APPENDIX A – INTERVIEW SCHEDULE FOR THE INTRODUCTORY MEETING*

1. **Can you tell us a little about THRIP?**
    a. History of THRIP
    b. Mission of THRIP
    c. Success of THRIP

2. **Which partnerships have been forged by THRIP?**
    a. Total Number of Partnerships
    b. Nature of partnerships
    c. Industry and higher education institutions involved (Universities and/or technikons. Public and/or private)
    d. Overall impact of THRIP on innovation and knowledge production in these areas? Which Indicators have been used: Patents, Publications, Students Graduated, Any others?

3. **Which Partnerships have been forged in THRIP in the area of biotechnology, materials development and ICT?**
    a. Does THRIP have a policy of encouraging partnerships in scarce skills areas?
    b. Total partnerships forged in these three areas?
    c. Nature of the partnerships?
    d. Industry and higher education institutions involved (Universities and/or technikons. Public and/or private)

    Overall impact of THRIP on Innovation and knowledge production in these areas? Which Indicators have been used: Patents, Publications, Students Graduated, Any others?

* The Appendices that follow are facsimile copies of the original research instruments.

APPENDIX B – THRIP PROJECT DATA ISSUES

File format

Format

The original data were presented on request by the research team, in the form of five Excel worksheets:

- Industry Partners
- Institution
- Grant Holders
- Budgets
- Teams

Issues

There are two issues with this flat file format:

- there is much duplication of information which:
  - wastes space
  - allows for inconsistent entries in different worksheets
- extracting related information from more than one worksheet is fairly cumbersome and therefore error prone.

Examples

Duplication

- duplicate records exist for Grant Holders and Researchers who are involved in more than one project. This duplication makes the counting and summarizing of so-called "warm bodies" as distinct from "research links" a lot more difficult to do in a consistent way.
- Institution appears in Institution, Grant Holders and Teams worksheets
- Department appears in Grant Holders and Teams worksheets

Inconsistencies

- Botany, Department of Botany, Phychology Unit Botany Department…

Related information

- Establishing whether the Grant Holder, in one worksheet, and the Team member, in another, belong to the same Institution and Department involves a lookup based on project ID, which can be automated, but the comparison of "Botany"with "Phychology Unit Botany Department" cannot. I generated short Department names by stripping out "Department of" etc. but the final cleaning of the "Phychology Unit" and spelling mistake inconsistencies was manual and time-consuming.

Missing data

Missing Department and/or Institution names limited the networking analysis to some extent.

A relational database

A relational database will be required for this data and analysis. An appropriately designed relational database minimises duplication and inconsistencies as well as dealing with the inter-relationships between the different "areas" of the data.

The data could be arranged in the following *tables*:

1. **Project** containing
   - Project ID
   - Title
   - Focus
   - Grant Holder

   with links to:
   - **Annual Record**
   - **Person**

2. **Annual Record** to deal with project details that may change from year to year:
   - Funding
   - Outcomes

   with links to:
   - **Person** via **Researcher** *junction table* to deal with the possible many-to-many relationships. A single researcher may work on many projects in a year and a single project may involve many researchers in a year.
   - **Industry Partner** via **Partner** *junction table* (as above).

3. **Person** containing Grant Holder and Researcher details because a single person may fulfil both roles.

4. **Institution-Department** combination – with links to:
   - **Person**

5. **Industry Partner**

6. An **Institution** *lookup table* would reduce duplication and ensure consistency.

APPENDIX C – COPY OF QUESTIONNAIRE SENT TO INNOVATION FUND HIGHER EDUCATION BENEFICIARIES

THE NETWORK SOCIETY – AN AUDIT OF INDUSTRY BENEFICIARIES

HSRC

QUESTIONNAIRE

To be completed by the higher education beneficiaries of Innovation Fund Project

THE INNOVATION FUND

Human Sciences Research Council

INSTRUCTIONS

1. Please answer all the questions as fully as possible.

2. Please **keep copies** of all returned questionnaires.

3. Before posting the questionnaire, please use the checklist on the back cover to check that you have completed all the requirements.

4. Please return the questionnaires to L. Powell Consultancy by the **XXX of XXXMonth 2002** to enable researchers to process the information as quickly as possible.

5. Return questionnaires to Lesley Powell, 29 First Avenue, Westdene, 2092 or Fax to: 011-477-3063 or email to lesleyp@worldonline.co.za.

6. If there are any queries address these to Lesley Powell at 011-673-3039 or lesleyp@worldonline.co.za

SECTION A - TELL US ABOUT YOURSELF

A1 Name _____

A2 Race (Please tick the appropriate square)

African ☐ Indian ☐ Coloured ☐ White ☐ Asian ☐

A3 Gender (Please tick the appropriate square) Female ☐ Male ☐

A4 Citizenship? (Please tick the appropriate square) South African ☐ Other ☐

A5 Department/centre/ unit _____

A6 Contact details

Physical Address (Street Address) _____

_____

Postal Address _____

_____

Telephone Number ( )_____

Fax Number ( )_____

Email Address _____

SECTION B - TELL US ABOUT THE INNOVATION FUND PROJECT

B1 **What is the Project Number?**

B2 **Name the Industry Companies and/or enterprises involved in the project and for each please provide the name and contact details of the main contact person**

Industry Enterprise or Corporation	Contact Person(s)	Phone No (W)	Cell Number	Email Address

B3 **Name any other Higher Education Institution(s) involved in the project (excluding your own institution) and for each please provide the name and contact details for the main contact person.**

Higher Education Institution	Contact Person(s)	Phone No (W)	Cell Number	Email Address

B4 **Please indicate which discipline your project falls into by ticking the appropriate square**

Biotechnology	
Information Communication Technology	
New Materials Development	
If Other, please indicate the discipline_____	

SECTION C - TELL US ABOUT THE OTHER STAFF (INCLUDING RESEARCHERS AND STUDENTS) INVOLVED IN THE PROJECT AT YOUR UNIVERSITY

Please provide details of the researcher(s), other than yourself who are involved in the project by completing the table below. Please note that 'researchers' could include students and university staff members who are working as researchers in the project.

