Report on the evaluation of the National Research Foundation (NRF) Programmes directed at research and research capacity development at Technikons

Report by independent panel

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Report on the evaluation of the National Research Foundation (NRF) Programmes directed at research and research capacity development at Technikons

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<td>DACST</td>
<td>Department of Arts, Culture, Technology and Science</td>
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<td>DOE</td>
<td>Department of Education</td>
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<td>EU</td>
<td>European Union</td>
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<td>National Research Foundation</td>
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<td>Research and Development</td>
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REVIEW PANEL EVALUATION OF THE NRF PROGRAMMES
SPECIFICALLY DIRECTED AT RESEARCH AND RESEARCH
CAPACITY DEVELOPMENT AT TECHNIKONS

Summary and conclusions

(a) Observations

The panel made the following observations on the NRF programme of research capacity
development at Technikons with reference to the NRF requirements:

- **Implementation of strategies**

  The NRF has succeeded in establishing awareness of research at all the technikons
  and has been the main driving force in establishing research programmes in most of
  the technikons. This is to be commended but it is important that the focus of the
  research drive should now shift to the technikons themselves.

- **Performance of the programme**

  The establishment of 55 activity areas in the various technikons over the past five
  years suggests that in principle the programme has been successful in its objectives.
  The quality and relevance of research outputs in some activity areas seem to be
  questionable based on the opinion of esteemed referees and the review panel. This
  might indicate an initial rush to establish quantity rather than quality in activity areas.
  However, excellent ones emerged where some high quality research and
  development work of world class is being conducted, which is a commendable
  performance.

- **Financial commitment**

  The investment of R60,3 million by the NRF in the programme over the past six years
  shows a significant yearly progression in funding since the origin of the programme in
  1996. This shows a definite commitment from the NRF in support of the programme.
  Because of some financial discrepancies between the NRF and the technikon reports,
  the panel recommends a more stringent control of the reporting of expenditure by
  technikons.

- **Input versus output**

  Unfortunately, no student/staff qualification profiles prior to 1996 were available to the
  panel. Therefore no comparison is possible. Comparisons for capacity development
  purposes will be restricted to the data available from 1996 to 2001. In terms of student
  throughput, the most progress has been made at MTech and BTech level. DTech
  graduation grew from four to nine.

  Staff qualifications grew by 85 M degrees and 28 D degrees, which in itself seems
  substantial even if base figures were not available. This suggests that the programme
  was successful in this regard.

  Linkages and collaborations have been formed with various other academic
  institutions at virtually every technikon. In the view of the panel this is a great
achievement. The establishment of strong relations with industrial partners as an outflow of these activities is an additional measure of the success of this programme.

- **Weaknesses and strengths of the programme**

  The continuous active involvement and drive of the NRF in the programme and its financial backing of the technikons throughout the period have been, in the opinion of the panel, the strength of the programme.

  The loss of focus or drifting of activity areas and the development of too many low quality activity areas might be considered a weakness.

- **Current capacity assessment**

  The programme definitely contributed as the main agent for building capacity in technikons.

(b) **Recommendations to meet future needs**

Considering the favourable results obtained during the previous five years, the review panel strongly recommends that the programme be pursued, with different emphases reflecting what has been achieved up to now in terms of meeting objectives.

The specific recommendations of the panel are to:

- improve coordination with other organisations funding research and education
- recognise that technikons presently deliver education at different levels. While the possibility should be given to go to “upper” levels, it should also be kept in mind that there is a need for good scientists and technicians at all of those levels.
- focus research on the more applied side including development of products and processes and innovation activities
- put the emphasis on quality and relevance to meet societal needs in particular those of communities and industry
- improve commitment of top management towards an environment conducive to research as well as towards the creation of an appropriate infrastructure and administration
- encourage collaborations among technikons, with universities, with industry
- encourage synergies between Science, Education and Technology (SET) and Social Sciences and Humanities (SSH) activities in technikons
- allow time for research by a better balance with teaching loads
- develop criteria for evaluation of scientific output that are better adapted to more applied research activities (in the technikons and elsewhere)
- encourage, where appropriate, applications for funds by technikons for the development of infrastructure to support research
- agree with technikons, as far as is consistent with the necessary flexibility, on research deliverables, to be monitored on an ongoing basis.
The review panel also makes recommendations to improve the efficiency of further similar evaluation exercises. (See 2.1 of the report.)
Main Report

1. The aim of the NRF programme

The review panel wholeheartedly welcomes the NRF programmes directed at research and research capacity development at technikons.

The objectives of the Technikon Programme are to:

- improve the qualifications of staff
- support staff to become established researchers
- increase the number of postgraduates
- increase the output of research of quality and relevance
- implement corrective initiatives aimed at involving both blacks and women as postgraduate students and staff
- strengthen research infrastructure
- attract and retain quality staff

The review panel distinguishes three major phases during which the emphasis would move, firstly, from the building of staff capability and infrastructural improvement, to, secondly, team capacity building by attracting good students and mentoring their research appropriately and, finally, to producing scientific outputs of the required quality and relevance.

The review panel would like to mention that time will be needed to reach the final stage and that progress in this process should be evaluated regularly on an agreed time basis.

2. Methodology used by the review panel

The review panel met from July 29 to August 8, 2001. The panel studied and analysed documentation provided by the NRF. This included:

- The Self-evaluation Report by the Management of the Technikon Programme
- Self-evaluations by technikon management in the fields of SET and SSH
- Self-evaluations by individual activity area leaders in SET and by project leaders in SSH
- Evaluations of activity areas (SET) and projects (SSH) by external referees.

In addition, the panel visited three technikons (Pretoria, Northern Gauteng, Vaal Triangle) and interviewed top managers, especially those immediately concerned with research activity, area leaders and students included in activity areas.

Further, the panel interacted with various key players in the technikon field: Mr AA Essop, Chief Director: Higher Education: Planning and Management, Department of Education, Prof R du Pré, Executive Director: Committee of Technikon Principals, and Dr R Adam,
Director-General: Department of Arts, Culture, Science and Technology, and, on a continuing basis during the ten days of the investigation, the NRF officials in the Technikon programme.

The first phase of the panel's activity, after initial consultation with the NRF management, was to produce a draft document against which to benchmark subsequent progress in the investigation. This was subsequently utilised in developing the final report, which was informed by the information acquired in the course of the investigation, and in some cases substantially modified by it.

The bulk of the panel's time was utilised in reading the documentation mentioned above. Individual technikon reports (see appendix) were compiled after intensive discussion.

2.1 Recommendations for future review panels

The overwhelming amount of paperwork that the panel attempted to master (12½ kg per person, as one panel member noted) made detailed analysis difficult. The panel strongly suggests that in subsequent reviews this amount be drastically reduced, probably by making a digest of technikon submissions: there was a danger, which the panel hopes it has avoided at least in part, of being unable to see the conceptual wood for the documentary trees. The panel would have appreciated more time to think and discuss, and to visit more technikons: all if possible.

Also, the report is in some senses only as good as the documentation upon which it is based. Many of the evaluations of SET and SSH areas by external referees are concise and helpful: some, however, are not, and it is strongly suggested firstly that a tighter, standardised format be developed that serves to focus the attention of reviewers on producing relevant critiques, and, secondly, that the net be spread wider in the search for relevant reviewers, especially into the pool of expertise in industry. There is at the moment a bias towards university referees, who are often excellent but at times over-emphasise purely academic criteria and fail to sufficiently appreciate circumstances peculiar to technikons and their role in the field of applied research.

The panel would also strongly recommend that the Committee of Technikon Principals be requested to compile a document expressing the technikons’ views for submission to any future review panel, in the same format as the overall report of the NRF.

2.2 Social Sciences and Humanities

The panel found itself in a dilemma in relation to SSH projects. These, up to now, have been conceptualised in a different manner to those in SET, and are predominantly on an individual basis, often with no postgraduate student involvement. The panel has, therefore, evaluated SSH projects separately from those in SET.

2.3 Reading the report

The body of this report is deliberately brief and we hope helpful as a succinct contribution towards the debate on the future of research at technikons. We hope, in the words of the terms of reference, that it addresses issues in “redress and … development of human resources”, and that it will also provide “an analysis of the progress made with research capacity development”. The panel was also asked to provide “an audit and analysis of the research outputs and outcomes" of technikon research: for this, the reader should consult the appendices.
3. **Strategic management of the programme**

Technikons appear to receive different messages about research: from the DOE, technikons themselves, the NRF etc. There is, in other words, a lack of strategic direction to research in the sector.

There appears to be a need to incorporate governmental and semi-governmental bodies in the definition of research areas: this is part of the need to understand the whole research landscape, and to avoid the possibility of duplication, or of ignoring potentially useful contributions. To this end, *ad hoc* committees might be set up as fora for consultation in this sphere. We suggest that research in technikons should be dealt with in a way that goes beyond the NRF-technikon relationship. However, the NRF is clearly in an excellent position to lead a discussion on the role of technikon research within the research community in South Africa. The panel fears that there is a considerable possibility of technikon research disappearing completely as a result of the blurring of what was traditionally “blue-sky” research and “applied research” on the one hand and a proposed funding model that does not seem to appreciate the different roles of technikon research and university-based research.

