytechnics developed for technological training and colleges for, for example, teacher training. Nursing was taught in colleges or hospitals while medicine was the prerogative of universities. One explanation for this distinction is that the body of theoretical knowledge for nursing did not warrant degree status at a university. The tradition is different in the US. Land grant universities were specifically established to teach vocational subjects such as agriculture and engineering. In the same tradition, community colleges in the US offer associate degrees and are considered very much part of higher education. In Germany too, science and technology formed the core curriculum in universities and polytechnics from the second half of the 19th century. With changes in class attitudes even in the UK, the civic or redbrick universities such as Birmingham, Manchester and Sheffield were established in the late 19th century to serve the 'working class' but incorporated both the research and vocational dimensions.

The modern university has had to provide access to much larger numbers of students, to transcend barriers of race, gender and class and to be more responsive to the socio-economic needs at local, national and global levels. Powerful states in a climate of market dominance with monetarism, deregulation, privatisation and liberalism as its core features had a profound influence on the nature of the modern late 20th century university. Thus we have seen in recent years the convergence of the university to a single type or model – the entrepreneurial university. This convergence is the consequence of the post-industrial society, driven by the knowledge based mode of production, the technological digital revolution and advances in telecommunications.

In an assessment of the university, West (1998) concludes that, owing to the explosion of knowledge, 'The purpose of the modern university, therefore must be to open the mind, to strengthen and discipline the cognitive powers and sensibilities of the mind, to refine the mind and to create efficient and effective independent learners and knowledge builders'.

Ernest Boyer (1990), in a report commissioned by the Carnegie Foundation, distinguishes between different types of 'scholarships':

- Scholarship of discovery – original research and the advancement of knowledge.

- Scholarship of integration – connecting ideas and synthesis across discipline boundaries.
- Scholarship of application – assembling knowledge through an interaction between intellectual and real world problems of practice.
- Scholarship of teaching – transforming knowledge through bridging the gap between the scholar's understanding and the student's learning.

Boyer's reconceptualisation, in contrast to the conventional dichotomous model of teaching versus research, has not received the attention it deserves. It does not place other forms of scholarship on a lower plane than that of original discovery. This is something that deserves close attention in reconceptualising teaching, research and other forms of scholarship as part of the modern, contemporary university.

That this view should receive urgent attention is supported by performance appraisals of academic staff which suggest low levels of research output. For example, in Australia in one survey, three quarters of respondents in universities published no books and 20 per cent no articles (Ramsden, 1994). Boyer (1990) found that 82 per cent of faculty in universities in the United States received no federal funding for research. The reality is that in most institutions a small proportion of staff produces most of the research.

The binary divide

The binary divide whose retention is advocated in the National Plan on Higher Education will be increasingly difficult to maintain because of

- the creation of the comprehensive institution offering both university and technikon type programmes;
- the proposed new academic policy which makes no distinction between vocational and general qualifications;
- similar governance structures for universities and technikons; and
- equality in funding under the new funding formula.

The dangers of removing the binary divide may result in

- academic drift and weakening of vocational, career focused, technikon-type programmes;
- technikon staff in general, compared to university staff, being less well qualified and therefore finding it difficult to compete with universities for research funds; and at the same time

- the dispersion of research funds over more institutions removing concentration and focus.

On the other hand steering mechanisms in place could counterbalance the dangers of removing the binary divide because:

- The DoE planning processes and procedures and the mission will determine the qualification and programme mix according to the goals of the national plan.
- Quality assurance processes being developed by the HEQC will reinforce national policy directives and help determine the nature and quality of programmes.
- The new funding formula will support policy priorities as required and help to steer the system accordingly.

The international experience

Australia

The Australian experience has found that dual sector universities (called universities of technology) have the potential to transcend the fractured educational arrangements through coherent learning pathways and meet the learning needs of students. There are differences between the missions of higher and vocational education but there is also a growing convergence between them. There is as much diversity within each sector as there is between them. While links with industry distinguish vocational from higher education, the latter is now seeking to make courses more vocationally relevant and building bridges with industry in course and curriculum design. Both are required to develop broad based and generic approaches to vocational education. As Doughney (2000) observes, 'Thus rather than narrowly defining the mission of each sector, a model of "continuous education" recognises that both sectors provide general and vocational education'.

There are dangers of homogenisation and academic drift but dual sector institutions may find it a distinct advantage to promote a range of offerings from certificates to diplomas to first degrees to doctorate level qualifications. The challenge is to retain the distinctiveness of vocational education while promoting seamless tertiary education.

Preconditions are necessary to create a model of a dual sector university:

- Dual accountability to different levels of government should be avoided.

- Two institutions of comparable size are needed, with complementary offerings and supported by an integrated administrative and student support system.
- There must be collegial relations between the two sectors, with effective dialogue, discussion and collaboration.

Victoria University of Technology, Australia, a dual sector university, has 14 campuses with 50 000 students; at merger the vocational component was 20 per cent, today it is 50 per cent. Twelve 'Fields of Study Advisory Groups' were constituted which incorporated linked disciplines in both vocational and higher education. The aim is to eventually offer a full range of qualifications, from certificates to PhDs, in each field of study. It has not replaced existing academic units but is a vehicle for cross-sectoral collaboration and providing advice to decision-making structures within the university.

A recent government document, 'Higher Education at the Crossroads', explains that the present structure of universities is to be dismantled. Only a few select universities will offer the full range of disciplines, while one or two will be funded 'for world class research'. The remainder will offer a limited range of programmes and will have to supplement income from consultancy fees and other income-generating activities.

The South African comprehensive institutions resulting from mergers of universities and technikons would fit neatly into the Australian classification of universities of technology. Yet in South Africa the same designation is used for a single sector institution, the former technikon, whose predominant mission is to offer vocational type, career-focused programmes.

New Zealand

Unlike a number of commonwealth countries, New Zealand did not have a binary system of higher education and degrees could only be offered by universities. However, legislative reforms in 1989 enabled the Auckland Institute of Technology (AIT) to offer degrees and during the next decade it instituted a range of bachelors, masters and doctoral programmes. Given the precedent of the British polytechnics and the Australian Colleges of Advanced Education being granted university status, AIT began to advance its case for similar status. The New Zealand Qualifications Authority considered legislation and established guidelines for interpreting what might constitute university status. In 1999, AIT was granted university status by the New Zealand Minister of Tertiary Education. There was, however, considerable opposition from existing universities to the interpretive guidelines and AIT's application. Interestingly,

four months prior to the decision to grant university status to AIT, the University of Auckland (UOA) entered into an alliance agreement with AIT. This agreement promotes the separate aspirations of UOA to be a leading research university and AIT to become an internationally recognised university of technology.