C1

Title	Initial	Surname Provide the surname of the researcher	Race 1=African 2=Coloured 3=Indian 4=White 5=Asian	Gender 1=Male 2=Female	Highest Qualification Please provide the highest qualification where: 1=Degree, 2=Degree+diploma, 3=Honours, 4=Masters, 5=Doctorate	Department Provide the name of the Department or Unit that the researchers is located. For example: Department of Biotechnology or Department of Forestry	Category of person involved Please indicate if the person is a student or a staff member of the university, where: 1=Student, 2=Researcher employed as a university staff member

SECTION D - INVOLVEMENT WITH INDUSTRY DURING THE PROJECT

D1	**Does your project involve higher education staff or students spending time (as staff or student placements) in industry OR vice versa?**	Yes	No

IF YES, PLEASE ANSWER THE FOLLOWING:

D2	**What is the total number of HIGHER EDUCATION STAFF that spent time in industry?**	
	What is the total number of HIGHER EDUCATION STUDENTS that spent time in industry?	
	What is the total number of INDUSTRY STAFF that spent time in higher education institutions?	

SECTION E - TELL US ABOUT THE OUTPUTS

E1 Please provide details on the outputs of your project

Project ID	Year	Students	Team Members	Research Publication(s)	Patents	Products/Artifects
		Provide total number of students who were involved	Provide total number of Higher Education team members involved	Provide total number of research publications	Provide total number of patents that resulted from the project	Provide total number of artefacts that resulted from the project.
	Round 1					
	Round 2					
	Round 3					

APPENDIX D – COPY OF THE QUESTIONNAIRE SENT TO INDUSTRY PARTNERS OF BOTH THRIP AND THE INNOVATION FUND

THE NETWORK SOCIETY: AN AUDIT OF INDUSTRY BENEFICIARIES

HSRC

QUESTIONNAIRE

To be completed by the Industry Enterprises involved in Innovation Fund and THRIP Projects

HUMAN SCIENCES RESEARCH COUNCIL

Dear Participant

Thank you for agreeing to complete this questionnaire. The questionnaire forms part of a larger study, funded by the Carnegie Corporation, that aims to investigate the phenomenon of networking and partnerships between industry and Higher Education institutions and the influence of this on the emergence of new forms of knowledge production and the development of commercial innovations.

In conjunction with the baseline data gathered from THRIP and the Innovation Fund, this specific survey, endorsed by THRIP and the Innovation Fund, aims to determine the industry perspective of higher education partnerships.

Before completing the survey, please note carefully the following:

1. This questionnaire has been designed to determine you r perspective of the higher education-industry linkage. Please complete the questionnaire yourself by providing, where requested, your personal perpectives, rather than the policy statements of the company for which you work. The data will be presented in aggregated format in the final report and the perspectives expressed by individuals will not be held as confidential.

2. Please answer all the questions as fully as possible.

3. Please **keep copies** of all returned questionnaires.

4. Abbreviations used in the questionnaire:

   - HE - Higher Education
   - THRIP - Technology and Human Resources for Industry Programme
   - N/A - Not Applicable

5. Please return the questionnaire to LPowell Consultancy by the **21st of October 2002** to enable researchers to process the information as quickly as possible. Return the questionnaires to June Knight, 29 First Avenue, Westdene, 2092 or Fax to: 011-477-3063 or email to: junek@worldonline.co.za.

6. Queries may be addressed to June Knight at 011-673-3039 or at junek@worldonline.co.za.

Please provide your contact details:

Name _____

Phone Number _____

Fax Number _____

Email Address _____

A. ABOUT THE RELATIONSHIP OF THE ENTERPRISE WITH HIGHER EDUCATION

A1

What is the total number of industry-higher education linkages that the enterprise is involved in?	Number of partnerships
Total number of THRIP partnerships	
Total number of Innovation Fund partnerships	
Total number of any other Higher Education partnerships not funded by THRIP or the Innovation Fund	
GRAND TOTAL (combined total of the above)	

A2

What are the main purpose(s) of industry- higher education linkages that ARE NOT funded by THRIP or the Innovation Fund that the enterprise may be involved in? Please tick one or more of the following

My organisation has no industry-higher education linkages other than those funded by THRIP and/or the Innovation Fund	Ä	Accreditation and/or quality assurance of education and training	Ä
Research	Ä	Learning Programmes & Curriculum Design	Ä
Human Resource Capacity Building	Ä		
Other (please specify)			

B.