Even though the review panel is aware that the borders between basic and applied research have never been very evident and are even vanishing more and more, it suggests that the research undertaken at technikons would be more on the applied side and even include development and innovation.

In order to foster better coordination between research initiatives, it would be useful to develop a link between the NRF technikon programme and other programmes such as the Department of Arts Culture Technology and Science (DACST) Technology Stations Programme (TSP), Department of Education (DOE) subsidy funding, Technology and Human Resources for Industry (THRIP) and the focus area Educating for the Knowledge Era.

The panel recognises that participation in the definition of research areas is not a new exercise for the NRF: it is strongly suggested here that there might be more emphasis on the contributions of different stakeholders, such as industry.

The panel notes also that the main actors in this area are the technikons themselves. While they should take careful note of the interventions and comments of the NRF and other role players, it should be emphasised that their future in research is essentially in their own hands.

4. **Strategy for selecting research areas**

The panel proposes a number of principles:

- Definition of activity areas should be an integrated top-down and bottom-up exercise, with society involved at every stage, as is appropriate for a sector dedicated to broadly applied research. “Society” is defined to include industry, local authorities, communities, government etc. It would be up to the technikons themselves, in this context, in cooperation with other players concerned, to decide upon the participants. In short, the emphasis at technikons should be on solving societal problems.

- Niches should be identified and research focussed on these. These can be broad and should be flexible (forestry, food, etc.), and should (as noted above) be coupled to societal needs, as for instance the needs of Small and Medium Enterprises (SMMEs), who do not perform research themselves but who do need research results for their innovative activities. We propose that technikons should incorporate the concept of “collective research centres”, primarily but not exclusively directed towards SMMEs,
which could be integrated into the existing technikon system, using existing competencies.

- There should be an attempt to focus on conceptual and geographical areas where there is a competitive advantage, domestically and internationally. Examples include:
  - surrounding industries
  - technikon specific expertise
  - surrounding SMME clusters
  - indigenous knowledge systems

- The NRF should be responsible for the selection of projects on well-defined and open criteria. The NRF should also ensure proper allocation of funds in such projects in terms of infrastructure, administration, etc. and find a way to allow for re-orientation of projects (this has now been introduced in the European Union (EU) Framework Programmes). Fixing a programme for a period of five years is particularly unrealistic when collaborations with industry are sought. Flexibility is needed.

- Clearly, the NRF must take account of official imperatives in terms of its disbursement of research finance. At the same time, the organisation must fix priorities in the context of the technikons' own priorities, defined, as noted above, in conjunction with other role-players. This subtle balancing is already taking place: the aim here is to reinforce commitment to this key area.

5. **Redress and the Development of Human Resources**

This section deals with the research environment both in relation to actual research areas, and in terms of research management.

- Technikons have been asked to do research, but the funding formula and other mechanisms are not such as to enable them easily to do this, especially in the disadvantaged institutions. Mechanisms need to be put in place to enable them to carry out the research that they are encouraged to do.

- The panel recognises that BTech degrees and above should only be awarded in areas where there is an active research focus (not necessarily within the framework of an NRF supported activity area) and suggests that exposure to research by BTech students is a prerequisite for their graduation.

- If the possibility of performing research in a particular area is not offered by a technikon, it should either withdraw or collaborate with a similar institution that has research activities in the area. Sharing lecturers could facilitate such collaborations and the NRF could encourage this.

- Qualified and experienced “champions”, who can drive specific areas, are crucial to the development of research – that is, each specific area should have such a champion. Certainly, amateur researchers who are not adequately qualified is a recipe for failure. There appear to be two broad possibilities where these champions do not presently exist. Firstly, such people can be developed internally. This is time-consuming, but necessary in any event in the long term. Secondly, it could be possible to employ well-recognised scientists, from South Africa or abroad, who would be given such conditions as would help ensure that they would remain in employment for an extended period – a minimum of five years. This will be expensive but might be inevitable. This is a general point: in the appendix the feasibility of this policy will be commented upon in relation to particular relevant technikons.
• Recognising that it is difficult to find individuals who meet the criteria in the previous point, other means should be investigated to answer this need. For example, attention might be given to cooperation with neighbouring universities and industries in the employment of individuals.

• The NRF, using its financial leverage, should find a way to encourage collaborations, development of synergies, and networking between Technikons in the fields of research and education.

6. **Enabling Conditions**

In this as in other spheres, it is realised that the NRF operates in an environment over which it of course does not have full control. It is nevertheless important that the organisation continues to grapple, as it does presently, with the implications of these conditions. In other words, even when the NRF does not have a direct role in this or that area it is important to identify what are the preconditions for the organisation to fulfill its mandate to the maximum extent.

• The question of the teaching load of potential or actual researchers is important. There should certainly be a combination and an adequate balance of teaching and research, but research must not be, as it at present generally is, an add-on to a teaching load that often, with preparation and administration, takes up all of a normal working week. Room must be created for research.

• The panel strongly suggests that there must be incentives for research. There must be increased personal rewards for achieving researchers, and time must be ensured for research activities, as indicated in the previous point. People who go from the institution for higher degrees that improve their research capacity must not be reinserted in a research-unfriendly environment, and indeed must be expected to carry out research in their area of expertise with the appropriate infrastructure and equipment made available.

• The support mechanisms for effective research should be in place. The importance of succession/backup plans for critical personnel should be addressed. Administrative systems should be such as to support, and not inhibit, the efforts of researchers. This is perhaps one area where the existing influence of the NRF can be further augmented.

7. **Technikons and the Wider Environment**

• In general, the technikons should take an outward-looking approach to research. Even less than universities can they afford an ivory tower approach. They should take all opportunities to collaborate with and as far as possible meet the research needs of the community and the outside world in general.

• A number of technikons have expressed concerns about their ability to attract M and DTech students. The panel notes this difficulty and wonders whether a study/survey to establish the industry’s need for such students would not shed some light on this concern. Such a study would also raise awareness in industry about the role of technikon research and the potential value of M and DTech students to their research and development agendas.

8. **Social sciences and humanities**

Projects from the ex-CSD are organised on an individual basis and cannot be evaluated by the same criteria as those in the FRD/NRF activity areas. The panel recognises that
there are differences that may impose different forms of research organisation between the natural sciences and technology on the one hand, and the social sciences and humanities on the other. The panel recognises also that the historical development of the higher education system has led to the placement of certain areas in technikons – Fine Art, for instance – that do not always relate to the applied function that is central to research in technikons. Areas such as this should not be penalised on this account.

However, the panel suggests, making allowance for the points above, that as far as possible, the SSH area should be integrated into the activity area paradigm that applies to the rest of the programme directed at research and research capacity development at technikons. Further, submissions in this area should be of a primarily applied nature and should be measured against the criterion of social relevance.

This can be done, firstly, through developing activity areas emanating from particular disciplinary or interdisciplinary groupings within the SSH area, such as marketing, communication or design, as has been done in SET for the past five years. Secondly, there should be an attempt to promote linkages between SSH and SET, and to develop activity areas that incorporate both dimensions. For example, areas that focus on nutrition and food security might – and should – include social scientists capable of analysing choice of diet in its social dimension, and household food budgets in their economic dimension. Again, participants in any activity area working with SMMEs should undoubtedly treat their work as a commercial and socio-economic as well as a technical project, and should involve researchers in market analysis and other business-oriented spheres from the beginning.

9. Evaluation of the outputs of the activity areas

The criteria used by the NRF to evaluate research in Technikons are predominantly though not exclusively of an “academic” nature (number of publications …). For more applied research as performed in Technikons, the panel suggests that number of patents and artifacts, number of contracts with industry, participation in networks, identified achievements in assistance to communities, and the like, be fully taken into account. This problem is not specific to South Africa. The EU is faced with this difficult problem of identifying criteria applicable to “networks of excellence” involving industrial research laboratories.

The panel notes the existence of two additional pieces of information that the NRF could use for the evaluation of the outputs, namely

- the “cost per unit”
- the “students per staff” ratio.

The “cost per unit” appended tables (pages 8 and 9) give in a concise form the ratios of total investment (NRF and other sources) to the total number of people promoted (postgraduate staff and students) per technikon and per activity area.

These tables are intended to give a general picture of the monies actually spent to reach these “unitary outputs”.

It should in no way be used to compare the efficiency of the expenditures (value for money) given the large variability of these costs according to activity areas, previous investments, presence of existing equipment, location, etc.

It is to be considered as useful but only partial information when starting any benchmarking exercise.
The “students per staff” ratio (page 10) gives an indication of the average workload of the staff.
Students per Staff

Technikons

Cape
Wits
ML Sultan
PE
Eastern Cape
Natal
Border
Free State
Northern Gauteng
Peninsula
Vaal
Mangosuthu
N-West
Pretoria
SA
10. **Classification of the Technikons**

The panel has been asked by the NRF to make a classification in five categories of the technikons it has reviewed in terms of the compatibility of their activities with the NRF’s objectives for higher education.