In the years prior to AIT achieving university status there was growing convergence between it and the UOA. AIT established a number of postgraduate programmes and strengthened its research centres. The UOA began to offer an undergraduate degree in nursing and a number of fine arts programmes previously offered in polytechnics. Both institutions offered degrees in business science engineering and languages. Despite their close proximity to each other, there was little cooperation between them. The deed of cooperation provides for the parties to remain separate legal entities and to retain their distinctive characteristics but to work towards the establishment of a single council to govern both institutions. The distinction between the institutions states that the UOA 'is a research-led university aspiring to the highest international standards' and that 'AIT aims to be a university of technology of high international repute'. Since the signing of the deed of cooperation, the institutions have met regularly in an attempt to develop a regional strategy, better integration of non-core services, staff development, computer systems, administrative systems and international marketing. Clearly academic issues will be more difficult to resolve.

The United Kingdom

The report of the National Committee of Inquiry into higher education (Dearing, 1997) finds that the defining characteristic of a university is the power to award taught and research postgraduate degrees. The granting of this power to the polytechnics in 1992 enabled them to acquire the status of universities. Opinions are still divided as to whether it was a wise decision to convert the former polytechnics to universities. The polytechnics have evolved in two distinct directions. Some have tried to compete with the older traditional universities, especially in research output, and have usually come out second best. Others have kept to their mission of providing career-focused vocational education. These have widened access, especially to minorities and other disadvantaged students, increased enrolments considerably, and are thought to contribute significantly to the rejuvenation of the British economy.

India

Shortly after its independence in the 1950s, the Indian Government established five Indian Institutes of Technology (IITs) across the country. These were in essence

universities enjoying autonomy like any other university and the right to award degrees. Initially each of the five IITs had a different international affiliation with a similar institution – in France, the Soviet Union, the UK, the US and Germany. Over the years they have evolved into prestigious institutions in the fields of science and technology; 90 000 students apply annually for admission but only 1300 are admitted. The Delhi IIT enrols 1300 undergraduates and 1700 postgraduates. Interdisciplinary research in fields such as biomedical sciences and environmental sciences is a particular feature. The humanities are integrated with the sciences in the hope that graduates can take responsible decisions as leaders. About a third of the graduates emigrate.

A recent CBS programme reported that of 178 000 applications to the Mumbai IIT, only 3500, or two per cent, of the applicants were accepted. Students who fail to gain admission to these IITs sometimes do gain admission to prestigious US institutions such as Harvard, MIT and Cornell. Interestingly, many who graduate from the IITs do so with entrepreneurial skills. The total cost to the student at the IITs amounts to about US$700 per year, including residence costs – a fraction of comparable costs at US institutions. About 2000 IIT graduates emigrate to the USA annually; a small number return. However, increasingly, funds from these graduates are sent back to India and some have persuaded their companies to establish branches in India.

These Indian Institutes appear comparable to the renowned higher education institutes in the US – Massachusetts Institute of Technology, California Institute of Technology, and so on. In every sense of the term they could be characterised as comprehensive research universities in the mould of Harvard, Cambridge or the Sorbonne. It is not clear why these prestigious institutions were called institutes of technology and not universities. One can only assume that their overwhelming concentration on science and technology was the distinguishing feature. Yet in South Africa the Minister found the term 'institute of technology' (as in Durban Institute of Technology) acceptable for a short while before he had a change of heart and designated the technikons universities of technology. As far as is known, neither the mission nor any other aspect of these institutions had undergone any change during this period.

The university of technology

The Committee of Technikon Principals' position paper (CTP, 2001) defines a university of Technology (UT) thus: 'If the ethos, role and value system of a particular institution is largely in agreement with that as set out for a "University of Technology" such institution should have the right to call itself a "University of Technology", irrespective of its size and research outputs.'

South Africa, the paper proceeds to state, will have a wide spectrum of UTs, some large, some small, some situated in industrialised areas and others in rural; some either with a national, local or international outlook; some engaged in research and development; others dealing with the problems of local communities and small and local businesses. The net effect will be the same: making knowledge useful, up-skilling, re-skilling, multi-skilling, responsiveness and relevance. The paper lists the core features of a UT:

- It specialises in making knowledge useful, thus constituting a dynamic and excellent higher education system for SA.
- It contributes to greater technology transfer and international competitiveness.
- It embraces recognition of prior learning (RPL), flexible entry requirements, and creative ways to identify latent skill and talent.
- It reconceptualises a university as learner-centred rather than faculty-centred.
- Cooperative education is one of its key strengths.
- It moves from prestige-driven to market-driven philosophies.
- It recognises that the culture of excellence nurtured by traditional universities will no longer be accepted by the general public and new era universities will become the mode.
- It specialises in multi-disciplinary teaching and application of knowledge.
- It specialises in research and innovation and makes no clear-cut distinction between basic and applied research.
- The emphasis is on teaching and learning, responsiveness and innovation.
- There is continuous upgrading of knowledge and skills.
- There is greater commitment to service and upliftment of the community.
- It has work ethics, an ability to work in multicultural teams, and produces students for life.

The CTP paper lists the advantages of a UT:

- Recognition and credibility, especially in the international arena.
- Help in recruiting quality teaching and research staff.
- Improved access to funding, especially for research and postgraduate programmes.
- Stronger appeal for students as institution of first choice.
- Recognition by national and international organisations and agencies.
- Being in a better position to add knowledge by offering higher levels of learning through technology-diffused programmes at undergraduate and postgraduate level.

Table 1: Typical roles and values of the traditional university compared with the university of technology

Traditional university	University of technology
Education	Education and skills – world of work
Preservation of culture	Promotion of business and work ethics
Basic research and scholarship	Applied research, innovation and scholarship
Critique of society	Good citizenship
Service to community	Service to community
Academic freedom	Accountability
Rational spirit of Inquiry	Innovative thinking
A community of scholars	A community of scholars
Commitment to excellence	Commitment to excellence
Shared governance	Participative governance
	Responsiveness and relevance

Many of the characteristics of the UT alluded to in the CTP paper match the dual sector type described above in the Australian case. Referring to Table 1, it would be difficult to accept that academic freedom is a characteristic of a traditional university while accountability is a characteristic of the UT. There is emerging consensus that academic freedom has to be exercised within a framework of accountability as spelt out in the White Paper on higher education (DoE, 1997).

It is hard to find evidence in the literature that provides an acceptable definition of a university of technology. Brook (2000), identifies the following five characteristics of the Auckland University of Technology:

- Being research-informed rather than research-driven.
- Being focused on a curriculum that meets the needs of the related industry and professions.
- Being engaged in research that meets the needs of professions and industry.
- Providing high quality vocational education both at degree and sub-degree level.
- Offering degrees that are vocationally relevant and involve the acquisition of technological competence.