B. ABOUT THE RELATIONSHIP(S) WITH HIGHER EDUCATION FUNDED BY THRIP AND THE INNOVATION FUND

B1 **Please provide the project numbers of the THRIP and/or Innovation Fund partnership that your enterprise is involved in.**

B2 **Select from the list below the top five reasons why your enterprise has relationships with higher education. You can do this by indicating in the squares provided the numbers 1 to 5, in order of priority, where 1 represents the top motivation. Please note that this question should be based on your own perspective, rather than on the mission or strategic vision of the enterprise.**

To gain added technological value to the company which will lead to future financial gain	Ä	To contribute to the equity of my organisation's workforce by contributing to the training of black students and female students	Ä
To gain added technological value which will lead to improved manufacturing and/or working processes	Ä	To gain access to research technology and infrastructure available at Higher Education institution(s) that are not available at my enterprise	Ä
To gain added knowledge which will lead to improved understanding amongst staff	Ä	To gain access to high level expertise and research expertise available at Higher Education institution(s) that are not available at my enterprise	Ä
To contribute to the marketing of your company	Ä	To contribute to sustained innovation in my sector	Ä
To gain tax rebates	Ä	To gain access to increased research and development capacity as my company has limited internal Research and Development (R&D) capacity	Ä
To maintain the competitive edge of my enterprise	Ä	To keep abreast of advancing technologies	Ä
To contribute to the social development of South Africa	Ä	To access highly trained human resources for employment in the company	Ä
It costs less to outsource the R&D aspects that are outsourced than to do them in-house	Ä		

C. SELECTING THE PARTNERS FOR THRIP AND/OR INNOVATION FUND PROJECTS

C1 **Did the enterprise select the higher education institutions involved in the THRIP and/or Innovation Fund industry-higher education linkage? (If the higher education institution approached the company indicate NO)**

Ä Yes
Ä No

C2 **If YES, what criteria were used to select the higher education institutions? Please indicate by selecting from the square. (More than one square may be ticked)**

It was the Higher Education institution/s who approached our organisation	Ä	They were selected because they have the HUMAN RESOURCES available at institution	Ä
They were institutions that the company had previous relationships with	Ä	They were selected for the general reputation of institution	Ä
They were selected for being Historically White Institutions	Ä	They were selected because of the appropriate costs of services they provide	Ä
They were selected for being Historically Black Institutions	Ä	They were selected because of their particular research expertise	Ä
They were selected because they have the physical and infrastructural resources (NOT human resources) available at institution	Ä	They were selected because they have a reputation for expertise in a needed area	Ä
They were selected on the basis of the geographical location of institution	Ä		

C3 **If there are other industry enterprises involved in the THRIP project and/or Innovation Fund projects, did your enterprise select some or all of these enterprises? (If there are no other industry enterprises involved, respond by selecting N/A)**

Ä Yes
Ä No
Ä N/A

C4 **If yes, what criteria were used to select them? Select from the list below**

Ä They were companies/ enterprises working in different fields who would not compete with the technological products produced

Ä They were companies/ enterprises working in the same field who could also use the technology

Ä They were companies/ enterprises that my company had prior or current working relations and partnerships with

Ä Other. Explain _____

_____

D. ABOUT THE BENEFITS OF THE RELATIONSHIPS FUNDED BY THRIP & THE INNOVATION FUND

D1

From your perspective, what are the benefits of the higher education-industry linkage project funded by THRIP/ Innovation Fund? Use the space provided below for your response.

BENEFITS TO YOUR ENTERPRISE	BENEFITS TO HIGHER EDUCATION INSTITUTION(s)

E. ABOUT THE MANAGEMENT OF THE PROJECT(s) FUNDED BY THRIP & THE INNOVATION FUND

E1 **What is the total number of people involved in the project funded by THRIP and/or Innovation Fund?**

Total number of researchers/subject matter experts from my enterprise	
Total number of researchers/subject matter experts from the HE institution	
Total number of non-research staff (e.g. management & administrative support) from my enterprise	
Total number of non-research staff (e.g. management and administrative support) from the Higher Education institution	

E2 **How regularly does the higher education and industry team meet? Please select one of the following.**

We work in collaboration on almost a daily basis	Ä	We meet once a quarter	Ä
We meet at least once a week	Ä	We seldom meet	Ä
We meet at least a month	Ä		

E3 **How do the members involved in the industry-HE linkage project communicate? Please select one or more of the following**

My enterprise takes responsibility for ensuring that information is communicated to partnership project members	Ä	We usually communicate only when necessary	Ä
The Higher Education institution takes responsibility for ensuring that information is communicated to partnership project members	Ä	There is a continual exchange of information between my enterprise and the HE institution	Ä
We only communicate with the HE institution to get report-backs on their progress.	Ä	We usually communicate only at our scheduled meetings	Ä

F. ABOUT THE NATURE OF THE PARTNERSHIPS FUNDED BY THRIP & THE INNOVATION FUND

F1 **What is the nature of the industry-higher education linkage that your enterprise has with the higher education institution in the project(s) funded by THRIP/ Innovation Fund?**

My enterprise funds basic research that is undertaken at the Higher Education institution	Ä	My organisation is involved in technological or Innovation Parks in which higher education institutions are involved	Ä
My enterprise contracts research that the Higher Education institution then undertakes	Ä	My enterprise undertakes research in collaboration with higher education institutions	Ä
My organisation funds a research unit (s) at higher education institution(s)	Ä	My organisation utilises the physical resources available at higher education institutions to ensure that the research work has the technology required	Ä
Other, please explain			

G. ABOUT THE RESEARCH OUTPUTS FROM THE PARTNERSHIPS FUNDED BY THRIP & THE INNOVATION FUND

G1 **Who owns the Intellectual Property Rights in relation to any research undertaken in the industry-higher education linkage project funded by THRIP and/or Innovation Fund?**

My enterprise owns the Intellectual Property	Ä	My enterprise and the HE institution share the Intellectual Property	Ä
The HE institution owns the Intellectual Property	Ä	The ownership of Intellectual Property has yet to be determined	Ä

G2

Are the findings of the research published?	Yes	No

If yes, who are the authors of published research?