After consideration, the panel found it more appropriate to limit the classification to four categories based on the technikons’ own strategic views and the present state of development of their research activities as related to their abilities to deliver diplomas and degrees, namely:

- those which already meet international standards for similar institutions and are able to deliver M and D degrees
- those which meet at least minimum standards for delivering M and perhaps D degrees but should either consolidate or even improve according to these standards
- those which should concentrate on quality at BTech degree level and develop research activities accordingly
- those which should concentrate on high quality technical diplomas.

The review panel is convinced that quality is of paramount importance at all levels and should not be sacrificed for quantity.

The technikons should be given the opportunity to go to “upper” levels of this classification if they so wish and can show the relevant capacity. It is suggested that technikons at different levels collaborate in order for all students to be given the possibility of graduating, if they have the capability, up to PhD level in another institution without any disruption in their curriculum.

The classification of individual technikons in these categories is a delicate and difficult exercise and different opinions have sometimes been expressed within the review panel. On-site visits would probably have helped to solve the uncertainties.

However, after deliberation, the panel was able to reach a unanimous view based on each technikon’s overall research output and capacity and on the degree of development of the institution’s research administration and infrastructure. This appears hereunder.

Category 1: Meet international standards for similar institutions – able to deliver M/D degrees:

- Port Elizabeth
- Pretoria

Category 2: Meet at least minimum standards for delivering M and perhaps D degrees:

- Cape
- Free State
- ML Sultan
- Natal
- Peninsula
Vaal Triangle

Category 3: Concentrate on quality at BTech degree level:

Northern Gauteng
Witwatersrand

Category 4: Concentrate on high quality technical diplomas:

Border
Eastern Cape
Mangosuthu
North West
SA

In each category, the technikons are deliberately listed in alphabetic order to avoid any impression of ranking that the panel is not in a position to do. It should, however, be understood that in all categories not all technikons are at the same level of quality and that, for some, efforts have to be made to consolidate and even improve the quality of research and training in the particular category to which we have allocated them.

In this respect it should be remembered that this is an overall classification of the technikons that does not necessarily consider specific strong or weak research activity areas in any particular technikon. Where such exemplary areas of research strength exist, they should obviously be considered models leading to general progress within the different institutions.
1. **Organisational Environment**

The expressed rationale for Border Technikon’s participation in the programme was to improve the level and quality of SET teaching. Border Technikon sees its essential role as “in the education of students from disadvantaged backgrounds”. Many members of staff expressed an interest in the field of education. This is probably more related to SSH pedagogic studies than SET “hard science” research and led to the fact that very little research was undertaken in the latter.

2. **Infrastructure**

Research infrastructure is apparently very limited with the exception of the Department of Chemistry that, however, never applied for NRF programme support.

3. **Management**

An advisory committee was put in place but then disbanded. The appointment of a research officer apparently improved the poor partnership with NRF.

4. **Finances**

Apparently monies allocated by NRF from 1996 were only used starting in 1998. This could be considered as flexibility provided it is agreeable to the NRF.

5. **Activity Areas**

5.1 **Information Technology**

Funds were devoted to seminars and meetings, not to research activities. The activity area has been abandoned.

5.2 **Effective SET Evaluation**

This activity is more related to pedagogy (SSH) than technology. It deserves to be supported but not as a research and development (R&D) programme under SET. It is noteworthy that research methodology is taught in the institution while no research is actually performed. There were some notable improvements in staff qualification.

6. **Social Sciences and Humanities**

Activities in SSH are still at the stage of capacity building studies (see specifically “Research capacity building among staff at the Border Technikon”) and while deserving appropriate attention this is not a research topic/activity in itself.

7. **Overall Assessment**

The views of Border Technikon management appear to concentrate on the quality of present educational output at the *existing* level. This is highly commendable and deserves support but does not require in house research activities.

SSH activities focussed largely on staff development.
TECHNIKON REPORT: CAPE

1. Organisational Environment

Research seems to be well organized even if internal communication is a concern. Top management seems committed and enthusiastically and vocally supportive. The institution has also developed excellent incentives to encourage staff to be involved in research.

2. Infrastructure

Apparently one of the best of the Technikons.

3. Management of the Programme

The partnership with NRF did not always run productively even though the advisory committee operated very well. There is evidence of some anger from the staff at having received NRF funding for only three (3) activity areas.

4. Finances

There are large discrepancies between the figures produced by the NRF and the Technikon. New forms have to be established that make financial reporting clear and understood in the same way by all people involved. The maturity of research activities has enabled the technikon to leverage external funds through THRIP.

5. Activity Areas

5.1 Hydromechanics

The research quality is well regarded nationally and internationally even if the number of publications in peer reviewed journals seems limited. Relevance to industrial needs has been noted. There is no real improvement of the staff nevertheless a significant production of postgraduate students attracted by the good mentorship of the activity area leader is evident. There is however concern about sustainability.

5.2 Instrumentation

There is very positive evaluation by the reviewers regarding quality, relevance (especially to industrial needs) and output. This is a highly commendable activity. The improvement of staff qualifications seems to have received more attention than that of students. Even if we can understand this for the time being, in the future we recommend a better balance between research and training of students by their involvement in research. The claim of the activity leader about administrative burden might be questioned considering the information the review team received from other Technikons. We suggest a more specific name for this area.

5.3 Separation Technology

The group seems to be somewhat under-staffed which appears in the poor co-authoring by staff members of the impressive list of publications by the activity leader. It is recommended that a staff member with industrial experience be hired to compensate for the "lack of industrial experience" mentioned in the self-evaluation report, as the work performed is strongly relevant to mineral industries. More information on their “success stories” with small
scale miners would be welcome. There is an impressive output in terms of publications and graduation. The table in the NRF report gives a misleading impression of lack of focus in the activity area; actually several funding allocations relate to participation in conferences and visits. The rest can be attributed to “normal” evolution of research within different projects lasting 2 – 3 years in the frame of the 5 years NRF programme.

5.4 Other Projects

The review team is deeply concerned with the number of activities that never took off or were discontinued such as Community Infrastructure and its “spin-off” programmes, “Edugreen”, “Health and Environment”, “Urban Housing”, “Urban infrastructure”, all programmes that show a clear SSH aspect. The reasons for this should be analysed to avoid such situations in future. The example of “Production of novel foods and components…”, a very interesting topic that could be the basis for collaboration with other technikons but that never took off, is a worrying example of the lack of communication and insufficient partnership mentioned above.

6. Social Sciences and Humanities

See remarks in general report.

6.1 Market potential and product acceptance study

Even if hardly qualified as research by the reviewers, the topic is of industrial relevance. Concerns are expressed by the author about the lack of “financial” support.

7. Overall Assessment

The three NRF supported groups have shown very positive developments. The collaboration of the Technikon management with NRF should however be drastically improved. This provides a mechanism for both parties to define together new activity areas that could be developed in the future. The impact on local industry has not been excellent, however the incubator has been identified as an alternative mechanism to transfer technology to local industry.

Little activity on SSH, though some on staff development and one possible project with some potential for further development.
1. **Organisational Environment**

   There is no evidence that there is any organisational commitment to driving research. The qualification level was reasonable at the start of the programme. It is unfortunate that this has not been built on very well. There is a research policy in place. However, the academic staff is still not research orientated.

2. **Infrastructure**

   The infrastructure is very limited except for one "Centre of Excellence" – the Telkom initiative.

3. **Management of the Programme**

   There seems to be a lack of commitment by the Technikon. The relationship between the NRF and management is good according to the NRF. There is no advisory committee in place.

4. **Finances**

   There are no discrepancies.

5. **Activity Areas**

5.1 **Telecommunications and Expert Systems**

   This activity area needs a new and decisive leader. The quality of research until now has been reasonable, but the problem of succession is crucial. The relevance of this activity to local needs, and the area's sustainability, are real concerns.

6. **Social Sciences and Humanities**

6.1 **Self development in Research Capacity Building**

   This is a staff and organisational development project. This has been effective in terms of its pedagogic aims.

7. **Overall Assessment**

   The achievements so far are disappointing. The possibility of discontinuing research at this institution should be considered, which will have an impact on B Tech programmes.

   SSH activity was minimal with some staff development being addressed.
1. **Organisational Environment**

There is good commitment from both the management and staff. The definition of the role of Research Director is excellent and might be considered a model for other institutions. This technikon has a consistent record of research which it has actively supported in the selected fields.

2. **Infrastructure**

It is generally very conducive for research. Active investment in research infrastructure is evident.

3. **Management of the Programme**

The relations between the NRF and the Technikon seem smooth. The advisory committee is effective. Partnership with external bodies is reportedly good though no examples are given.

4. **Finances**

This was difficult to assess because figures and the naming of the various researchers as they appear in different tables do not appear to correlate. Comparisons are therefore difficult to make.

5. **Activity Areas**

5.1 **Agriculture**

In this area the focus appears to be mainly on student throughput rather than active involvement in research by the area leader. This in itself can be positive in establishing a research base, but progressively more active involvement in actual research is advisable.

