Continuities and discontinuities in the journey from technikon to university of technology

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Abstract

This paper offers a `genealogy' (Foucault 1984) of technical higher education in South Africa. Key concepts in technological education and research, namely career focused education and applied research, were investigated through a study of documents and through interviews with lecturers and researchers in universities of technology. The genealogy describes how these concepts and their associated practices developed, changed and persisted across the period 1967 2004.

The genealogy identifies three `chronotopes' (Bakhtin 1981) in the development of technical higher education: in the first chronotope Colleges of Advanced Technical Education (as they were known) positioned themselves to serve the needs of industry; in the second chronotope, the technikons find themselves in a state of `academic drift' away from the practices of education for the needs of industry; in the third chronotope the universities of technology engage in processes of reinvention, realignment and enhancement, as the original mission of technical higher education is reconsidered in the light of changing contexts and changing needs.

INTRODUCTION: A GENEALOGY OF TECHNICAL HIGHER EDUCATION

Foucault appropriated the term ‘genealogy’ from Nietzsche (1887/2003), who used it metaphorically in The genealogy of morals to describe the role of historical contingency in the way in which values proliferate and come to be accepted as ‘common sense’. Foucault took up this term (in preference to ‘archaeology’) as more descriptive of an intellectual history, and developed it in his later work on institutions and discourses. Metaphorical genealogies, like real ones, are complex, even paradoxical. In once sense, a genealogy implies continuity, because elements of one generation can be passed on to another. Within a generation there can be regularity in the dispersion of elements such as technologies, media, institutions, disciplines, and values. In other words, the discourses that are prevalent at a particular time are likely to dominate across a wide variety of domains.

In another sense, genealogies foreground temporal discontinuity. Genealogies show how the past was different from, strange in relation to, or even threatening to
the present. Genealogies can disrupt the comfortable, intimate relations that historians typically claim link the past with the present. They show that the present is foreign and constitutes a break – often a violent break – with the past:

History becomes ‘effective’ to the degree that it introduces discontinuity into our very being – as it divides our emotions, dramatizes our instincts, multiplies our bodies and sets it against itself. ‘Effective’ . . . history will uproot its traditional foundations and relentlessly disrupt its pretended continuity. This is because knowledge is not made for understanding; it is made for cutting (Foucault 1984, 88).

The goal of a genealogy is to disrupt the present. The genealogist begins with a present phenomenon (such as a technikon) and tries to explain how it arose, developed and gained legitimacy. The genealogist is concerned with unmasking the processes that functioned (or still function) to render a historically produced phenomenon as natural and universal, rather than as historical and local.

Because institutions (like other social formations) cannot be understood in their entirety, Foucault recommends a ‘syncopated’ rather than a totalising approach to understanding them. This approach does not pretend to capture the whole of any social formation, and instead sets out to describe the uniqueness and oddities of its practices, and the ways in which these depend on the historical affordances of the time. The focus of this paper is on the educational practices, and emergent research practices, of technical higher education. The questions that I address with regard to these areas of focus are: What collection of ideas and practices in the 1960s and 70s enabled the establishment of these educational practices? And what subsequent collection of ideas and practices in the 1990s enabled technikons to embark on a path which would propel/compel them towards a research agenda? The genealogy is restricted to the five remaining technical higher education institutions in South Africa: the Cape Peninsula University of Technology, the Central University of Technology, the Durban Institute of Technology, Tshwane University of Technology, and Vaal University of Technology. Documentary data was obtained from the websites of the institutions and the Committee of Technikon Principals. Interviews were held with lecturers and researchers of the five institutions, whom I purposively selected as being at the cutting edge of change in the technikon system.

**FINDINGS: CHRONOTOPES OF TECHNICAL HIGHER EDUCATION**

Bakhtin (1981) borrowed the term ‘chronotope’, which literally means ‘time-space’, from Einstein and applied it to the study of language and literature. For Bakhtin, chronotopes link particular times, spaces and events, and construct layers of themes, agents, objects, dispositions, intentions, ideologies, and value orientations. Chronotopes resemble cultural formations, that is, historically formed/informed and socially distributed modes of engagement with particular
sets of practices for particular purposes. To understand and describe a chronotope thus requires a reconstruction of its context: the field of objects, practices, and agents by which the specific configuration reproduces itself across time and space. Chronotopes are the ‘stratagems’ of genealogy: the chronotopes of technical higher education index the durable traditions that constitute what is common, natural and expected by communities of practice within the system.