Staff from my enterprise are the authors	Ä	The authors include staff from my enterprise and the HE institution	Ä
Staff from the HE institution are the authors	Ä		

G3 **Is there an expectation that product development or innovation will be DIRECTLY achieved through the process or outputs of the industry-higher education linkage funded by THRIP/ Innovation Fund.**

Ä Yes
Ä No

G3a **If YES, please indicate if any of the following could be considered intended products? You may select more than one response.**

Increased stock of published scientific knowledge	Ä	Increased stock of human resources who have knowledge in a given area at my enterprise	Ä
New innovations, including new technologies, products and processes	Ä	Increased stock of commercially exploitable knowledge	Ä
Increased stock of scientific knowledge	Ä	Increased stock of human resources who have knowledge in a given area at the HE institution	Ä

G3a **If YES, which innovations or products are expected to be developed, or have been developed? Use the space below to explain one that you believe has added (or will add) maximum value.**

G3b **If NO, why is the enterprise involved in the relationship with higher education? Use the space below to provide an explanation.**

G3c	From your perspective, are the intended products of the research being met (or will the intended products be met if the project is still ongoing)?	Yes	No

If no, please indicate from your perspective why intended products have been or are not being achieved

G4 **Are there any new applications which were developed (or are being developed) that were not initially envisaged?**

Ä Yes

Ä No

G5	From your perspective, what steps can THRIP and/or the Innovation Fund take to improve the relationship between industry and higher education? Please rank the list provided below by indicating in order of priority from 1 to 4.	
	THRIP and/or the Innovation Fund can facilitate the relationship between higher education and industry/ commerce by arranging workshops or meetings where higher education and industry can meet.	Ä
	THRIP and/or the Innovation Fund can facilitate the relationship between higher education and industry/ commerce by having a database available of the expertise available in higher education	Ä
	THRIP and/or the Innovation Fund can facilitate the relationship between higher education and industry/ commerce by printing a publication that shares ideas of innovative research	Ä
	Other. Please indicate _____	Ä

H. THE SUSTAINABILITY OF THE RELATIONSHIP WITH HIGHER EDUCATION

H1	How was the relationship with the higher education institution, that exists in the project(s) funded by THRIP/ Innovation Fund, initiated? Please select one of the following.	
	The Higher Education institution approached my enterprise	Ä
	My enterprise approached the Higher Education institution	Ä
	My enterprise had a prior relationship with the Higher Education institution and both parties initiated the partnership	Ä

H2	How will the relationship with the higher education institution, that exist in the project(s) funded by THRIP/ Innovation Fund, be terminated?	
	The partnership will be terminated when the research outputs have been achieved	Ä
	The partnership will continue when the research outputs have been achieved but in another form	Ä
	It is unclear how the relationship will develop on completion of the project	Ä

I. NATURE OF THE RELATIONSHIP WITH HIGHER EDUCATION

I1	Please indicate how you would describe the relationship with the higher education institution by selecting, from the terms below, the concept that best describes (from your perspective) the nature of your institution's relationship with the higher education institution during the THRIP and/or Innovation Funded project.			
	Partnership	Ä	Collaborative relationship	Ä
	Professional relationship	Ä		
	Please use the space below to define or explain the term that you selected above.			

APPENDIX E – ADDITIONAL TABLES*

* The tables in Appendix E provide detailed breakdown data to support the arguments in the text. Note that the data in Table 9 reflects verbatim responses extracted from the industry survey.

Table 1. Researchers by race and gender for THRIP and Innovation Fund projects

GENDER	PROGRAMME	RACE	COUNT OF SURNAME
Female			
	Innovation Fund	African	9
		Coloured	4
		Indian	3
		Not provided	5
		White	31
		Subtotal	52
	THRIP	African	14
		Coloured	16
		Indian	10
		Not provided	5
		White	262
		Subtotal	307
	Total		359
Male			
	Innovation Fund	African	7
		Asian	1
		Coloured	2
		Indian	4
		Not provided	15
		White	72
		Subtotal	101
	THRIP	African	85
		Coloured	28
		Indian	38
		Not Provided	7
		White	863
		Subtotal	1021
	Total		1122
Not Provided			
	Innovation Fund	African	1
		Not Provided	77
		White	1
		Subtotal	79
	THRIP	White	1
		Subtotal	1
	Total		**80**
GRAND TOTAL			**1561**