5.2 **Food and Nutrition**

There seems to be good quality research undertaken and good throughput of qualifications at student and staff levels. We agree with the NRF evaluation that this area should be linked with Agriculture but not that it should be *included* under this heading. We also feel that links with Food and Nutrition programmes in other institutions should be pursued. This would assist focus and avoid duplication. Some concerns have been expressed that research outputs are at times over-descriptive and insufficiently analytical. This should be taken into account.

5.3 **Manufacturing**

There seems to be relevant, good quality research undertaken which is very applicable to economic life. This focus area is designated as a Technology Station and Centre of Excellence. The leadership is capable and strong and the focus group has strong links with CSIR and provincial government. The activity leader is internationally recognised in the field. This is an important initiative, which can have many beneficial effects on manufacturing.
5.4 **Water Quality Management**

This activity area has a capable leader who is highly respected in this field. The quality of research appears to be high. The challenge will now be to widen and strengthen the project's base through further development of human resources.

5.5 **Electronic Sensing and Control/Industrial Electronics**

This programme needs decisive leadership. There are also concerns about the quality and quantity of research outputs and about the isolation of this field in the technikon.

5.6 **Occupational Health and Safety**

There is no report from the institution as the activity area has been terminated. This may be linked to biotechnology-related issues, where technikons seem to have a problem in establishing activity areas. There is no point in evaluating the NRF reports since they stand alone with no comparative material.

6. **Social Sciences and Humanities**

No apparent activity. Lack of documentation to verify this.

7. **Overall assessment**

Overall there is good progress. There is definite institutional commitment with very good research in some activity areas. In some areas, there are still problems with research leadership.

Apparent lack of activity in SSH compared to SET. This can be improved.
1. **Organisational Environment**

There is no evidence of real commitment to research by top management. The environment at the Technikon has been volatile, and not conducive to research endeavour. There is a lack of research culture amongst academics.

2. **Infrastructure**

The infrastructure is very limited. The funding by the Tertiary Education Linkage Project (TELP) of two research laboratories is possibly something that could be built upon.

3. **Management of the Programme**

The NRF has played its role well. There is no advisory committee in place and this is problematic in terms of promoting a research culture.

4. **Finances**

There are some apparent discrepancies between the amounts reportedly allocated by NRF and spending by the Technikon.

5. **Activity Areas**

5.1 **Community Health**

There are some reasonable research results, but they are insufficiently directed, hence the low overall output. Teamwork is lacking. Focus is also lacking and should be re-examined.

5.2 **Appropriate Technology for Rural Development**

There are no research outputs though there are four students involved. The leadership is inadequate. The continuation of this focus area must be in question.

6. **Social Sciences and Humanities**

6.1 **Staff Development – Capacity Development in Research**

There is low funding for a programme that is more staff and institutional than research orientated (See overall recommendations).

7. **Overall Assessment**

The achievements so far are disappointing. The possibility of discontinuing research at this institution should be considered in the light of no existing M or D level studies. This will have an impact of B Tech programmes.

Activity in SSH was low with only some staff development being addressed.
1. **Organisational Environment**

Research culture was a relatively new concept at the start of the NRF programme. Reactions were very positive. However, internal changes in top management hampered the process. The appointment in 1998 of a research director who has the full support of the top management improved the situation by initiating a concerted effort to "import" research.

The Technikon made excellent use of the Lecturer Replacement Scheme – the NRF, however, notes "misunderstandings and miscommunication with some of the researchers" even if improvements are now observed.

Noticeable support is brought to staff graduating at other institutions.

2. **Infrastructure**

Relatively good but research equipment is also used for student training which can often reduce its efficiency. Space is a problem.

3. **Management of the Programme**

Partnership has run very efficiently and the advisory committee worked "extremely well".

4. **Finances**

There is a noticeable discrepancy between the annual amount spent on research as presented in the Technikon self evaluation report and that disclosed in the NRF report. The table related to individual areas’ funding suggest that the monies available have been spread too thinly over a lot of activities. This could be very detrimental to the efficiency of the funding.

5. **Activity Areas**

5.1 **Artificial Intelligence and Communication**

The area is relevant to the South African situation and has shown remarkable progress from its inception. The considerable staff turnover after inception has affected the outputs of the activity area but it now seems to have a leader and staff well on course to start publishing and producing M and D Tech students. A substantial number of staff members have obtained higher qualifications (M) at other institutions whilst a significant number is registered for D degrees. There are publications in refereed journals, e.g. IEEE, but the authorship of these seems to rest on two researchers.

The research has had little impact on industry and some attention needs to be given to this issue. The activity area has also been able to attract THRIP funding.

5.2 **Computer Aided Manufacturing**

This area suffered from leadership problems at inception. There was also staff development overseas which was advantageous but had negative implications in terms of current staffing.
This has led to rather slow capacity development in this activity area as reflected by both low publications and number of post-graduate students.

Whilst the activity area was designed to cover a wide range of manufacturing related fields, it is perhaps the right time to consider focussing on a selected few areas and concentrate more on those in view of capacity within this area and the lack of collaborative efforts with other institutions.

5.3 **Industrial Processes & Pollutants**

The focus of the activity lies in sampling and analysis of a wide range of pollutants. This does not appear clearly from the title. Despite this the field is of clear relevance to industrial needs. The limited information about collaboration with local industries is therefore somewhat surprising. It is interesting to note that the team filed a patent.

The staff has developed well. Training in international institutions is acknowledged.

5.4 **Microbiological and Organic Control**

The review panel is deeply concerned by the highly divergent opinions expressed about this activity area. The panel strongly recommends that this should be investigated.

The focus area is relevant and has succeeded in laying an excellent foundation for the next phase of research. A number of staff members have had their qualifications upgraded through the NRF programme. There has been a significant number of post-graduate students who have benefitted from the programme.

Linkages with other institutions have been established but the impact on agricultural bodies, industries and other government agencies has not been well developed.

5.5 **Water and Membrane Technology**

The research is clearly focussed on a field that is highly relevant in the SA context. It appears that good work has been done but very little has been published. However, there are a number of patents filed and in preparation and products have been developed. Contacts with industry are suggested but too little information is available. Such contacts are to be encouraged.

The area leader is certainly an efficient champion of the activity, but this kind of "one-man show" poses questions about the sustainability of the activity.

Staff development seems only to have happened internally at ML Sultan. Is this a sign of isolation?

It is clear that initially, there has been little staff involvement, but subsequently the activity area is contributing in this sphere.
6. **Social Sciences and Humanities**

6.1 **Staff development: Capacity Building in the Faculties of Arts and Commerce**

Essentially, funds available were used to organise workshops that are very relevant as "introductions to research" but can hardly be considered as research in themselves. In the forthcoming period it is therefore expected that actual research projects be conducted.

6.2 **Investigation to an appropriate response to product design**

Despite some criticisms, the reviewers strongly emphasise the importance of this project, the impact it has already had and its general quality. The author is encouraged to publish her results in appropriate journals.

The project should be supported further as its "applied" aspect fits well in the role of Technikons in the SSH domain.

7. **Overall Assessment**

The Technikon has created a conducive atmosphere and has provided infrastructure for conducting research within the institution. The programme has in a number of activity areas succeeded in improving the qualifications of staff. However staff development policy whereby staff are normally trained in other institutions has led to an under development of research capacity in some activity areas at least in the short term. This is not seen as negative but efforts should be put in place to accelerate this phase of research. This should be looked at in the perspective of a merger with Natal Technikon.

There is a need for further focus in several activity areas.

The review panel strongly recommends that the issue raised by diverging opinions concerning the "Microbiological and Organic control" activity be addressed.

Some progress in SSH with mainly staff development in the Arts and Commerce Departments and in Product Design shows promise for further development.
1. **Organisational Environment**

   The management support for research is questionable. There is no dedicated driver in this area.

2. **Infrastructure**

   Reasonable.

3. **Management of the Programme**

   Partnership with the NRF is satisfactory. Commitment to research appears to be more in terms of finance than structured human capacity. The Advisory Committee appears to work well. Relations with the ex-CSD appear to have been excellent.

4. **Finance**

   Finance well managed compared to many other technikons. Ratio of budget spent on research seems good compared to other technikons. There is a satisfactory technikon contribution on top of amounts provided by the NRF.

5. **Activity Areas**

   5.1 **Design, Materials and Manufacture**

   Though originally criticised in terms of output, it would appear that capacity was being built, and the results of this are now emerging in increased research output of good quality. Fundamentals seem sound.

   5.2 **Process Control and Systems Analysis & Design**

   Our ability to comment on this project is blurred by the disquieting allegations that emerge in one of the reviews. Added to the, at times, somewhat uneasy relationship between the project and the NRF, this is of some concern. There are also concerns about continuity of membership of the advisory committee. However, the project has been productive in terms of research results. The uncertain aspects of this activity area need to be investigated.

   5.3 **SMME Sector Technology Transfer**

   Though activity in this area has been limited, depending largely on one person, with little staff development, the programme is interesting in that, although classified as SET, it is in part a typically SSH area. This points towards possibilities in the next phase of NRF activity of a wider integration of human sciences submissions. However, in itself this activity area is embryonic and needs to be further developed.