I have identified three chronotopes in the evolution of South African technical higher education:

- **Chronotope 1: Educating for the needs of industry**
- **Chronotope 2: Imitating the universities**
- **Chronotope 3: Rediscovering technology.**

This typology implies a progression, that successive chronotopes are more ‘advanced’ than the earlier ones. The layered nature of the progression is important; this makes it possible for certain features of an earlier chronotope to persist in a later one. For example, for many current university of technology staff the worldviews embodied in the first chronotope are likely to be more familiar and less counterintuitive than the worldviews embodied in later ones.

**Chronotope 1: Educating for the needs of industry**

Most of South Africa’s universities and technikons have a common ancestor in the technical college. The South African College in Cape Town, and the technical colleges of Natal, Pretoria and the Witwatersrand gave rise to both the universities and the technikons which bear (or bore) these names. The universities broke away from the technical colleges during the 1920s–1930s, leaving behind an aggregate of programmes, which were deemed inappropriate for university status at the time: such as the trades, crafts, nursing, teaching, some of the health sciences, business, and engineering.

By the 1960s there was wide distribution of technology across industrial and commercial workplaces in South Africa, and a resultant shortage of technically skilled personnel. The technical colleges were identified as having the potential to address this need. The Advanced Technical Education Act of 1967 changed the status of the technical colleges of the Cape, Natal, Pretoria and Witswatersrand to Colleges of Advanced Technical Education (CATEs). To these were later added new colleges at Vanderbijlpark and Port Elizabeth, so that by 1969 there were six CATEs enrolling over 23 000 students. Others were soon to follow, such as the M. L. Sultan College for Advanced Technical Education in 1969. As these colleges evolved, their CATE designation was changed to ‘technikon’ as a result of the Advanced Technical Education Amendment Act of 1979. The existing CATEs were henceforth known as technikons. In addition, a number of new technikons were established such as Technikon Mangosuthu (1979), Technikon Northern

Because technikons were established to address the shortage of technically skilled personnel to meet the needs of commerce and industry, they recruited staff from industry to teach on the various certificate and diploma programmes. Many lecturers were, and some still are, practitioners in their fields: engineers, personnel managers, medical technologists, and so on. Many technikon lecturers identify strongly with their professions: ‘I’m an engineer’, they would say, rather than ‘I’m an academic’. One of the strong practices in technikon education has been the Advisory Committee. In addition to staff who teach on the programme, representatives of the industries and communities affected are invited to serve on an Advisory Committee. This committee regulates programmes, and sometimes departmental practices as well – such as the setting of programme outcomes, deciding how assessment should occur – down to the level of what should be included in student guides.

Perhaps the most significant effect of the role of industry in curricular decision-making has been ‘cooperative education’ which, in the technikon context, means taking up an apprenticeship, usually in a company, for a period of up to one year. During this time, students are supervised by a designated person at the workplace, their performance is monitored and assessed, and this assessment contributes to the student’s final mark for the course.

It would be an understatement to say that there has been a shortage of pedagogical expertise in the development of technikon curricula. Technikon programmes, particularly in their earlier manifestations, resemble school curricula. The content is dense, packed with many subjects, with virtually no time allocated to individual study, research or project work. Technikon libraries, up until the 1990s, were virtually non-existent. The idea of students doing their own research on a particular project or topic was not in the technikon paradigm. Students would be told what they needed to know in the lecture hall, the workshop, the laboratory, or the workplace.

Despite these pedagogical limitations, technikons were initially successful in educating for the needs of industry. Various industrial and professional councils regulated the numbers of students who could enrol for particular qualifications, and technikon diplomates tended to find employment. Technikons were also successful in accepting students without matriculation exemption, and developing their skills, particularly in mathematics and science.

From its inception, and in a large measure due to the role of industry, technikon education has been plagued with a large bureaucracy which has, ironically, placed many constraints on the idea of education for the needs of industry. The Certification Council for Technikon Education (SERTEC) was created as a statutory body to monitor and evaluate all technikon programmes. In order to offer new programmes, a technikon had to apply for permission to SERTEC. This
involved a complex process of establishing the applicant as a ‘convenor technikon’, which meant convening national meetings with all technikons that might possibly have an interest in the programme, as well as with the relevant industry and community stakeholders. Several rounds of these processes needed to be implemented, lengthy forms (Form ‘A’, Form ‘B’, Form ‘C’), and reports on the process had to be submitted for approval. Similar processes had to be engaged with when changing an existing programme. SERTEC made regular inspections of programmes, which were evaluated according to approved curricular documents, some of which were as much as twenty years old.