Table 2. Researchers by NRF rating

Type	Programme	NRF Rated	Biotechnology	ICT	New Materials Development	Not ONE of the 3 bands	Grand Total
Grantholders							
	Innovation Fund	Not Provided	14	16	20	2	52
		Total	**14**	**16**	**20**	**2**	**52**
	THRIP	A				9	9
		B	7	2	7	19	35
		C	11	7	12	40	70
		L	1			4	5
		Not Rated	11	14	9	67	101
		P			1		1
		Y	3			10	13
		Not Provided			1		1
		Total	**33**	**23**	**30**	**149**	**235**
Grantholders Total			**47**	**39**	**50**	**151**	**287**
Research Team Member							
	Innovation Fund	Not Provided	77	66	17	20	180
		Total	**77**	**66**	**17**	**20**	**180**
	THRIP	A	2		2	5	9
		B	7	2	4	21	34
		C	17	9	12	49	87
		L	1		1	12	14
		Not Rated	139	93	69	618	919
		P	2		1	1	4
		Y	2	2	3	20	27
		Total	**170**	**106**	**92**	**726**	**1094**
Research Team Member Total			**247**	**172**	**109**	**746**	**1274**
Grand Total			**294**	**211**	**159**	**897**	**1561**

Table 3. Products/Artefacts by HEI and by technological band

TECHNOLOGICAL BANDS	ORGANISATIONAL TYPE	HE INSTITUTIONS	PRODUCTS / ARTEFACTS
Biotechnology			
	Technikon	Technikon Natal	0
		Subtotal	0
	University	Potchefstroom University for CHE	0
		Rhodes University	0
		University of Cape Town	5
		University of Natal	1
		University of Port Elizabeth	0
		University of Pretoria	2
		University of Stellenbosch	8
		University of the Free State	2
		University of the Western Cape	1
		Subtotal	19
		Total	**19**
ICT			
	Technikon	ML Sultan Technikon	0
		Technikon Pretoria	0
		Technikon Witwatersrand	0
		Subtotal	0
	University	Potchefstroom University for CHE	9
		Rhodes University	15
		University of Cape Town	3
		University of Durban-Westville	0
		University of Fort Hare	1
		University of Natal	4
		University of Pretoria	8
		University of Stellenbosch	21
		University of the Western Cape	3
		University of the Witwatersrand	5
		Subtotal	69
		Total	**69**
New Materials Development			
	Technikon	Cape Technikon	1
		Port Elizabeth Technikon	0
		Technikon Natal	0
		Technikon Pretoria	1
		Technikon Witwatersrand	0
		Subtotal	2
	University	Potchefstroom University for CHE	4
		Rand Afrikaans University	14
		University of Cape Town	0
		University of Natal	7
		University of Port Elizabeth	1
		University of Pretoria	21
		University of Stellenbosch	20
		University of the North	0
		University of the Western Cape	2
		University of Witwatersrand	3
		Subtotal	72
		Total	**74**
Not an area of HSRC Focus			
	Technikon	Cape Technikon	2

Table 4. Patents by HEI and by Technological Band

TECHNOLOGICAL BANDS	ORGANISATIONAL TYPE	HE INSTITUTIONS	PATENTS
Biotechnology			
	Technikon	Technikon Natal	0
		Subtotal	0
	University	Potchefstroom University for CHE	0
		Rhodes University	0
		University of Cape Town	4
		University of Natal	0
		University of Port Elizabeth	0
		University of Pretoria	1
		University of Stellenbosch	2
		University of the Free State	0
		University of the Western Cape	0
		Subtotal	7
		Total	**7**
ICT			
	Technikon	ML Sultan Technikon	0
		Technikon Pretoria	0
		Technikon Witwatersrand	0
		Subtotal	0
	University	Potchefstroom University for CHE	4
		Rhodes University	0
		University of Cape Town	0
		University of Durban-Westville	0
		University of Fort Hare	0
		University of Natal	0
		University of Pretoria	0
		University of Stellenbosch	0
		University of the Western Cape	0
		University of the Witwatersrand	0
		Subtotal	4
		Total	**4**
New Materials Development			
	Technikon	Cape Technikon	1
		Port Elizabeth Technikon	0
		Technikon Natal	0
		Technikon Pretoria	0
		Technikon Witwatersrand	0
		Subtotal	1
	University	Potchefstroom University for CHE	1
		Rand Afrikaans University	0
		University of Cape Town	0
		University of Natal	0
		University of Port Elizabeth	0
		University of Pretoria	3
		University of Stellenbosch	3
		University of the North	0
		University of the Western Cape	0
		University of Witwatersrand	0
		Subtotal	7
		Total	**8**
Not an area of HSRC Focus			
	Technikon	Cape Technikon	0

Table 5. Research Publications by HEI and by Technological Band

TECHNOLOGICAL BANDS	ORGANISATIONAL TYPE	HE INSTITUTIONS	RESEARCH PUBLICATIONS
Biotechnology			
	Technikon	Technikon Natal	15
		Subtotal	15
	University	Potchefstroom University for CHE	0
		Rhodes University	0
		University of Cape Town	21
		University of Natal	12
		University of Port Elizabeth	0
		University of Pretoria	85
		University of Stellenbosch	46
		University of the Free State	28
		University of the Western Cape	18
		Subtotal	210
		Total	**225**
ICT			
	Technikon	ML Sultan Technikon	9
		Technikon Pretoria	0
		Technikon Witwatersrand	0
		Subtotal	9
	University	Potchefstroom University for CHE	21
		Rhodes University	43
		University of Cape Town	40
		University of Durban-Westville	0
		University of Fort Hare	7
		University of Natal	30
		University of Pretoria	21
		University of Stellenbosch	85
		University of the Western Cape	13
		University of the Witwatersrand	22
		Subtotal	282
		Total	**291**
New Materials Development			
	Technikon	Cape Technikon	1
		Port Elizabeth Technikon	1
		Technikon Natal	1
		Technikon Pretoria	4
		Technikon Witwatersrand	0
		Subtotal	7
	University	Potchefstroom University for CHE	13
		Rand Afrikaans University	21
		University of Cape Town	1608
		University of Natal	21
		University of Port Elizabeth	9
		University of Pretoria	35
		University of Stellenbosch	61
		University of the North	0
		University of the Western Cape	14
		University of Witwatersrand	43
		Subtotal	1825
		Total	**1832**
Not an area of HSRC Focus			
	Technikon	Cape Technikon	16