   5.4 **Waste Management**

   Some quality research has been done in this area, but it revolved around the area leader who has since departed. This project does indicate the necessity for strong and continuous leadership. There appears to have been resistance in the group to collaboration with other
institutions. This is regrettable. In our view, this is an important area and it would be unfortunate if it was to be discontinued. Collaboration with other technikons in the field is strongly recommended. There are strong possibilities here for interfacing with social scientists in the impact on communities of waste management.

5.5 **Distance Education through Radio**

While this area is now dormant, and while it was terminated because of its uncertain research content, it is an important area that is more a social than a natural scientific or technological concern. It might be pursued under the heading of social sciences.

6. **Social Sciences and Humanities**

There seems to be potential in this area for the formation of broadly SSH-oriented activity areas, especially in applied art and economics. This should be explored.

6.1 **Tourism Research: Education and Training in KwaZulu Natal**

Some good work appears to have been done here, with a pleasing output of students. This might be an area, organised at the moment on a largely individual basis as with many SSH initiatives, that has the potential to become a wider sustainable activity area.

6.2 **Analysis of the Service Quality Expectations amongst Health Care Users in KwaZulu Natal**

This is a relevant area with some research outputs. There are no details about students. There is, in general, not enough detail to make a judgement on overall outputs.

6.3 **Computer Mediated Communication**

This was a beginning researcher’s small-scale project. It looks relevant and satisfactory, but should not really be the subject of attention by a team such as this. This project might be integrated into some larger investigation.

7. **Overall Assessment**

Disappointing in terms of SET outputs given the amount of money spent. Insufficient investment in human capital. There is room for collaboration with other institutions where possible – there are several relevant areas. This institution is apparently making some progress in terms of SSH activities, and, especially in the context of the forthcoming merger with the ML Sultan Technikon, there are possibilities of interesting synergies.

Progress has been made with SSH programmes and one possible niche area, tourism, has potential.
1. Organisational Environment

It appears that in spite of a committed Director of Research, there is a lack of support for research from top management. There are thus difficulties in creating a research environment, in spite of some successes in building research capacity at least in terms of increasing numbers of staff obtaining higher degrees. There is a considerable amount of conflict within the institution: while management says that outside involvement is essential, there appears to be staff resistance to this. There is also a high turnover in staff. It appears that BMW, which at one stage committed itself to the development of links with research at the technikon, has now withdrawn.

2. Infrastructure

There is very limited research infrastructure including laboratory and library facilities at this technikon. It is insufficient to train masters and doctoral candidates. This is a major problem that needs urgent and continuing attention.

3. Management of the Programme

Research is not given a high priority, with top management support lacking. There is a lack of clarity as to the locus of responsibility for research. The relationship between the Director of Research and the NRF is good.

4. Finances

The NRF is a minor participant in research support at this technikon, contributing 3% of the research budget, which is itself 0.7% of the overall budget. It is therefore questionable whether the technikon should be urged to “seriously question" its research involvement, since it would appear it is involved in research on the basis of substantial funding obtained elsewhere (ESKOM, THRIP etc.), but not primarily in NRF-supported research. Nevertheless, it is doubtful if real value for money has been achieved from the NRF’s investment at this institution in terms of research.

With some relatively substantial funding, the question presents itself as to why there is not a better research administration structure?

At this as at some other institutions, more money appears to have been allocated in some cases by the NRF than has been spent by the institution. This needs to be investigated.

5. Activity Areas

5.1 Renewable Energy

This activity area has enthusiastic leadership and its work has been well received. Generally, quality is acceptable, but needs further development. It is a relevant area with appropriate partners, and funding has been received from several sources. There are no masters or doctoral students associated with this programme, and staff development is also a major concern.
5.2  **Water and Related Environmental Issues**

Though this area possesses enthusiastic leadership, and has links with partners in France and the United States, it has suffered from conflict between the departments of Chemistry and Chemical Engineering. The area is certainly relevant. However, the inadequacies of the institution’s infrastructure, as well as the low level of qualifications of participants, must call in question the ability of the team to do work of any stature. There are no postgraduate students.

Sustainability of this area is a real question. There does not appear to be any real succession planning.

5.3  **Food Production and Security; Health Care**

We note that both these activity areas failed to develop. They are both important, however, and we suggest that collaboration on such issues between technikons could give them the collective muscle to consider embarking on research.

6.  **Social Sciences and Humanities**

No NRF-supported projects listed.

7.  **Overall Assessment**

Improved infrastructure is a precondition for sustained progress at this technikon. There is an apparent contradiction between the rather limited research capacity of this institution, the small NRF involvement, and the relatively substantial outside funding that it is receiving. The leverage that the NRF can exert must be rather limited in these circumstances. The readiness of this technikon to put its full weight behind a research effort is questionable.

No apparent SSH activity areas.
1. **Organisational Environment**

Very little commitment by top management and internal conflicts within the institution led to the absence of development of any research activity. There appears to be a lack of research strategy within top management. The responsibility of the activity leader whose collaboration but also ability are questionable is a major contributing factor.

2. **Infrastructure**

The equipment in the chemistry department is apparently good, thanks to external donors. The library is ill equipped to support an intensive research effort.

3. **Management of the Programme**

There seems to be no structured management of the programme despite the statement to this effect from the research director. The activity leader claims he is unwilling to collaborate. There is no advisory committee: this is probably not a major problem considering that there is only one research activity area.

4. **Finances**

Data from the Technikon is essentially absent.

5. **Activity Areas**

5.1 **Sophisticated Chemical Analysis**

The self-evaluation report is very poor, accordingly the reviewer’s comments are very negative. There are no real outputs. It should however be mentioned that the co-leader who seems to be of good quality is graduating at DTech level at Technikon Pretoria. He should be given an opportunity to stay there or perform research and teaching in another institution.

6. **Social Sciences and Humanities**

6.1 **Marcus Aurelius and his meditations**

Despite the interest of the topic, it is questionable if it is actually research and it is anyway hardly relevant to activity at a Technikon.

6.2 **Role of Venture Capital Finance in Black Business Development**

The topic is obviously of socio-economic interest and could be addressed within a Technikon. However the work is far from being finalised and hence no report is available.

7. **Overall assessment**

The achievements so far are very disappointing. The possibility of discontinuing research at this institution should be considered which will have an impact on B. Tech programmes.

SSH activities were limited to two areas. One area has the potential for further development.
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1. Organisational Environment

The Technikon established a decentralised research administrative structure without strong coordination. This resulted in the dilution of responsibilities exacerbated by the absence of a dedicated manager to drive research. Accordingly, even if the overall partnership was good, some researchers did not understand the “rules of the game” and the aims of the programme. The difficulty in attracting post-graduate students is often mentioned; it might be related to the admitted lack of supervision expertise.

2. Infrastructure

Satisfactory. Some activity areas have acquired “a fair amount” of equipment.

3. Management of the Programme

See § 1. A formal advisory committee was appointed in 1997 (on top of the other structures?) and seems to have worked well despite a problem of continuity of membership.

4. Finances

The percentage of the Technikon’s budget allocated for research, as claimed in the technikon self-evaluation report, is far higher than for the other institutions, reaching 17% in 2000. Is this the reality? Further, even in total terms, there is a very significant difference between the funding as disclosed by NRF and NRF’s contribution as recalculated from the technikon data.

5. Activity Areas

5.1 Appropriate Technologies for Affordable Food Products

Despite the recommendation of the advisory committee and NRF and good planning assisted by outside advisors, the progress in terms of four research results is described as very disappointing. The future of this activity should be scrutinized very carefully: if the basis is there for this, collaboration with other institutions might be considered.

5.2 Control and Computer Applications

Even though the activity leader claims that it will focus on application-based research, the postal reviewers strongly recommended that such a focus should be improved. Though there are some nuances in their opinions, they express a common concern about the outputs and development of this activity. It is thus questionable if the activity should be pursued without a further in-depth review. The favourable output in terms of improving the qualifications of staff and the number of postgraduate students should be noted.

5.3 Environmental Research

Environmental research is a topic that is addressed by several technikons; therefore it appears that a certain specialisation should be introduced which is certainly not the case within this activity. Apart from the list of publications of a single researcher, the output of the activity, including linkages with policy makers and communities, is very limited.
However, the review panel considers as a very positive output the fact that students are rapidly taken up by industry, even if this has some negative input on retaining some of them for MTech qualifications. This should obviously be addressed for development of the staff and the sustainability of the activity. In contrast with one of the postal reviewers, the panel considers as very positive that the activity is oriented towards industrial needs.

5.4 Manufacturing

All three main areas - i.e. welding, CAD/CAM, composites - are activities of great interest for industry and are all led by well-recognised experts. The review panel suggests that they be further supported, but split into three more focused activity areas that already show great potential and even outputs. Quality and relevance to industrial needs are acknowledged.

A strong infrastructure has been created in the form of a “partially autonomous centre” with three research laboratories devoted to the areas identified above. This benefited from financial assistance from THRIP and SASOL; therefore the comment of one of the postal reviewers about “limited industrial participation” is questionable. There appear to be also commendable “triangular” collaborations with industry and universities especially in the area of polymers.