This bureaucracy inhibited the development of new programmes, as well as curriculum development in existing ones. In the meantime, industry and workplaces had undergone fairly dramatic changes. There was, and still is, a need for people trained at the technician level – although technicians in new workplaces play different roles and need different skills from those which the original technikon curricula produced. Workplaces were becoming globalised; post-fordist production methods had reduced the need for narrowly competent technicians (Cloete and Maasen 2002). Flattened decision making structures, creative, problem solving teams, and the complex social changes wrought by the new technologies meant that technikon education was (with notable exceptions) locked in a time warp, and was no longer meeting the needs of industry. By the 1990s there was a need to make some fairly wide ranging changes.

Chronotope 2: Imitating the universities

The changes that were perceived to be necessary did not involve doing away with what by now had become ‘naturalised practices’ in the Technikon system: advisory committees, co-operative education, or SERTEC. Nor were the old-fashioned content-heavy curricula discarded; they were simply rewritten in compliance with the different permutations of unit standards or outcomes statements required at various times by the Department of Education and its statutory committees. Instead, the ‘problem’ was seen to be a combination of the staff and the level at which the programmes were offered. By changing the staff profile to include more ‘university trained’ people, and raising the level of the programmes it was assumed that the technikons would once again be in a position to satisfy ‘the requirements of commerce and industry’ (Committee of Technikon Principals 1995).

The Committee of Technikon Principals spearheaded the move by technikons into post-diploma studies and higher qualifications. The Technikon Act of 1993 made it possible for technikons to become degree-awarding institutions. The first Bachelors degrees were offered in January 1995, and shortly thereafter technikons offered Masters and Doctoral degrees in particular fields of study. While this seems like a natural progression, considering the expansion and distribution of technology in South African society, and the concomitant need for more advanced
technical personnel, I have called this period one of ‘imitation’ because, although there were superficial changes, there was a lack of systemic change to the technikon system during this period.

By 2000, most technikons, across all departments, had staff with different types of expertise (university, technikon and/or industry-based), varying degrees of disciplinary or professional affiliation, different levels of tertiary education, and different institutional histories. While, to a greater or lesser extent, this is a normal situation in all higher education institutions where there are likely to be experts and novices, in the technikon this was (and still is) an unhappy mixture. Firstly, the leadership (predominantly at the head of department level) consisted of the people originally recruited from industry, who did not have the experience, the qualifications, or the inclination to provide academic leadership; secondly, the persistence of the strong mindsets and practices associated with an older version of ‘educating for the needs of industry’ was a constraint on the achievement of university equivalence.

In the perception of the ‘old guard’, technikons had fallen victim to academic drift. The introduction of ‘theory’ and ‘research’ modules into even undergraduate programmes was forcing technikons in the direction of generic university courses, and ‘softening’ the hard techno-science content of the original technikon programmes. Advisory committee meetings became a site of curricular struggle. While new staff brought new ideas into the technikon system, the bureaucracy supported the old practices. This was the time of standards generating bodies, of measuring performance with outcomes, and fair technicist quality assurance processes, with which technikons were ready to comply. Indeed, technikons felt comfortable with the discourses of development, modernisation and managerialism that were (and still are) dominant in higher education policy.

The SERTEC bureaucracy grew to accommodate the certification ‘needs’ of the new postgraduate programmes. Technikons had ‘to apply individually [to SERTEC] for every programme they wish to offer on a degree or higher degree level’; and SERTEC would, moreover, ‘monitor the whole process of accreditation in order to ensure that the required standards are met on a continuous basis’ (Committee of Technikon Principals 1995).

Quality assurance undoubtedly has an important role in postgraduate education, but it is difficult, if not impossible, to offer postgraduate education when a research culture is not yet established in an institution, and lecturers do not have higher degrees themselves, or significant academic publications, and where strong disciplinary affiliations are not common. The practices of a strong academic culture in which academics read authoritative literature from a multiplicity of sources, engage in the rational critical analysis of disciplinary theory, evaluate assumptions, and question ideas and claims, engage in the practices of academic peer review, conduct seminars on their current research, and so on, still do not play a significant part in technikon culture.
This is not to say that the technikons did not recognise these difficulties, and various measures were put into place to address these shortcomings, with greater or lesser degrees of success. The first, and most obvious difference, were changes in staff recruitment policies and the resultant changes in institutions’ staff profiles. Staff with industry experience were no longer recruited. Staff with higher degrees, and with research and publication records, were now actively sought. At the same time, opportunities were provided (although not always taken) to ensure that existing academic staff were provided with support for further studies, research development, writing for publication, and research supervision.