Table 6. Students involved by HEI and by technological band

TECHNOLOGICAL BANDS	ORGANISATIONAL TYPE	HE INSTITUTIONS	STUDENTS
Biotechnology			
	Technikon	Technikon Natal	17
		Subtotal	17
	University	Potchefstroom University for CHE	4
		Rhodes University	7
		University of Cape Town	35
		University of Natal	19
		University of Port Elizabeth	1
		University of Pretoria	68
		University of Stellenbosch	129
		University of the Free State	17
		University of the Western Cape	30
		Subtotal	310
		Total	**327**
ICT			
	Technikon	ML Sultan Technikon	3
		Technikon Pretoria	11
		Technikon Witwatersrand	6
		Subtotal	20
	University	Potchefstroom University for CHE	62
		Rhodes University	46
		University of Cape Town	87
		University of Durban-Westville	0
		University of Fort Hare	12
		University of Natal	34
		University of Pretoria	29
		University of Stellenbosch	121
		University of the Western Cape	18
		University of the Witwatersrand	16
		Subtotal	425
		Total	**445**
New Materials Development			
	Technikon	Cape Technikon	2
		Port Elizabeth Technikon	6
		Technikon Natal	12
		Technikon Pretoria	6
		Technikon Witwatersrand	3
		Subtotal	29
	University	Potchefstroom University for CHE	14
		Rand Afrikaans University	14
		University of Cape Town	25
		University of Natal	22
		University of Port Elizabeth	3
		University of Pretoria	50
		University of Stellenbosch	57
		University of the North	1
		University of the Western Cape	10
		University of Witwatersrand	38
		Subtotal	234
		Total	**263**
Not an area of HSRC Focus			
	Technikon	Cape Technikon	10

Table 7. University outputs by technological bands

HE Institutions	Technological Bands	Research Publications	Patents	Products / Artefacts	Students
Potchefstroom University for CHE	Biotechnology	0	0	0	4
	ICT	21	4	9	62
	New Materials Development	13	1	4	14
	NOT one of the 3 technological bands	134	2	18	195
	Total	**168**	**7**	**31**	**275**
Rand Afrikaans University	New Materials Development	21	0	14	14
	NOT one of the 3 technological bands	13	1	7	33
	Total	**34**	**1**	**21**	**47**
Rhodes University	Biotechnology	0	0	0	7
	ICT	43	0	15	46
	NOT one of the 3 technological bands	0	0	0	6
	Total	**43**	**0**	**15**	**59**
University of Cape Town	Biotechnology	21	4	5	35
	ICT	40	0	3	87
	New Materials Development	1608	0	0	25
	NOT one of the 3 technological bands	213	1	26	207
	Total	**1882**	**5**	**34**	**354**
University of Durban-Westville	ICT	0	0	0	0
	NOT one of the 3 technological bands	6	0	0	30
	Total	6	0	0	30
University of Fort Hare	ICT	7	0	1	12
	Total	**7**	**0**	**1**	**12**
University of Natal	Biotechnology	12	0	1	19
	ICT	30	0	4	34
	New Materials Development	21	0	7	22
	NOT one of the 3 technological bands	95	0	8	120
	Total	158	0	20	195
University of Port Elizabeth	Biotechnology	0	0	0	1
	New Materials Development	9	0	1	3
	NOT one of the 3 technological bands	10	2	0	15
	Total	**19**	**2**	**1**	**19**
University of Pretoria	Biotechnology	85	1	2	68
	ICT	21	0	8	29
	New Materials Development	35	3	21	50
	Total	**141**	**4**	**31**	**147**

Table 8. Technikon outputs by technological bands

HE Institutions	Technological Bands	Research Publications	Patents	Products / Artefacts	Students
Cape Technikon	New Materials	1	1	1	2
	NOT one of the 3 technological bands	16	0	2	10
	Total	**17**	**1**	**3**	**12**
ML Sultan Technikon	ICT	9	0	0	3
	NOT one of the 3 technological bands	0	0	0	0
	Total	**9**	**0**	**0**	**3**
Port Elizabeth Technikon	New Materials Development	1	0	0	6
	NOT one of the 3 technological bands	8	2	0	14
	Total	**9**	**2**	**0**	**20**
Technikon Free State	NOT one of the 3 technological bands	0	0	0	0
	Total	**0**	**0**	**0**	**0**
Technikon Natal	Biotechnology	15	0	0	17
	New Materials Development	1	0	0	12
	Total	**16**	**0**	**0**	**29**
Technikon Northern Gauteng	NOT one of the 3 technological bands	0	0	0	0
	Total	**0**	**0**	**0**	**0**
Technikon Pretoria	ICT	0	0	0	11
	New Materials Development	4	0	1	6
	NOT one of the 3 technological bands	13	2	3	66
	Total	**17**	**2**	**4**	**83**
Technikon Witwatersrand	ICT	0	0	0	6
	New Materials Development	0	0	0	3
	NOT one of the 3 technological bands	0	0	0	1
	Total	**0**	**0**	**0**	**10**
Vaal Triangle Technikon	NOT one of the 3 priority Technological Bands	0	0	1	8
	Total	**0**	**0**	**1**	**8**
GRAND TOTAL		**68**	**5**	**8**	**165**

Table 9. Which products are expected to or have been developed?