Despite the large numbers of postgraduate students who have participated in the programme, the number of staff involved appears to be very low. It is not clear whether the autonomous status of the centre has contributed to this.

5.5 Sustainable Community Technology

Most of the projects seem to be related more to literature surveys than to actual research and often more to SSH issues than “hard” science, engineering and technology. Concerns have been expressed about the “far-from-reality” aspect of the papers produced. Focus is lacking. It is suggested that this activity area be examined in terms of objectives, projects conducted and links with industry, before further support is envisaged.

5.6 Telecommunications

The activity area has failed in meeting one of the major objectives of the NRF programme, namely the improvement of staff and postgraduate student qualifications. The NRF programme is in fact a minor source of funding for the activity that receives the majority of its funds from THRIP or directly from industry. This kind of high quality and very relevant research should be encouraged but the involvement of the NRF is questionable.

6. Social Sciences and Humanities

The SSH activities at this stage are essentially related to educational issues. They resulted in significant improvement of staff qualifications especially when considering the size of the staff.

6.1 Research to assess the training and development needs for local government in Northern Cape Province and the possible training strategies

There is a strong discrepancy in the opinion of the postal reviewers about the quality of this work ranging from questioning “any intellectual impact” to proposing that it “can serve as a training model throughout South Africa.” Unfortunately this throws some doubts on the validity of this particular postal evaluation; the panel is not in a position to comment further.
6.2 **Accreditation of scholars in higher education: Some impressions of the UK experience**

This seems to be limited to a report of a study trip of the author to England without any in-depth analysis of the applicability to South Africa.

6.3 **Mechanisms of participatory and sustainable teacher development**

Very divergent and even opposing views are expressed by the two postal reviewers about the relevance, quality and methodology of this research. Even if one of these reviewers is a renowned leader in the field of educational studies, this again throws some doubt on the validity of this particular postal evaluation exercise and does not enable the panel to have a well-founded opinion.

7. **Overall assessment**

The overall development of research at the technikon is difficult to assess due to the very different stages that individual research areas have reached up to now. In contrast with the NRF report, the panel believes that research has effectively taken root, but not in all areas. Manufacturing is probably the best example of development. Telecommunication is another, though up to now it has shown poor synergy with the NRF programme.

Activity in SSH revolved around staff development.
1. **Organisational Environment**

   This technikon took a proactive approach towards research development before most others and this has shown results in terms of its activities in this area. There is commitment from management: a very well-organised environment.

2. **Infrastructure**

   The research infrastructure appears to be good. There are still some bottlenecks in terms of expensive specialist equipment in some areas.

3. **Management of the Programme**

   Relations between the NRF and the technikon have been smooth. In general, the advisory committee has worked well.

4. **Finances**

   The percentage of funding devoted to research is good. We are unclear as to why NRF funding is excluded from the technikon's research budget. There are also discrepancies between the funds allocated by the NRF and those recorded as spent by the institution. This might be clarified by an explanation of the previous point.

5. **Activity Areas**

5.1 **Catalysts and Technologies for the Environmentally Responsible Production of Fine and Intermediate Chemicals**

   A good and relevant research niche area. Very good collaboration with and respect from industry. Feedback on quality also appears good, though it is recommended that international exposure be extended, since the quality appears to justify this.

5.2 **Effective SET Education**

   Initial progress was slow, with some problems of focus at first. This situation seems to have been remedied. The area is in the field of pedagogic development, and might be reassigned to some programme stressing this dimension other than research as such. However, good work has come from this area. Inter-institutional collaboration is active.

5.3 **Food Production and Food Security**

   There are doubts about the relevance of some projects to the overall activity area. There may be some lack of focus: collaboration with Technikon Free State or the University of Fort Hare is advised, because of similar focus areas. There is mixed feedback on the quality of work in terms of international standards.

5.4 **Forestry**

   A good niche area, unique amongst technikons. While activity in the area is escalating in a significant way, it is unclear from the documentation who will be the designated activity
leader. There are some concerns as to the output of original work: however, there is considerable potential in this area. Some further research focus is needed. The activity area received some support and encouragement from the forestry industry.

5.5  **Information Security**

This area revolves primarily around one individual. Quality and applicability is good but there does need to be attention to sustainability and succession given the high demand for personnel in this area. High quality work is being produced here.

5.6  **Manufacturing Technology Expertise Development**

Based on the one useful review report available, it seems that there is excellent commitment in this field, though there are a few concerns in terms of the quality of outputs. In contrast, the NRF report mentions this area as being of high quality even by university standards.

5.7  **Renewable Energy**

This area has been terminated. However, it is active in at least three other technikons, and is highly relevant, and collaboration might be considered with other institutions.

6.  **Social Sciences and Humanities**

6.1  **Towards the ratiocination of the extent of Artifacts ....**

This project, which is original and creative, is certainly an unusual piece of research. It does not have any spin-offs in terms of training. However, the resources that have been directed to it by the NRF are not large. This research is an example of how SET and SSH areas can function together in a multidisciplinary way.

6.2  **Education**

This project, for which there are apparently no external reviewers, appears to be pedagogic research for a D Tech study. Within this framework, there seems to have been reasonable productivity.

6.3  **Conferences**

This appears to be simply grants to attend conferences: it is not in itself a research project and no comment can be made on this level. We recommend that such modes of support would be incorporated in the wider NRF programmes henceforth.

6.4  **Feasibility of compulsory defense disclosure in SA criminal justice system**

This project is to support a PhD project which is still in progress. Therefore, there are no research results as yet upon which to comment.

6.5  **Managing diversity**

The small amount of support given in 1996 was to support a PhD study. It seems to have been productive in terms of subsequent published outputs. This is an important area which might be considered further as a potential activity area.
6.6  **Breaking the hoop: A site-specific art form**

A small amount of money was given in one year to support this artistic enterprise. It seems to be forcing this very legitimate enterprise into a conceptual straitjacket to have to see it in terms of "research". It would seem that critical comment in its field regards this project as being broadly of a high level of interest and creativity.

6.7  **Mass customisation in the Eastern Cape - a required paradigm shift**

This project is to support a PhD study. Within this framework, good if descriptive work appears to have been done, with a considerable number of outputs in terms of publications, reports, etc.

7.  **Overall Assessment**

The drive, intentions and support for research are well-established at this technikon. In terms of strictly research criteria, some of the activities are doubtful and while they should be pursued, perhaps not under the research rubric. Much good work is being done here, more advanced in many cases than in most other technikons.

The SSH projects supported by the NRF are mainly small-scale, comprising for the most part support for doctoral candidates and other often valuable and limited enterprises. Much SSH research output here can be grouped in the economic and human-relations areas. This might be related to some of the SET areas of the technikon. Clearly this does not fit into the wider "activity areas" concept to which the NRF is now adhering. The conclusion may be that in future projects such as these should, where possible, be integrated into a broader research thrust. Projects such as the site-specific art form and the study of the Turin Shroud (Towards the ratiocination of the extent of artifacts ...) should be encouraged: the difficulty is whether this should happen within an activity areas framework.
1. Organisational Environment

There appears to be definite commitment to research at top level at this technikon, and there is a comprehensive research policy in place. While there is a need to upgrade the overall qualifications of staff, there seems to be a real commitment to doing so, including the allocation of funds to the appointment of Research Professors dedicated to the upgrading of research and the building of research capacity. All this is in the context of the development of a limited number of well-focussed research areas.

The person with direct overall responsibility for research is highly effective, and now has the role of Research Director.

2. Infrastructure

Research infrastructure seems good. The administrative framework is handled adeptly by a team of twenty people.

3. Management of the Programme

As mentioned above, the strategic vision in terms of research seems admirable. The NRF initiative is regarded very positively.

4. Finances

Even taking into account the carry-over of funds from one year to the next, there appear to be considerable discrepancies between research funds allocated by the NRF and spending by the technikon. This should be interrogated and explained.

5. Activity Areas

5.1 Analytical Separations and Spectroscopy

The quality of research in this area is good, but there is a lack of focus which the participants are perhaps reluctant to confront. There are in fact two quite distinct research areas, which could with advantage be separated, continuing independently. The development of personnel has been steady, with good output of masters and doctorates.

There are possibilities of cross-linkages with other activity areas such as Pollution and Waste Control and Food Technology which might be looked into. Some administrative problems concerning mid-year registrations should be ironed out.

5.2 Combating Malnutrition

This activity area is well planned and focussed, is relevant to social needs, and has good leadership. However, though output of higher degrees is satisfactory, there are some quality concerns and the publications emanating from the area are not at this point particularly impressive. Community involvement is positive.

There is a proliferation of programmes in similar areas in various institutions, and it might be appropriate to consider cooperation and joint planning. Even within the institution, the
relationship of this activity area to that on Food Technology to Feed the Nation should be considered. It might also be possible to involve social scientists in the area: combating malnutrition is clearly a social as well as a food quality problem.