The author then proceeds to differentiate these characteristics from those of a classical university but qualifies these differences by referring to their very general nature.

Table 2: Comparison of Auckland University of Technology with the classical university

AUT	Classical university
Research-informed	Research-driven
Curriculum developed around the graduate profiles defined by industry and the professions	Curriculum developed around the academic discipline
Focus on strategic research, applied research, research into professional practice	Focus on pure or basic research
Multi-level entry and exit points for students	Focus predominantly on degree- and postgraduate-level study
Concerned primarily with the development of vocational/professional education	Concerned to some extent with higher education as an end in itself
Technological capabilities take precedence over cognitive skills	Cognitive skills take precedence over technological capabilities

National Working Group recommendations

The National Working Group appointed by the Minister of Education to advise him on the restructuring of the higher education landscape in 2001 published indicators and benchmarks for universities and technikons. These benchmarks attempted to determine the shape of institutions based on enrolments across broad fields of science, engineering and technology (SET), business and management studies and humanities. For technikons it was proposed that the FTE enrolments by CESM category groupings should be 70 per cent for SET and business management with at least 30 per cent in SET. For research for technikons, 0.2 research outputs per full-time academic staff member per annum was the benchmark. There is no evidence to indicate that these criteria were applied by the Minister in arriving at the decision to call former technikons universities of technology.

The inverted pyramid and the dual nature of the economy

It is widely believed that the transition from an industrial economy to an information economy changes the job/skills model, resulting in a huge demand for high-level skilled people rather than semi-skilled or unskilled workers. However, in disaggregating the large percentage of the high-level skilled workforce, there is considerable debate about

whether a country should pursue a high-skills or low–skills strategy for economic growth. The view advanced by King and McGrath (1999) of a twin strategy is an alternative model that deserves consideration. Young (2001) argues that the economic advancement of a country depends on the extent to which knowledge and skills are diffused throughout the population. It is thus clear that the higher education sector, which currently caters for 15 per cent of the cohort aged 18–21 years (postulated to increase to 20 per cent by the end of the decade), cannot fulfil this role. In the South African situation, if the DoE's target of an increase to one million technical college learners from the current 250 000 is to be achieved, the two per cent of the education budget spent on the FET Sector compared to 15 per cent on the higher education sector will not suffice.

In this context the former technikons, now universities of technology and comprehensive institutions, can help reverse the inverted pyramid,

- first by providing a range of career-focused vocational and technical training programmes, especially at the certificate and diploma levels;
- second by continuing to admit students without matriculation exemption, thus widening access; and
- third by encouraging articulation between the FET Sector and the universities of technology.

The idea of reverse transfer is an interesting one. By this is meant, for example, a student who acquires a three or four year UT or university bachelor's degree in the humanities or social sciences and then proceeds to obtain a diploma or certificate at a UT or goes to an FET (technical) college to be trained in a particular skill for one or two years, such as computer skills, photography, graphic design etc. This offers a powerful combination of general education and vocational training, well suited to the changing nature of the workplace in the information and technology driven age. This kind of transfer is common practice in the Australian TAFE System. In the USA one in every ten community college students has a bachelors degree. If one considers that there are 12 million community college students in the USA, then 1.2 million students transfer from universities to community colleges. Reverse transfer is rare in SA for two possible reasons: elitist notions of education and the quality of the FET Colleges and their offerings. An improvement in the quality and efficiency of FET colleges should place them in a position to attract degree students and make them more employable.

While articulation occurs in both directions, it has been shown that more students transfer from higher to vocational education than from vocational to higher (Golding,

1985). Furthermore, such dual sector graduates tend to have a competitive advantage in seeking employment (Marginson, 1997).

Quality assurance in the South African Higher Education System

Many countries have in recent years introduced quality assurance systems to improve the quality of their programmes and provide students and employers with indicators of the value of higher education institution graduates. The construction of a national quality assurance system is a key component of the broad and far-reaching restructuring of the South African Higher Education System. The system is intended to support the purposes and goals of higher education identified in the Education White Paper 3 (DoE, 1997). Quality is identified as one of the principles, together with equity and redress, democratisation, development, effectiveness and efficiency, academic freedom, institutional autonomy and public accountability, that should guide the transformation of higher education.

The Higher Education Quality Committee, an independent coordinating body constituted as a sub-committee of the Council on Higher Education, 'is committed to a quality driven higher education system that contributes to socio-economic development, social justice, and innovative scholarship in South Africa' (HEQC, 2001). The quality assurance system has to be implemented in the context of the changing size and shape of the higher education system, as witnessed by the mergers currently going ahead. In addition, the landscape of the sector is very uneven, with advantaged and disadvantaged institutions, urban and rural institutions, universities, technikons and colleges. It also has to contend with a growing private higher education sector as well as competition from international institutions which are offering programmes in South Africa.

In accordance with the Higher Education Act, 1997, and the quality assurance responsibilities of the CHE, the HEQC will

- promote quality among higher education providers;
- audit the quality assurance mechanisms of higher education institutions;
- audit the higher education providers to offer programmes leading to NQF (National Qualifications Framework) registered qualifications; and
- coordinate and facilitate quality assurance activities in higher education within a partnership model.

A differentiated higher education system

The legislative and planning documents in South Africa support a higher education

system that will comprise a set of differentiated and diverse institutions which will respond effectively and efficiently to the varied needs of the country and its students. Evidence suggests that functionally differentiated educational institutions can only be maintained in formally differentiated educational sectors. 'But the fundamental point is that the answer to the question of whether or not a nation wants a highly differentiated set of tertiary education institutions, serving the diverse needs of an extremely heterogeneous mass student clientele, rests on a policy decision: it cannot be left to the market to resolve' (Meek et al., 1996).

In considering possible criteria for differentiating universities and polytechnics, Silver (1983) concludes that the boundaries are increasingly blurred and 'it is impossible to discriminate between the university and other sectors of higher education on the basis of defensible criteria'. This is due in part to the rapid growth of knowledge in the 20th century and the fact that it is no longer compartmentalised into discrete areas but increasingly interconnected in emerging new fields – bioethics, genetic engineering and its applications, neuropsychology and many others. Thus we refer to mode II, interdisciplinary and transdisciplinary knowledge. Moving from theoretical into vocational fields demands intellectual rigour.

Given the lack of uniformity in designating higher education institutions for different missions, objectives and goals across the world, there hardly seem to be cogent arguments for calling certain higher education institutions universities of technology. Through mergers, the higher education landscape will be dramatically changed, and reduced from 36 to 21 institutions. An alternative approach would be to call all 21 higher educations institutions universities and, through definitive policy decisions, as suggested by Meek et al. (1996) and Meek (2000), to steer into place over time a differentiated higher education system to serve the varied needs of the country and its students. Such steering instruments are already in place in South Africa and include planning, funding and quality assurance.