- © The development of the Gneiss microkernel.
- © The development of Laser based gas detection products, laser based gas detection services and manufacturing technologies using laser ablation. The most value is in constructing customized products for detection of hazardous pollutants.
- © The highest values comes from development of intellectual property in specific technology areas of interest to my company.
- © The molecular genetic characterisation of fundamental biological defects which leads to these forms of blindness is meant logically lead to gene-specific or gene-based therapies, including Gene therapy, Pharmaceutical intervention, Growth Factor intervention and stem cell manipulation amongst others.
- © Geocell product used a sacrificial mould to cast interlocking cement-block paving. 3D interlock relies on distortion in vertical plane of the cell wall to simulate a rounded keyway joint. Performance can be understood and predicted. This is a reengineered product.
- © The development of Glucose oxidase.
- © The development of new earthquake proof building technology for poor and developing countries
- © Crane loading developments resulting in change to loading codes this impacts on whole industry.
- © New cultivars (of Proteas) are in development.Knowledge treatment of pathogens ,these projects need to be continued, post - harvest care studies continuing, pruning methods study continuing, biological control studies are long term and need to be continued.
- © The development of a packaged (mobile) treatment unit for effluent, generated in the wine, juice and spirit industries this has commercial potential. The development of a framework for the implementation of environmental management systems has already proved beneficial.
- © A higher quality recycled polypropylene granule used for automotive lead/acid battery cases.
- © The development of desalination equipment and processes utilising renewable energy , this is leading edge technology and superior product quality.
- © The development of a baculovirus product as a biological control agent for pests of agricultural crops.
- © Tomography, the development of numerous applications in the chemical process industry to be used a contract work by the Universities to generate income. Bagasse, sufficient knowledge to make decision regarding the viability of the project. Drying, the direct application of the information to company designs.
- © Lead compounds may be identified that can be optimised to generate new drugs for TB, particular markers have been identified that have the potential to be developed into simple kits for diagnosis and prognosis of TB.
- © The development of wear resistant materials containing fine vanadium carbide.
- © We have produced 56 new indigenous polyploid species which could have commercial value. Evaluation of this potential is just starting, if any are successfully they could start new industries.
- © Development of a volatile corrosion inhibitor systems for plastics packaging , development of an improved flame retardant systems, development of an improved purging compound for cleaning plastics machinery , development of a prodegradant additive for use in plastic bags.
- © We connect for underground mining communications specifically for data, video and voice communication. This product has been patented and a company formed to commercialise the product.
- © A patent on a new device for the monitoring of membrane fouling to be used in the filtration and desalination of sea water and treatment of industrial waste water.
- © The development of a route optimisation system branded as logics(www.logicslink.co.za).This is intended to become a commercial piece of software that will lead to financial benefit for our enterprise.
- © Research is specialised in digital communications, these technologies will be used in products in 3-5 years.
- © New polymer based So2 sheet for the control of botrytis decay of table grapes. Same or better So2 release pattern over time, at a lower cost, with faster screening of new varieties has lead to more product development
- © Task 7.2.1 develop air scrubber technology for recognition air ,to enable controlled re-circulation and re-use of ventilation air. Potentially this will lead to a 40% reduction in air power and improved cooling distribution. The financial benefit will be in the region of R16 million per annum per mine.
- © Armgold specialises in managing mines that are marginal or near end of life, the extraction of the shaft pillar is generally the last mining to take place. With improved efficiency and safety we have the potential to increase revenue by say 10% ,this equates to R40 million per shaft.
- © The mining system has the potential to increase minable gold reserves of future mine industrial partners by enabling low grade, previously uneconomical narrow reefs to be extracted economically through the implementation instope long hole drilling.
- © Ultimately the aim is to produce locally made specialised carbon forms (graphite) of high value, which will be made from local natural resources, using local technology for power generation.
- © Developing the know how to predictably pump explosives in a pipeline service an existing and rapidly expanding market, developing the know how to formulate chemical compositions of explosives blasting accessories that have highly precise and controllable reaction speed.
- © The development of a national online vehicle identification system through unique metallurgical fingerprints and vehicle prints.
- © The development of an improved and faster, therefore shorter method to identify the presence of micro-organisms in potable water and thereby to reduce the associated health risks to consumers.
- © The development of fully sealed lead acid batteries and high power battery and 36/42 volt batteries.