5.3 Food Technology to Feed the Nation

While a satisfactory number of publications have emanated from this area, few higher degrees have emerged, and some sub-themes seem not to be appropriately housed and could with advantage be moved to other areas: Treatment of an Oil Effluent, for example, could be moved to Pollution Control. Overall, the core elements in the area could be incorporated, as noted above, in Combating Malnutrition. Concerns about information technology resources, financial systems and the like have emerged in this area: these should be investigated. The integration of biotechnology in this area should be further investigated.

5.4 Industrial Control and Communications Technology

The output of students has been good, and there is ample potential in this area. However, there seems to have been some decline in the initial industrial linkages and collaboration, and there is a certain amount of internal leadership conflict. There is a need for more focus and a clarification of leadership, which at the moment is centred excessively on individuals.

It is questionable whether telecommunications fit fully into this area, and there may be an element of artificially coupling insufficiently compatible elements. This may have impacted negatively on the leadership of the area as well as on its research coherence.

5.5 Materials Technology

This area should be named Inorganic Materials Technology. The quality of research is good, but a focus on applications is required. The production of degrees has been good.

5.6 Mathematical Technology

This is an excellent applied activity area. A substantial number of papers have appeared in education and applied mathematics journals, and the output of masters and doctoral students has been good. There may be an incipient problem of sustainability, which should be monitored carefully and appropriate action taken when necessary.

5.7 Pollution Control and Waste Technology

Some good work seems to have been done, not however always reflected in journal articles of sufficient quality. Some aspects of this area might be shifted to other programmes, and control over equipment might be improved. Links with industry might also be improved.

Aspects of this area are researched in a number of institutions, yet it is a relatively minor activity at Pretoria Technikon. It might be worth considering whether this area should be pursued at this institution. Sustainability and succession are a problem.

5.8 Processing of Polymers

This is an admirable joint initiative, primarily with the CSIR, with some other linkages also involved. It fills a definite niche. Research quality is fair, though quantity is not so impressive in terms of publication, and there is a relatively slow increase in formal staff qualifications.
Collaboration with external institutions should be commended. Several SMMEs have their origin in this area, and the filing of a joint patent with SASOL is a forward-looking move.

Questions do arise as to the future of this area. It would be good to know the strength of the links that bind the area to the technikon, or whether it has become to all intents and purposes a CSIR programme, given, amongst other things, the reliance on the CSIR through the use of expensive equipment housed there. This is positive in terms of research, but might be a concern in terms of student training, which has been low. Succession planning for the future leadership of the area is also needed.

5.9 **Utilisation of Plant Resources**

There are attitudinal and leadership problems in this area, and it appears to be fading out. However, we would not necessarily agree with the evaluation of the NRF that this area should be “totally reconsidered”, if this means that it should be abolished. The problems appear to be human rather than conceptual, and, though this is a sensitive area involving complex issues of indigenous knowledge and community ownership, it is not an area from which researchers should shy away. It might be asked, however, whether Pretoria Technikon, an urban institution, is best placed to carry out research in this area, given the minimal impact of this activity area outside the technikon.

5.10 **Automotive Technology**

This area was terminated because, in the words of the internal evaluator’s report, it managed only “disparate and unrelated projects”. This seems unfortunate, since, perhaps in cooperation with Technikon Northern Gauteng – if the latter’s programme in this area continues – there seems to be a real niche to be filled in automotive technology. Clearly, if it was to be revived, this area would need to avoid the irrelevant and incoherent projects and lack of liaison with industry that seem to have characterised the project when it was at its height.

6. **Social Sciences and Humanities**

Pretoria Technikon has a substantial number of SSH projects.

6.1 **Social Aspects of Intervention Programmes to Combat Malnutrition in Rural Areas in South Africa**

This project is interesting in that it is an attempt to approach problems of rural malnutrition from both social and scientific perspectives. This is certainly appropriate to the role of technikons.

The project is in its early stages and it is too soon to judge on its efficacy and results. There are, however, some concerns expressed by reviewers on the quality of the M theses produced. Also, the appointment of a consulting firm to do a social survey indicates present lack of capacity in this area: hopefully, this link will be structured in such a way as to contribute to building such skills within the technikon. There is no detail provided as to how the subvention was actually spent.

It should be noted that, though the area is certainly relevant, there are many studies of malnutrition and to justify the investment in this research, real advances in implementation strategies would be expected.
6.2 **Establishment of an African Arts and Artefacts Research and Development Centre**

The idea behind this project is interesting, in that it is intended to utilise indigenous African knowledge and Indian expertise, particularly in the field of jewelry and related areas. While imaginative, this should be seen as a developmental initiative with little research involved.

There are, however, no real results as yet except an investigative trip to India. While it is not possible to demand results at this early stage, evidence might be expected of the incorporation of postgraduate training, and of plans to publish whatever results may emerge.

6.3 **Computer-aided Performance Voice Training**

This project seems more developmental than truly research-oriented in that it concerns the application of an already existing training technique to operatic singers in the South African context. This is a valid activity, but does pose the question of the interface between research and development and pedagogy in the technikon context.

There is very little apparent in the way of published results. However, the project is relatively new, and these may be forthcoming.

6.4 (a) **The Development of Pretoria Glass Design and Technology Programme**

(b) **The Establishment of an Information Database On Glass Design and Technology**

These linked projects appear to be path-breaking in South Africa. Going by reviewers’ reports, excellent work has been and is being produced.

Without in any way wishing to suggest that support is inappropriate, it might be mentioned that, once again, the NRF is here supporting a developmental (and aesthetic) initiative rather than, on the whole, a research one. There are few research products in the sense of published papers. It may be that the NRF needs to examine and define clearly its role in this area. However, in the review panel’s opinion, the project seems well worth support.

6.5 **Functional Studies of the Academic Year of Higher Institutions in the USA and at South African Technikons**

This research into educational organisation was intended to be a once-off enterprise. There are no research results other than one published article and a similar research report. Within these parameters, it appears to have been valuable.

6.6 **Vernacular Courtyard Homes of Africa**

There is a substantial disagreement about the value of this research between one of the postal reviewers and the other two. It must be said that the single highly critical reviewer makes a strong case estimating the research as largely a historical and considering it to be creating misleading typologies. Since there are as yet no published outcomes and the project appears not to have involved postgraduate training, the value of this research is still to be proven. It may be that a project such as this would be better housed at a University with the resources in African Studies, Sociology, etc. that should be available there.
7. **Overall Assessment**

There is some excellent research in progress at this technikon. The technikon has apparently good strategic management with well established goals in research. Some activity areas are well established with high quality research outputs and well established national collaboration. Some activity areas which are grouped together might be considered for splitting up into more focussed areas (e.g. Separations Technology and Spectroscopy). Other areas should be considered for combination (Food Technology and Malnutrition). A more appropriate name for Materials Technology might also be considered.

There is undoubtedly good work within SSH, though also some of indifferent quality. In terms of the evolving NRF criteria, the material is somewhat haphazard, but this is not culpable either in terms of the researchers or the NRF, given the nature of those criteria at the time of application.

These projects often raise the question of the relationship of developmental activities and pedagogic research to the aims of the NRF. Many fall within these categories. A pointer to best future practice in the technikons might be a project such as that on glass, which appears to incorporate both SSH and SET elements in a creative way.
1. **Organisational Environment**

While it would appear that the NRF, in its own words, has not “fully understood or addressed the complexities of research at this distance education institution”, it remains surprising that research development is apparently at such a low ebb at an institution with a relatively high staff qualification profile. Hopefully the new Research Director will guide Technikon SA through a forthcoming further period of change as it merges with other institutions, and assist in the development of a research strategic plan.

2. **Infrastructure**

There are difficulties due to the SET distance education role of the institution. Nevertheless, there are opportunities as well as difficulties, and investment is needed in infrastructure to develop the staff’s own research capabilities. Collaboration is critical if it is to succeed in SET.

3. **Management of the Programme**

Communication between the Technikon and the NRF has apparently been sporadic and the level of research involvement has been low. There is no advisory committee.

4. **Finances**

No financial details are contained in the single SET submission. Only the NRF’s figures are available to the review panel.

5. **Activity Areas**

5.1 *Management of Natural Resources in Conservation Areas*

This area appears not to have produced the body of research that might have been expected given that it has been in operation since 1996. In a field where SA has real expertise this project would seem to be of indifferent quality and the published research outputs of limited value. Some publications listed are not in fact relevant to the activity area. There appears to be no financial report from the activity area.

6. **Social Sciences and Humanities**

6.1 *Role of Education and Training in Rural Human Development*

The research outcomes of this project appear to have been meagre. However, it seems to have been reasonably effective in terms of training post-graduates: it was primarily, in other words, useful as a capacity building and training exercise.

7. **Overall assessment**

Clearly progress has not been satisfactory at this technikon. Difficulties are likely to be compounded in the short term by forthcoming mergers with other institutions. However, it would seem possible for staff research to take place, and lines of communication should be
kept open with the NRF that may enable the exploitation of research opportunities, and that may help to avoid the swamping of research in the midst of the forthcoming mergers.

One team member expressed severe concerns about the possibility of experimental SET research for students in the context of a distance institution.