The role of the HEQC

Despite the lack of defensible reasons for the designation 'universities of technology' the HEQC, in terms of its mandate, has to both audit these institutions and accredit their programmes. In doing so, what criteria will it use to differentiate them from other higher education institutions? In the South African case these will comprise the conventional university, the comprehensive university (the result of merger between a university and a technikon), institutes of higher education (yet to be established) and colleges such as agricultural and nursing. The following questions need to be considered.

1. *What is a UT and what distinguishes UTs from other higher education types? What is the appropriate UT for the South African context?*

The above review has provided some ideas as to what might constitute a UT. The five characteristics of the Auckland University of Technology listed above, as identified by Brook (2000), capture the essence of a UT. To this list can be added several features identified by the Committee of Technikon Principals (2001). A UT

- contributes to greater technology transfer and international competitiveness;
- embraces recognition of prior learning (RPL), flexible entry requirements, and creative ways to identify latent skill and talent; and
- cooperative education is one of its key strengths

In the language of the technikons, the offering of career-focused/vocational types of qualifications is repeatedly emphasised

It would therefore seem that the above features should figure prominently in the audit/programme accreditation criteria being developed by the HEQC. It would be difficult and perhaps inappropriate to define precisely what the appropriate UT for South Africa should be at this stage. It would come about through a process of evolution tempered by demographic characteristics, socio-economic imperatives and guided by the steering instruments of planning, funding and quality assurance.

The merger of a university and a former technikon in South Africa is referred to as a 'university'. In the Australian experience they are referred to as 'universities of technology'. These dual sector universities, it is claimed, have the potential to transcend the fractured educational arrangements through coherent learning pathways and meet the learning needs of students. There are differences between the missions of higher and vocational education but there is also a growing convergence between them. Doughney observes: 'Thus rather than narrowly defining the mission of each sector, a model of "continuous education" recognises that both sectors provide general and vocational education' (2000). There are dangers of homogenisation and academic drift but dual sector institutions may find it advantageous to promote a range of offerings, from certificates to diplomas to first degrees to doctorates. The challenge is to retain the distinctiveness of vocational education while promoting seamless tertiary education.

The HEQC has to address this challenge of the dual sector comprehensive university as well as that of the UT. In the case of the comprehensive, the HEQC has to be particularly vigilant about academic drift, blurring of the boundaries between academic and vocational programmes, and the sensitivity of applying two approaches in a single institution.

2. How can technikons transform their current missions and core functions to become UTs?

The National Working Group appointed by the Minister of Education to advise him on the restructuring of the higher education landscape in 2001 published indicators and benchmarks for universities and technikons. These benchmarks attempted to determine the shape of institutions based on enrolments across broad fields of science, engineering and technology (SET), business and management studies and the humanities. For technikons it was proposed that the FTE enrolments by CESM category groupings should be 70 per cent for SET and business management with at least 30 per cent in SET. For research for technikons, 0.2 research outputs per full-time academic staff member per annum was the suggested benchmark.

The current trend indicates that increasingly technikons are exhibiting a drift towards university type programmes – postgraduate degrees, the humanities and research endeavours in some cases. The fact that technikons are becoming more attractive than universities and are the first choice for some students indicates that they are successfully addressing students' needs. In order to remain true to their core functions UTs should

- guard against academic drift to university type disciplines and programmes;
- keep the focus on career-type vocationally driven programmes that would command employability;
- deepen and widen experiential learning through strengthening their cooperative programmes;
- develop and provide criteria to admit an increasing number of adult/workplace students through recognition of prior learning;
- retain flexibility in admission criteria through not insisting on matriculation exemption especially for certificate and diploma type programmes; and
- encourage 'reverse transfer' i.e., university degree students enrolling in UTs/ FET colleges to acquire particular skills through obtaining a diploma or a certificate.

3. What are the implications of becoming a UT for industry, community and professional partnerships?

- Industry: The former technikons, now UTs, have historically had a relationship with industry through cooperative learning and advisory boards. However, the quality of this learning and the role of the advisory boards in monitoring

and strengthening this form of learning have been uneven. SERTEC evaluation over the years was not thorough or systematic, nor had it developed explicit criteria to evaluate this aspect of learning. In comparison, many of the former polytechnics, now the newer universities in the UK, have developed cooperative learning to new levels and it is believed that their contribution to the vibrant British economy in terms of skills development has not been insignificant. Now is the opportunity for the newly established UTs to strength and deepen this relationship. There should be a much more closely integrated relationship between the academic classroom and the industrial floor. Clear guidelines should be developed for time schedules, supervision and the translation of theory into practice. The academic staff of the UTs and their counterparts in charge of the industrial workplace should be in constant dialogue about the nature of this learning. Overseeing this are the properly constituted advisory boards, which should comprise the academic staff, industrial staff, community representatives and students. The boards should meet periodically, say three times a year, to review progress and make an input into curriculum review and curriculum development as well as into the methods of assessment. It is critically important to obtain student feedback in order to improve the quality of this learning process.

- Community: It has already been mentioned that community representatives can form part of the advisory boards in order to strengthen cooperative learning. They should also be members of the Councils of the UTs. In such a role they could convey to the management of the UTs the community's perception of the institution and its graduates and also convey to the community the tasks, challenges and achievements of the institution. Most of the UTs are blessed with generous facilities – lecture rooms, meeting rooms, sports facilities such as swimming pools, and computer facilities. This infrastructure can be put at the disposal of communities, in many cases disadvantaged, to build sound community–institution relations. While service learning or community engagement is a popular notion, there is not much to show in terms of concrete results. These well-endowed institutions have the opportunity in their reincarnated form to provide a range of services integrated with the learning process – health services, law clinics, computer literacy, adult literacy, nutritional advice, HIV/AIDS counselling, small business expertise, water conservation, recycling of refuse and other aspects of sustainable development. It is important to underline and caution that UTs should not become welfare agencies but should carefully scrutinise community relationships so that they become embedded in core academic activities and with time become an intrinsic component of the broad learning process.