In 1990 the former Foundation for Research Development (FRD) and the Centre for Science Development (CSD) launched the first programmes dedicated to support research activities and research training at technikons. These programmes merged under the National Research Foundation (NRF)’s Technikon Research Development Programme (TRDP) in 1995, now known as the Institutional Research Development Programme (IRDP). Research (or the idea of research) clearly separated the new technikon people from the ‘old guard’. Technikons have had a troubled relationship with research. Despite the Committee of Technikon Principals’s brave assertion that ‘It must be categorically stated that technikons have already established a research culture’ (Committee of Technikon Principals 1995), research administrators and researchers tell a different story. Many research offices developed out of existing Teaching and Learning Centres. Because lecturers did not have postgraduate qualifications, research was conceptualised as a staff development issue and, like most other staff development initiatives, had a low status in the technikon system. Although much has changed, the repeated complaint of research administrators has to do with the lack of research infrastructure and support. The high teaching loads (inherited from the school model) remain, making time to do fieldwork or laboratory work and to write up research findings difficult. There is a lack of understanding (because of inexperience) around how to factor research and research supervision into workloads. There has been a considerable research investment in the technikons by the NRF and international donors, often without the infrastructure needed to ensure research development and research outputs. The dismal figures with regard to technikon publication outputs, the graduation of masters and doctoral candidates, and the lack of rated researchers give evidence of the failure of the technikons to imitate the universities.

Chronotope 3: Rediscovering technology

The Higher Education Act of 1997 repealed in its entirety the Technikon Act of 1993, and later amendments (1999/2000/2002) established the principles by which technikons could become fully fledged higher education institutions and entitled to adopt the new nomenclature of university/institute of technology. In one sense, this feels premature, as if technikons are being rushed into an advanced level of
operation when the processes of becoming a university (begun in the 1990s) are not yet fully established, and when there has not been adequate time to consolidate emergent practices, or to learn from the mistakes which are inevitable when innovation is pursued. On the positive side, the propulsion of technikons (ready-or-not) into a new era, has forced the institutions to rethink their educational and research missions. And for most, this has meant rediscovering ‘technological education’ (Cape Peninsula University of Technology 2004; Durban Institute of Technology 2004).

Underpinning the contestation around the admission of universities of technology into the broader higher education community has been the central notion of ‘criticality’ (Barnett 1997). All higher education should aim not simply to transmit fixed blocks of information to students, but to develop independent, creative and responsible critical thinkers. Students, and their lecturers, need to question the accepted truths, and ask the difficult questions. There are many good reasons why a university of technology in particular needs to promote critical thinking.

Universities of technology are beginning to realise that they cannot not offer ‘quick fix’ solutions to national industry’s lack of competitiveness; and they cannot transform a ‘low skills’ society into a ‘high skills’ one, given their own limitations. Universities of technology are beginning to see themselves as offering a broad and critical education: one that enables students to engage with the consequences of science and its applications, and to question scientific ways of knowing, especially in the context of environmental sustainability and human health. They see themselves as developing students’ scientific and technological ‘literacy’ in a broad, rather than a narrow, sense. To achieve this is no easy task. Integrated approaches to teaching, learning and research, that combine the disciplines of science, engineering and technology with other disciplines, will need to be critically examined and promoted in seeking to educate students to engage with a diversity of views and visions, and to develop an equitable, socially just, and ecologically sustainable economy and technology.

As technikons prepare to take on more fully fledged university status, they are questioning their roles as providers of technical higher education. Many more university of technology academic staff hold higher degrees, are engaged in research activities, and are supervising postgraduate students – including some ‘old’ technikon staff (perhaps motivated by the looming spectre of mergers, acquisitions and retrenchments). International collaborations with technical institutes, in particular, have started to produce new ideas about what it might mean to become a university of technology in South African context.

CONCLUSION: A REFLECTIVE UNIVERSITY OF TECHNOLOGY

Like all other institutions, universities of technology will be judged on how well they do their jobs. Because their work attempts to be responsive to the needs of
industry, society, entrepreneurs, and communities, traditional academic criteria of excellence have limited applicability. An appropriate approach to judge the achievements of universities of technology is to insert into the discourse of excellence an epistemology of technology in terms of undergraduate and postgraduate education, and research.