SSH activities were primarily effective as staff development.
TECHNIKON REPORT: VAAL TRIANGLE

1. Organisational Environment

This technikon has appointed a Research Director whose work appears to have had a beneficial effect on the commitment of top management to research in terms of support and funding. On the basis of a clear research mission statement and supported by the Research Director who has worked well with the NRF, the technikon has in general focussed effectively on niche areas. There are a number of active research partnerships with universities and technikons in South Africa and abroad: in general, research networking appears to be a strong point at this technikon. Incentives for staff to become involved in research through, for instance, training and conference attendance, are well developed.

2. Infrastructure

Research-related infrastructure is improving.

3. Management of the Programme

As noted above, partnerships in research have been well developed. This is particularly the case in the activity area, Development of Functional Foods. Though the Advisory Committee operated haltingly at first, it now appears much improved. Relations between the NRF and the technikon are good.

4. Finances

There are significant discrepancies between the amounts allocated by the NRF, and the amounts recorded as spent by the technikon itself. This is particularly marked in the activity areas Environmental Chemistry, and Electrical Power Cables, Power Quality and Electrical Machines. These discrepancies require explanation and are, on the face of it, a source of concern.

The percentage of research funding emanating from the NRF is not given in the technikon report.

5. Activity Areas

5.1 Environmental Chemistry

At a technikon at the centre of South Africa’s chemical industry, with all the opportunities that this should present, this activity area is extremely disappointing. There appear to be no research outputs, so quality can be said to be non-existent. The choice of sub-themes seems inappropriate in some cases: for instance, Analysis of the Atmosphere is beyond the potential of a technikon, and some others, while feasible, are not relevant to local conditions.

Human problems also play a role. There appear to be disabling attitudinal and leadership problems, to the extent that it is clear that new leadership is urgently required. Reporting to the NRF has been weak, and there appears to have been a negative attitude in the activity area leadership towards the NRF. Postgraduate qualifications achieved by staff are few. None have been achieved by students.
Differing in this respect from the internal NRF report, we would suggest that this activity area is highly relevant, and that new leadership and conceptualisation in the area, and not abolition, is required. A specific suggestion is that a reformed team might consider collaboration with the CSIR, where parallel research is taking place.

5.2 **Electrical Power Cables, Power Quality and Electrical Machines**

While there has as yet not been a high level of published research output, or of production of postgraduates, this activity area has been in operation for a comparatively short time and clearly needs time to develop momentum. However, it would appear that quality is good, and relevance high. Networking is commendable.

A point to be carefully considered is that of sustainability. There should be sufficiently robust backup of the current leadership to ensure programme continuity.

5.3 **Human Resources for SMMEs**

As the Self Evaluation Report notes, this activity area was too miscellaneous and lacked focus. In addition, the relevance of some areas could be questioned. It was rightly disbanded with subsections being constituted as new activity areas.

5.4 **Development of Functional Foods**

There are few outputs in this activity area, as it has been constituted recently. However, indications are that quality is good and content relevant. Helpful contacts have been made with external bodies.

This activity area should refer to nutritional research, and not “functional foods”. Ill-defined nomenclature can be damaging in terms of networking with other researchers in the field.

5.5 **Engineering Vibration**

It is too early to comment on this activity area, except to say that it appears relevant, and should be encouraged. The leadership of this area is not clear to us.

5.6 **Fluid-thermal System Technology Development and Optimisation**

It is too early to comment on this activity area, except to say, as above, that it appears relevant and should be encouraged. Quality so far seems good.

6. **Social Sciences and Humanities**

6.1 **Development of Business Skills – Curriculum for Human Resource Management**

We have no indication of progress with this research.

7. **Overall Assessment**

There has been commendable progress in a number of areas in which the technikon is actively engaged. Problems in chemistry need to be urgently addressed. Progress with SSH activities is unclear.
1. **Organisational Environment**

  Apparently, limited contract based research activities existed at the technikon, but there was very little commitment to research at any level and even “at some levels active discouragement” (!) until the appointment in 1998 of a good research director who initiated an “enormous improvement”, a sincere commitment of top management and effective partnership with NRF. This partnership seems to be hampered by the perception of some researchers that the programme leads to an overload of administrative work. This is questionable in the view of the review team, given the information received from other technikon sources. It is suggested that researchers should be trained in writing proposals, reports and other deliverables (see also 5.3)

2. **Infrastructure**

   Research infrastructure is considered as fair to good even if concerns are expressed about some laboratories. It is not clear if this refers to buildings, equipment, safety and so on.

3. **Management of the Programme**

   The very positive role of the research director has already been mentioned. An advisory committee was established in 1999 and operates well.

4. **Finances**

   Even if the reasons for not having reliable data before 1998 are acknowledged, it must be noted that there are strong discrepancies between the amounts claimed to have been invested by NRF and those that can be reconstructed from the technikon self-evaluation report. As mentioned elsewhere, the review panel recommends that the NRF elaborates a new form of financial reporting that is clear, covers the needed information and is understandable by all partners in the same way.

5. **Activity areas**

   5.1 **Casting Technologies**

   While this activity area could be an excellent niche for the technikon, nothing seems to have really happened from the time when the area was first funded (1997). No postal reviewers’ reports were available. No post-graduate students improved their qualification within the framework of this activity.

   5.2 **Occupational and environmental radiation assessment**

   Changes in personnel and leadership have delayed the start of this activity by two years. The review panel is concerned about what it considers to be a lack of focus. As a matter of fact, 12 projects are presently running which are of very different natures even if all of them are related to biological effects of radiation. They cover as well basic biological research, epidemiological studies and radiation exposure evaluation techniques. Referring to the latter, the panel would like to nuance the opinion of the NRF that this is a "very narrow specific focus". On the contrary it sees there a valuable niche for a technikon’s activity.
It is noticeable that research on pulmonary tuberculosis in gold miners is obviously of great interest to the mining industry. The activity leader is directly involved in eight of the projects and should thus not unfairly claim problems with "work other than research." She alleges a plethora of internal and external problems which make progress difficult. However, this should be seen in relation to the decision to conduct a wide range of projects and take on many postgraduate students, though with low research output. Again, greater focus seems imperative.

5.3 **Optimal delivery of the constructed environment**

N.B. The title given by the technikon is "Optimising delivery of physical infrastructure." These titles could cover different areas.

The programme started only in 1999 and the financial support is low. With the available information, it is not clear to the review panel how the very heterogeneous projects fit under the umbrella of the activity area from logistics to civil engineering.

There is up to now very limited output in terms of qualifications improvement. The activity leader apparently does not understand the role of the NRF and is further frustrated by his contacts with his hierarchy, his colleagues, the research office of Technikon Witwatersrand. Not really a good sign for prospective students.

5.4 **Technology of cereal, legume and tuber foods**

Activities started essentially in 1999/2000, which explains the limited output. The focus is questionable. However, good scientific quality is mentioned by the reviewers for publication related to three individual projects.

5.5 **Other Activity Areas**

The panel expresses its concerns about the number of activity areas that were appraised and never followed-up.

It also draws the attention of NRF to the "fashionable" aspect of nanotechnology and the rather "blue-sky" nature of this recent discipline. It wonders if it fits presently in technikons’ more applied research.

6. **Social Sciences and Humanities**

6.1 **Establishment of a paper making unit at Technikon Witwatersrand**

Despite the limited amount of information and a limited output in the form of publication, the postal reviewers are extremely positive about this project.

The very dedicated leader raised large enthusiasm among the students. In the past 4 years a pilot paper mill was set up. Papermaking is now part of the curriculum. A fibre data base was started as well as links with industry.

This kind of activity, combining SET and SSH aspects, is highly commendable and deserves more support from the technikon management. It is an example to be followed by other institutions.
6.2 **Skin deep (De) constructing gender and identity in representation**

The summary of the activities hardly allows the team to identify either the goal of the research or the achievements if in fact any research was actually performed. This looks more like support to an individual artist for her artwork than research.

6.3 **Assessment of practical skills: criterion referenced approach**

The research was seemingly performed in 1996-97. As no indication is given on the specific area, the panel can hardly comment. Two of the three postal reviewers are quite negative about the quality of the work.

7. **Overall Assessment**

The review panel is concerned by the frustration expressed by different activity leaders that could indicate relationship problems within the technikon as well as with NRF. It is alarmed by the opinion expressed by the NRF report that “there is active resistance to research in some quarters”!! In the field of SSH, there are few specific actions to be mentioned in terms of staff development; suggestions by the research office were not met. Few initiatives are targeted at postgraduate students. Here also lack of interest by staff in research is notable.

However, given the enthusiasm and clear views of the research director, the panel is of the opinion that a further chance should be given to the technikon to demonstrate its ability to perform research, even for a limited period. Scientists in the institution should be educated about their own responsibilities when initiating research projects, reporting their advancement and disseminating their results. The activity on "Establishment of a paper making unit" is very commendable and the panel recommends that it should be taken as an example of combined SSH and SET activities that could be undertaken by technikons.

There is apparently little interest in SSH activities including staff development. One good area emerged (paper making) which is noteworthy but other activities were limited and sporadic.