- Professional partnerships: These can be forged with a range of partners – with the community (as discussed above) and with industry in the case of cooperative learning. In addition there are opportunities for forging partnerships with other local, national and international institutions. In the case of local partnerships it would be an advantage to form a relationship with the local conventional university. Among the opportunities that could be explored are student mobility with credit transfer, staff exchange, research cooperation, and joint invitations to overseas academics, for example sharing Fulbright scholars. International relationships should also be developed but these should carefully scrutinised to ensure that they are mutually beneficial, that funds have been sourced and that bureaucratic processes do not hamper such relationships. In this context it would be beneficial if such partnerships could be developed with one or more African higher education institutions. Professional partnerships with schools and FET colleges should also be explored. In the case of schools, improving teacher education and making available the vast infrastructure of the UT during, for example, vacation periods, of computers, library and laboratory facilities would contribute to improving the quality of incoming students. The further education colleges which are being transformed need a great deal of assistance in upgrading management and staff qualifications and expertise and in curriculum development. These institutions, which are currently grossly underdeveloped, can play a vital role in mid-level skills training and can be an important feeder institution to the UTs.

4. How should technikons re-orient their quality systems (planning, policies, implementation, monitoring and re-planning) to help them become UTs?

As imperfect they were, the former technikons have had experience of quality assurance through SERTEC for nearly a decade. In their strategic planning and resource allocation they should focus on the following aspects:

- Staff development: A Department of Education survey has found that only a minority of staff at the former technikons have masters degrees and even fewer have doctorates. These institutions should set targets and help staff upgrade their qualifications if they are to be worthy of the designation 'university of technology'. This will also be necessary because they now intend to engage in research. Sessional staff who are employed in industry make a vital contribution to teaching at the technikons by infusing practical and updated skills techniques. They are also important in introducing cooperative education that links industry and the academic institution. This sector should be nurtured and

integrated with the full-time academic staff. Their views on curriculum change and development should also be valued.

- Curriculum review, change and development: These should be a dynamic part of the institution. On the one hand it must guard against academic drift into university type programmes; on the other it must ensure that recent, innovative and cutting edge knowledge is continually infused into the curriculum. It must also ensure that it addresses local, national and global imperatives.
- Cooperative learning: This has been described above. It should be continually monitored and improved with student feedback. Carefully targeted placements could also pave the way for employment opportunities for at least some of its graduates.
- Graduate tracking: This is a necessary research tool for determining whether education and training is being provided via appropriate disciplines and programmes and qualifications. The Ministry of Education is deploying planning and funding mechanisms in order to have the appropriate programme and qualifications mix (PQM) so that we develop a more responsive higher education system than in the past. However well intentioned, planning mechanisms are at the best 'guesstimates'. Research informed by the tracking of graduates will provide the necessary corrective back-up.
- Adult students: The DoE has found that admission of adult students has hardly improved within the higher education system in recent years. RPL provides a mechanism to improve the situation. The new UTs need to pay urgent attention to policies for RPL, including criteria for admission and assessment methods .
- Research: Brook (2000) refers to UTs as being research-informed rather than research-driven and also states that they should meet the research needs of the professions and industry. In South Africa the former technikons were not funded for research until recently, so they have yet to develop a research culture and expertise. Their staff in most cases have had little experience of formulating original research projects. In the UK, the polytechnics, which became universities in the 1990s, followed two distinct trajectories. One group focused on its mission of providing vocational and career-oriented education and training to an increasing number of non-traditional students, thereby widening access significantly. Thus the tradition of university education being the preserve of the elite was once and for all broken. These institutions also developed intense and productive relationships with industry and the business sector, thus enhancing and deepening cooperative education. The second group embarked on developing a research culture, with large investments, in an attempt to compete with well-established research universities such as Cambridge, Oxford and the newer redbrick universities of Birmingham,

> Sheffield, Manchester. The UK research assessment exercise showed that they invariably came out second best. Are there lessons here for our fledgling UTs? Given the limited research funds available in the country and the lack of research capacity, these institutions should follow a research trajectory with caution and discretion. Perhaps it will not be necessary for all of them to become research institutions. Those who choose to do so should carefully target and define their research niches, with an applied, strategic research focus, and develop the appropriate research capacity.

5. *How should the HEQC approach its quality assurance mandate, that is, institutional audit, programme accreditation, and capacity development, in relation to UTs?*

The above review and analysis provides a 'road map' which the HEQC can use to guide its quality assurance mandate.

Institutional audit: The HEQC sets out its approach to institutional audits in its framework document:

> In line with the vision of White Paper 3 (DoE, 1997), a programme for the transformation of higher education for a single, coordinated higher education system, this document sets out a common institutional framework for universities, technikons/universities of technology, agricultural colleges, private providers and other providers whose programmes and qualifications fall under the jurisdiction of the HEQC. The specific needs and circumstances of different sectors within higher education will be taken into account within parameters of the common policy framework ... Audits will also address quality related issues pertaining to the adaptability, responsiveness and innovativeness of institutions in the production of new knowledge and skills, and the utilisation of new modalities of provision. In addition, audits will seek to evaluate institutional initiatives to produce a vibrant intellectual culture both within the institution and in society, and act as incubator of new ideas and cutting edge knowledge as part of the national system of innovation. (CHE, 2004a)

Although it is clear that there is no universal consensus of what constitutes a UT, this review has attempted to provide some elements and a yardstick for what these institutions might be. Thus the institution's mission should reflect its core features – being focused on vocations and careers, technological competence, readily employable graduates, cooperative education and flexible admission criteria. Some other matters to consider are:

- Community engagement, research, satellite campuses and distance education – if these are part of the mission, special attention should be given to each of these in the audit.
- Whether quality assurance is an integral part of the planning process. Is there a quality assurance unit and, if so, at what level is its head appointed and what is the reporting structure? Ideally it should be to the DVC (academic). What resources are allocated to the unit?
- As regards cooperative learning, among matters to be verified are policies, the relationship between the institution and the industry floor, the role of mentors in the industrial workplace, the role of advisory boards, feedback from students, monitoring and assessment.
- Where professional bodies are involved in the auditing process, the HEQC would have to work closely with these bodies and ensure that they function within its broad conceptual framework of quality assurance. Their primary role would be in programme accreditation.
- As regards teaching and learning, consideration must be given to reviewing the curriculum to see whether it reflects the latest developments in vocational, technological education and training.
- Graduate tracking to inform the PQM.
- Policies and procedures for RPL.

Programme accreditation: the overarching question is to verify whether the PQM is reflective of a UT and that academic drift is being monitored and contained. In many instances the HEQC will undertake programme accreditation jointly with professional bodies.

Capacity development: the areas of focus should be

- staff development in order to upgrade their qualifications to a level consistent with a university;
- particular emphasis on research capacity development should that be specified in the mission of the institution;
- quality assurance capacity, especially self–evaluation;
- staff capacity to manage cooperative learning; and
- if specified in the mission, capacity to manage and operate community engagement activities, open and distance learning and satellite campuses.