Undergraduate technical education

Technikons have prided themselves on providing career-focused education, and producing highly employable graduates (du PreÈ et al. 2001/3). They have acknowledged and valued experiential learning; and have understood that students develop important knowledge and skills in workplaces, but they have not studied this systematically. So there is work to be done in this regard. There are many good reasons to maintain experiential learning in the new universities of technology, not as a ‘naturalised practice’ but as an educational practice with clear goals for enhanced learning. This does not involve deferring to the knowledge production practices of work and industry, or valuing these over the knowledge production practices of academic disciplines. In technikon education there had been a clear acknowledgement of the role of the workplace in education but there has not been an attempt to theorise how different knowledge production systems function, how work-based knowledge is different from academic knowledge, or how work and academic systems might productively interact. So, despite the role they claim to play in workforce development, technikons have shied away from researching the world of work. There has been very little explicit discussion of the theory of work-based learning, and practically no evaluative research to trace the impact of career-focused programmes (Cooper 1995).

One of the reasons why co-operative education, for example, is not serving the purpose that it was originally designed to meet, has to do with the changing nature of workplaces. Employers require entry-level employees with high level technical skills, and this makes a second-year student ‘apprentice’ not particularly useful to a modern technology-based workplace. Nor does it provide the student with appropriate learning experiences. The technikons are thus seeing a decline in this system for the same reasons that the apprentice system has declined in the rest of the world (Young 1998). The transformation from technikon to university of technology requires reflection on what is probably the most important aspect of the educational mission: to equip students with solid technical knowledge and practical skills, but also to promote an awareness of social and ethical concerns, individual creativity, as well as the ability to reflect on and evaluate their own actions – as a direct response to the demands placed on future young professionals. In order to ensure that students are adequately trained, supported, supervised, and assessed for life in their work environments, academic staff themselves need to understand how to integrate experiences across different areas of learning, both within and outside of academic contexts.
Postgraduate technical education

While there is an obvious need for developing expertise in the supervision of masters and doctoral candidates, at the postgraduate level, the work that needs to be done is epistemological, rather than operational. Many university of technology based academics have an intuitive understanding (based on personal experience) that their area of technology, whether it is in health science, engineering, or other areas, has developed to the extent that it has become appropriate to offer postgraduate qualifications in their fields. However, the nature of technological knowledge in different areas – what Bernstein (1999) describes as the ‘verticality’ of its discourses – has not always been adequately demonstrated. What is needed if technical higher education is to be understood, is a discursive space that might enable practitioners and researchers to reflect on the discipline – or transdiscipline – or even non-discipline of ‘technology’ and its practices. Creating such a strategic site of enquiry will enable universities of technology to analyse the various discourses: scientific, sociological, economic, and political, and the clashes between them, which constitute different conceptions of technology. In such an in-between space ‘technology’ can be constructed and deconstructed, discussed and debated by practitioners of the multiple disciplines and fields that are involved in its conceptualisation and practice.

Technological research

Universities of technology have a responsibility to analyse, debate and deconstruct technology. Their mission should not only be to make a contribution to technological innovation, but to make a contribution to the ability of society to control and manage the development of technology. Insights gained through research and debate can guide discussions on the role that technology should play in society. The insights developed through theorising technology can be useful to business, industry, government and communities. They might be translated, for example, into recommendations for the choice and effectiveness of technological innovation, the nature of long-term growth processes, the design of technological artefacts, the effectiveness of decision-making processes, the critical analysis of the role of law in the development of technology, ethical aspects of the professional practice of engineers, the nature of decisions made during the development of technology, and the role of the government in developing technology.

Technikons have always had a strong sense of being in the world, rather than being in an ‘ivory tower’, and apart from the world. For many institutions this has meant doing research in collaboration with industry partners. In addition to linkages with other educational and research institutions and with industry, many universities of technology have partnerships with members of their communities and with local or national governments, and have developed strategies for informing the public at large about their activities. There are important epistemological concerns to be addressed when establishing participatory systems.
Working with many different voices and different perspectives in a framework of mutual support and knowledge has the potential to generate responsible and inclusive knowledge. Public or stakeholder participation is intended to develop what Nowotny (2001), in her challenge to science, calls ‘socially robust’ knowledge.

Becoming a university of technology is contingent upon the creation of a space for debate and reflection, within and across departments, on experiential learning, career orientation, and work-related projects in terms of their pedagogic function and usefulness, in and across a variety of learning contexts. Similar reflective practices need to be embedded in the applied and strategic research projects that universities of technology engage with. It is only by subjecting practices to intense and scholarly scrutiny that universities of technology will be able to achieve excellence in the fulfilment of their teaching and research missions.

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