REFERENCES

BOK, D 1986. *Higher learning.* Cambridge, MA: Harvard University Press.
BOYER, EL, 1990. *Scholarship reconsidered: Priorities of the professoriate.* Princeton, NJ: Carnegie Foundation for the Advancement of Teaching.
BROOK, D, 2000. Diversity in the university sector: Can an alliance protect it? *Higher Education Review,* 32: 7–24.
CTP (COMMITTEE OF TECHNIKON PRINCIPALS), 2001. Position, role and function of universities of technology in South Africa. Committee of Technikon Principals, Pretoria.
CHE (COUNCIL ON HIGHER EDUCATION), 2004a. *Framework for institutional audits.* Higher Education Quality Committee, June.
CHE (COUNCIL ON HIGHER EDUCATION), 2004b. *Criteria for institutional audits* – Higher Education Quality Committee, June.
DEARING, J, 1997. Higher Education in the learning society. Report of the National Committee of Inquiry into Higher Education to the Secretaries of State for Education and Employment, Wales, Scotland and Northern Ireland, 23 July.
DOE (DEPARTMENT OF EDUCATION), 1997. *White paper 3. A programme for the transformation of higher education.* Department of Education, Pretoria.
DOE & DOL (DEPARTMENTS OF EDUCATION AND LABOUR), 2003. National Qualifications Framework: An Interdependent System. Consultative Document. Departments of Education and Labour, Pretoria.
DOUGHNEY, L, 2000. Universal Tertiary Education: how dual-sector universities can challenge the binary divide between TAFE and higher education – the case of Victoria University of Technology
GOLDING, B, 1995. Intersectional articulation and quality assurance. *Journal of Tertiary Adminstration,* 17(1): 21–38.
HEQC (HIGHER EDUCATION QUALITY COMMITTEE), 2001. Vision and Mission Statement.
HOLIDAY, A, 2003. An ice pick to the life of the mind. *Cape Times,* 11 November.
..., 2002. Implementation of the National Qualifications Framework, Report of the Study Team, Departments of Education and Labour, Pretoria.
JANSEN, J, 2004. One sharp scalpel in education. Interview with Siphiwe Mpye. *Saturday Star,* February 7, p. 7.
KING, K & MCGRATH, S (Eds), 1999. Enterprise in Africa: Between poverty and growth, London: Intermediate Technology Publications.
LEVINE, AE, 2000. The future of colleges: 9 inevitable changes. Chronicle of Higher Education, 27 October.
MARGINSON, S, 1997. *Markets in education.* Sydney: Allen & Unwin.

MEEK, VL, 2000. Diversity and marketisation of higher education: Incompatible concepts. *Higher Education Policy,* 13: 23–9.
MEEK, VL, GOEDGEBUURE, L, KIVINEN, O & RINNE, R, 1996. *The mockers and the mocked: Comparative perspectives on diversity, differentiation and convergence in higher education.* Oxford: Pergamon.
MOE (MINISTRY OF EDUCATION), 2001. *National Plan for Higher Education.* Ministry of Education, Pretoria.
NCHE (NATIONAL COMMISSION ON HIGHER EDUCATION), 1996. A framework for transformation. Parow: CTP Book Printers.
PATERSON, G, 1997. *The university from ancient Greece to the twentieth century.* Palmerston North, NZ: Dunmore.
RAMSDEN, P, 1994. Describing and explaining research productivity. *Higher Education,* 27: 207–26.
SILVER, H, 1983. Higher education: The contenders. In Phillipson, N (Ed.), *Universities and the future.* Edinburgh University Press.
WEST, R ET AL., 1998. Review of higher education financing and policy. DEETYA (Department of Education, Training and Youth Affairs), Commonwealth of Australia.
YOUNG, M, 2001. Human resource development strategies: Some conceptual issues and their implications. In Kraak, A & Young, M (Eds), *Education in retrospect: Policy and implementation since 1990.* HSRC (Human Sciences Research Council), in association with the Institute of Education, University of London.

UNIVERSITIES OF TECHNOLOGY: WHAT IS THEIR DISTINCTIVE ROLE?

Geoff Scott*

A NEW AND VERY DIFFERENT OPERATING CONTEXT TRIGGERS THE NEED TO (RE)DEFINE THE CONCEPT OF A UNIVERSITY

A rapidly shifting and increasingly uncertain operating context for universities has triggered increased focus on what exactly distinguishes such an institution from other post-secondary and higher education providers. This new operating context is characterised by the *combined* impact of the following forces for change.

Over the past decade there has been a significant decrease in the proportion of university funding provided from the public purse in many countries. This decrease has been due, in part, to the rapid take-up of expanded opportunities to attend university and insufficient public resources to fund the expansion. In countries like Australia this has been accompanied by a significant change in funding processes and the promulgation of new legislation – the Higher Education Support Act 2003 – to enable expansion. A new Australian HE funding system now provides access to fee-help schemes for domestic students undertaking higher education courses not at public universities but at private, for-profit institutions. It also allows public universities increased flexibility to increase the fees charged to government-supported students by up to 25%.

As the proportion of funding from the public purse has decreased, universities have had to identify and sustain new sources of income to remain viable. This has led to a rapid increase in, for example, the international higher education export market. From relatively low numbers a decade earlier, by 2003 some 210 000 international students were enrolled in an Australian university, generating a total annual economic benefit of approximately $5 billion per annum.

The opening up of what are seen to be lucrative new international and local markets has led to increasing competition from overseas higher education institutions and a rapid increase in local private and for-profit providers. Ongoing developments in IT have enabled offshore institutions using the name 'university' to operate electronically in different countries without having to submit themselves to local accreditation

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or quality assurance procedures. These developments have combined with global developments in trade, including the Free Trade Agreements, the GATS, the Bologna Accord and other initiatives aimed at supporting cross-border trade to further 'open up' the higher education export market. This, in turn, has made the operating context of universities increasingly volatile.

As fees and competition have grown, students have become increasingly interested in pursuing their rights as consumers to receive maximum value for their money. This trend has generated increasing levels of student complaint and litigation in many countries. The combined effect of these change pressures has been to trigger a wide range of initiatives to track and assure the quality of higher education more closely.

New sources of income, in particular the funding generated from the 'higher education export market', are seen as being associated with increasing levels of risk by governments and the governing boards of universities alike. Furthermore, the sustainability of such new sources of income is hard to predict in an increasingly competitive and volatile market. This in turn has triggered a much more systematic focus by universities and the government on assuring consistent quality, irrespective of where a university's accredited course is delivered. External scrutiny and reporting requirements, primarily by government, have grown rapidly. This is understandable, but is also to some extent paradoxical, as the proportion of higher education funded from the public purse is decreasing. Many countries now have external quality assurance agencies and reviews of the higher education systems are increasing in number and intensity.

Australian universities have not escaped the combined impact of these trends and what constitutes a university in this new operating context is now the subject of widespread discussion in a round of consultations between the government and the sector. This focus has been exacerbated by quite different uses of the term 'university' and controls over its use and the standards that underpin it in the many countries now involved in the extensive global, cross-border activities that that have emerged.

Defining a university

The term 'university' comes from the Latin, universitas – a corporation, body of persons, or guild (of teachers and students).[1]

In Australia, under the MCEETYA Protocols 2000, the name 'university' is protected and 'the establishment or recognition as a university in Australia should only

occur by the mechanism of legislative instrument, either by a separate Act, or by a Regulation or order made under an Act' (MCEETYA, 2000, Protocol 1.8. p. 6). The Protocols identify a set of criteria which together constitute one operational definition of a university:

- Authorisation by law to award higher education qualifications across a range of fields and to set standards for those qualifications which are equivalent to Australian and international standards;
- Teaching and learning that engage with advanced knowledge and inquiry;
- A culture of sustained scholarship extending from that which informs inquiry and basic teaching and learning, to the creation of new knowledge through research, and original creative endeavour;
- Commitment of teachers, researchers, course designers and assessors to free inquiry and the systematic advancement of knowledge;
- Governance, procedural rules, organisation, admission policies, financial arrangements and quality assurance processes, which are underpinned by the values and goals outlines above, and which are sufficient to ensure the integrity of the institution's academic programmes; and
- Sufficient financial and other resources to enable the institution's programme to be delivered and sustained into the future.

(MCEETYA, 2000, Protocol 1.14, pp. 7–8)

Overseas higher education institutions seeking to operate in Australia are subject to a specific set of criteria and processes which build on Protocol 1. Protocol 2 covers what is required. Non-self-accrediting institutions (private providers) can apply to have each higher education course they wish to provide accredited by a State Office of Higher Education. Protocol 3 covers this process. Of the remaining protocols, Protocol 4 covers delivery arrangements involving other organisations (both onshore and offshore) and Protocol 5 covers the endorsement of courses for overseas students for the purpose of being listed on the Commonwealth Register of courses for overseas students.

During April 2005, given the combined effect of the change forces outlined above, the Commonwealth Government of Australia engaged in a set of consultations with key stakeholders aimed at revising the 2000 MCEETYA Protocols. The focus was specifically to review Australia's future accreditation and approvals processes for higher education. This process was supported by a Commonwealth Government discussion paper, 'Building university diversity'

(www.dest.gov.au/highered/pubs/buildingdiversity/default.htm).

The questions explored in these consultations have included:

- Given the changed environment for higher education in Australia and globally, is there a need to accommodate a broader range of institutions in the National Protocols?
- Should the National Protocols accommodate specialised institutions?
- Should the National Protocols provide for different ways of regulating private and for-profit higher education institutions?
- Should a higher education institution that has demonstrated over time its capacity to achieve reaccreditation of its courses be able to seek authorisation to accredit its own courses?
- What nomenclature would be appropriate to designate the different types of institutions within a restructured National Protocols?

The discussion at one of the state consultations with senior staff from a wide range of universities and private providers is indicative of the current debate about what exactly distinguishes a 'university' from other post-secondary providers.[2]

A university should, said the senior academics present, focus not just on education up to doctoral standard but on research and systematic community engagement.[3] Whether a university can be called such if it does not engage in research or only does a little is a key element of the emerging discussion. Many emphasised that targeted, sustained two-way engagement with the professions and other key groups is also a core function of a university – especially if this gives consistent focus to furthering the 'public good' and links directly to the educational and research activities of the institution. If offshore universities wish to operate in Australia it was emphasised that they should not only be demonstrably up to the Australian standard[4] in their educational programmes, research and the systems that underpin them but also actively involved in community engagement and assistance activities. Like any Australian university they should also, said participants, be subject to periodical audit by the Australian Universities Quality Agency (www.auqu.edu.au).

A university must be demonstrably operating at a 'tertiary standard'. This requires that there be carefully applied admission standards and moderated marking and assessment criteria which clearly focus on:

- higher order intellectual capabilities – such as the ability to get to the core issue in complex practice situations, to trace out the consequences of alternative solutions, to work out what the problem is in any situation rather than simply being able to solve predetermined problems; and

- key elements of emotional intelligence – such as the ability to work productively with diverse groups, to work as a member of a team, to tolerate ambiguity, work with conflict, manage change.

Simply testing key facts and skills was seen as being necessary but not sufficient to constitute a university standard of assessment.

The institution should also be academically independent of external interference and pursue rigorous processes to assure the quality of what it researches, delivers and says. In terms of educational profile a university, said these participants, should provide a wide range of courses, not just one or two, and these should operate from the undergraduate right through to the postgraduate level. It was agreed that there should be a clear nexus between the research and educational activities of the university and that it is this nexus which helps distinguish a university from a technical or community college. A broader definition of research, along the lines proposed in the 1990s by Ernest Boyer, may be necessary.[5] There was general agreement that, either way, a university must have research students, up to doctoral level.

It was noted that a wide range of university courses (from Engineering to Medicine) is also subject to accreditation by an external national professional accreditation body. This was seen as constituting an additional quality assurance mechanism with which to ensure that the programmes meet both professional and academic standards.

A number of dilemmas were seen to be emerging as universities seek to manage the new operating environment, such as how best to

- balance mission with market;
- provide a broad profile while making a profit;
- open up access to HE while maintaining university standards;
- combine blue sky research with research directly tied to the immediate needs of industry;
- provide access to local and international students;
- offer equity and also excellence; and
- balance consistency and diversity.

What is a university of technology?

The term 'technology' comes from the Greek, *teckhnologi* – systematic treatment of an art or craft.[6]

Given the new operating context and the general discussion outlined above of what distinguishes a university, what, then, specifically distinguishes a university of technology? What must it have in addition to the attributes characteristic of all universities? To answer this question we first need to define 'technology'.

Some dictionaries, for example the Macquarie Dictionary, take a very specific focus. Macquarie defines 'technology' as 'the branch of knowledge that deals with science and engineering, or its practice, as applied to industry'. Others, however, take a broader view and see it as a tool to achieve a positive and adaptive end and note that such tools do not necessarily have to be electronic or mechanical. Chambers Dictionary defines 'technology' as 'the practice of any or all of the applied sciences that have practical value and or industrial use; technical methods in a particular field of industry or art; technical means and skills of a particular civilisation, group or period'.

One way to explore the question further is to compare the missions of universities of technology with those of other sorts of universities. This comparison reveals that most universities of technology emphasise

- applied research through partnerships, especially research into a wide range of technologies with a focus on their use for social good and for assisting key societal development agendas (for example, in the context of South Africa such research might include looking at ways of dealing with HIV/AIDS, water shortages, sustainability, bridging the digital divide, developing sustainable small businesses and entrepreneurs);
- research into the differential social impact and consequences of developments in new technologies;
- the creation, dissemination and commercialisation of technologies relevant to the national imperatives; and
- the productive use of a range of technologies for the benefit of all, not just the few.

However, most universities, in order to position themselves favourably in the new, more competitive context outlined earlier, now also talk about being increasingly applied, problem-based, partnered and practice-oriented, as well as student-centred. It is quite common in fact for universities of all types to emphasise the way they promote theory–practice links, offer a wide variety of practice-based learning opportunities, work closely in partnership with targeted communities, and so on.

Consider the following mottos and mission statements from six universities in Australia. The first two are universities of technology; the rest are not:

UTS	Think, change, do
QUT	A university for the real world
UWS	Bringing knowledge to life
Deakin	Progressive, relevant, innovative, responsive
Flinders	Think → Learn → Lead → Link
Latrobe	To be an internationally recognised leader in scholarly discovery, preservation, transmission and application of knowledge

This focus on linking knowledge creation with real world application is not new. Consider, for example, the following description (Eco, 1988) of the oldest university in the Western World, the University of Bologna:
Let us first set out what we at the University of Bologna mean by 'university':

a) A place where a scholar traces the outlines of a discipline and within this framework carries out precise research for the sake of knowledge;
b) A scholar while carrying out his research transmits his knowledge to a group of pupils who follow him freely, this being done outside any other official institution, whether of the church or state;
c) Society may, if necessary, turn to this centre of research to exploit its knowledge for practical ends.

So what might be the distinctive focus for a university of technology?

Given the fact that most universities, in addition to meeting the general distinguishing attributes of a university suggested earlier, are increasingly positioning themselves as being applied, what might be the distinctive mission for a university of technology? What might give it a distinctive edge in the challenging context outlined earlier? The following ideas have emerged out of the author's being involved in the development of one of Australia's universities of technology – the University of Technology, Sydney – for 15 years and through involvement in the development of the Australian Technology Network of Universities from the mid-1990s (see www.atn.edu.au).

A university of technology gives:

- *Consistent,* strategic attention to being applied across all of its activities, to being more outcomes-oriented than inputs-oriented, being consistently close to business and the professions as well as society, being hands on, career-focused.

- Specific attention in the assessment of every course to testing the key capabilities identified by research on what makes for a successful graduate in the unique context of the profession concerned. That is, the focus is on using the findings from *practice-oriented research with successful graduates* to ensure that assessment and the curriculum focus on what counts for effective early career practice in each profession. This approach to being practice-oriented is distinctive.[7]
- Focus in its research not only on investigating the practical problems that count most to the country and making sure that the solutions identified are used, but also on bringing *a multi-disciplinary perspective* to this research. This means that a university of technology will concentrate on researching the differential social impact and consequences of the developments in new technologies; on the creation, dissemination and commercialisation of technologies relevant to the national imperatives; and on the productive use of a range of technologies for the benefit of all, not just the few.
- Consistent attention to social *critique of all forms of technology* and their application; to ensuring that technology is used for positive, equitable social ends and in ways which are consistent with the national development agenda.
- Expert, research-generated *advice to government* on the wise, efficient, effective and equitable use of current and new technologies in key areas of social service as well as in business and commerce.
- Focus on showing higher education institutions the most productive ways of using *technology to support* a broader approach to blended and practice-oriented *learning* in their own educational and staff development programmes.
- Focus on providing access to higher education, especially by working in close partnership to support seamless access and appropriate, articulated *pathways from technical colleges* to universities of technology. In this regard dual-sector universities of technology in Australia such as RMIT University in Melbourne may be of interest.
- Consistent attention to becoming the national leader in *project management and effective change implementation* research.

CONCLUSION

This brief paper has argued that in a new, rapidly changing, globally shifting operating context it is critical that universities become clear about exactly what distinguishes them from other post-secondary providers and exactly what their unique contribution to national development is. As part of this process it is important that universities of technology identify a distinctive mission and focus.

It has been argued that this should be centred on the consistency with which they pursue theory–practice links, commit to not just identifying solutions to key national problems but making them happen, focus on checking that technological developments are nationally and equitably used, experiment with and apply the wide use of IT to support HE learning, provide systematic links between technical colleges and their own courses, and become a source of expert advice on key national development issues and effective change implementation.

Despite the pressures to 'commodify' higher education and develop more user-paid systems in many countries, a high quality, applied university education remains one of the most profound investments a nation can make in its total social, intellectual, cultural and creative capital. And in helping their country fulfil this purpose universities of technology have a critical role, especially if they pursue a common agenda such as that outlined above, and as a network rather than individually.

REFERENCES

BOYER, E, 1990. *Scholarship reconsidered: Priorities for the professoriate.* Princeton, NJ: The Carnegie Foundation for the Advancement of Teaching.

ECO, U (Ed.) 1988. *University of Bologna 1088–1988.* Milan: University of Bologna & IRI.

MCEETYA (MINISTERIAL COUNCIL ON EDUCATION, EMPLOYMENT, TRAINING AND YOUTH AFFAIRS), 2000. National Protocols for Higher Education, approved by the Ministerial Council on Education, Employment, Training and Youth Affairs, 31 March. DEST (then DETYA), Australian Government, Canberra.

SCOTT, G & YATES, W, 2002. Using successful graduates to improve the quality of undergraduate engineering programmes. *European Journal of Engineering Education,* 27(4): 363–78.

NOTES

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[1] This article is based on a position paper developed by a CTP Task Team in 2001, revised in 2004 and published as a book by Vaal University Press.

GEOFF SCOTT

[1] For web definitions see: http://www.google.com.au/search?hl=en&lr=&oi=defmore&q=define:university

[2] There were representatives – primarily at the VC, DVC, PVC and Executive level – from eight major Australian universities, five large private providers, the state and national governments and peak organisations at this meeting.

[3] Many Australian universities have community outreach as part of their legislated mission.

[4] See the Australian Qualifications Framework for indicators of the comparative standards required http://www.aqf.edu.au/.

[5] In *Scholarship reconsidered* (1990) Boyer identified four forms of research and scholarship: the scholarship of discovery; the scholarship of integration which makes connections within and across disciplines; the scholarship of application; and the scholarship of teaching where research on the practice of higher education is undertaken.

[6] For an article which discusses the history of the term see: http://www.techcentralstation.com/061103A.html

[7] For an example of how research on successful graduates in a specific profession can be used to make assessment and the curriculum relevant and the graduate capabilities developed more specifically situated in the profession concerned see Scott & Yates (2002).

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