- © Developing a new vaccine against HPV virus to counteract cervical cancer, the registering of three patents. Developing new tests to be able to detect colon cancer earlier. Developing new drugs against cancer, three patents have been registered. Capacity building at higher education resulting in Msc and PhD students and publications.
- © Developing the expertise in the modelling and control of process systems, as well as developing software for offline data analysis.
- © The development of a manufacturing excellence cdrom, which will be used by firms as guide to bolster competitiveness, for in/formal training, for the facilitation of change management programmes.CDRom and manuals are due for completion by April 2003,this will be a world class product which will benefit South Africa enormously.
- © Limited angle tomography has been shown to be a possibility, there are also s me longer term and less tangible possibilities.
- © Expertise is being established focusing on the repair of structurally critical composite components for instance primary load bearing composite aircraft structures. The technology is also directly applicable to the design of reliable bonded joints between composite and metal components, which has become a growing demand in the automotive and bridge construction industries.
- © There is scope for product optimisation in the area of impact copolymer polypropylene grades. Research at the higher education institution needs further in-house and commercial thought to be brought to reality. The projects are developing on a continual basis, with the resulting development of human resources and skill.
- © The development of a national online vehicle identification system (novis) .Proof of concept in demonstration system
- © Process of SSM.
- © Scientific information on the citrus bluespot fungus, is responsible for inspecting fruit and restructuring of export to be expanded. Some of this information is used to overcome barriers to international trade in citrus.
- © Selection of options for ensuring appropriate acid resisting properties for modified concrete used for the manufacture of lining of concrete sewer pipes used in various applications with differing corrosion properties.
- © Pilot protection structure proposes a new seating arrangement which should enhance pilot survival in the event of a crash or bad landing.
- © Developing the process of carbon source utilisation to profile a microbial population in a paper mill under different microbial regimes, including enzyme technology and microbides. This is an innovative approach to bio control.
- © The development of a micro turbo jet engine.
- © The development of a Broadband wireless router for rural connectivity.
- © The work on grain refining could assist in setting up a different marketing angle. The work improves relationships between team members, and allows for mutual exploitation of marketing opportunities.
- © In order for a non ceramic insulator to be accepted by ESKOM, the supplier had to have the insulator tested at a costly price overseas.ESKOM now provides such a service that is now also used by other utilities worldwide.
- © Gene constructs for enhancing sugar production in sugar cane via genetic engineering.
- © Keeping timber plantation trees healthy.
- © A collaborative research programme between UCT, WITS, Stellenbosch and UDW into aspects of concrete durability has resulted in changes to the way concrete is being specified and accepted in industry.
- © Publication of research findings in research monographs or conference or seminar proceedings.
- © An alloy like 3CRR was developed and improved by research and development at the higher education institution, even predating THRIP. Currently 50 000 tons are sold every year.
- © Research in both projects lead to the development of new polymer currently being commercialised. Both projects have yielded an increased HR capacity at our enterprise. There has been an increase in knowledge of polymer science at the higher education institution and in our enterprise.
- © Lallemand is a Canadian based yeast manufacturing company. The research project develops new wine yeast that can be used by specifically the South African wine industry to produce wine and brandy, to be able to breed and market a yeast with a distinct South African genetic background.
- © There are several projects that will eventually lead to new products or better use of existing technologies, for example a yeast that also sterilises wine resulting in lower sulphur levels, which is popular with consumers. Grapes which are resistant to pathogens will use less chemicals resulting in more profit and less environmental harm.
- © The wet granulation of titania slag that was developed in the Innovation Fund project.
- © The development of Cavendish bananas with improved resistance to fusarium wilt. The development of Molecular markers for rapidly identifying the pathogen from soil, water and plants. Molecular markers are also able to rapidly identify resistance in plant selections.
- © The development of bar coding for copper cables at COE at Rhodes university by Professor Clayton's team
- © The development of organic pacifying pigments for paint and novel emulsion binders for paint.
- © The development of a new bio bleaching process. New sources of lacasses and other novel applications of biotech within the forest product industry.

Table 10. Total departmental links by grantholder/primary beneficiary's department

a) For all projects

	Own Department	Other Department in same institution	Other institutions
No links	96	164	167
ONE link	56	30	34
TWO links	32	19	17
THREE links	24	7	6
FOUR links	8	7	7
FIVE links	10	1	3
6-10 links	21	6	5
> 10 links	5	6	2
> 20 links	1	4	1
Missing	18	27	29
TOTAL LINKS ASSOCIATED WITH GRANTHOLDER	**271**	**271**	**271**

b) For projects Biotechnology

	Own Department	Other Department in same institution	Other institutions
No links	10	21	22
ONE link	10	6	4
TWO links	5	2	1
THREE links	4	1	1
FOUR links	2	0	2
FIVE links	2	2	1
6-10 links	1	1	2
> 10 links	1	0	1
> 20 links	0	0	0
Missing	1	3	2
TOTAL LINKS ASSOCIATED WITH GRANTHOLDER	**36**	**36**	**36**

c) For projects in ICT

	Own Department	Other Department in same institution	Other institutions
No links	9	17	17
ONE link	4	1	6
TWO links	5	1	1
THREE links	1	1	1
FOUR links	1	2	0
FIVE links	0	0	0
6-10 links	5	1	0
> 10 links	1	2	0
> 20 links	0	0	0
Missing	2	3	3
TOTAL LINKS ASSOCIATED WITH GRANTHOLDER	**28**	**28**	**28**

d) For projects in New Materials Development

	Own Department	Other Department in same institution	Other institutions
No links	14	25	25
ONE link	7	3	2
TWO links	3	3	2
THREE links	6	1	1
FOUR links	1	1	1
FIVE links	0	0	0
6-10 links	2	1	0
> 10 links	1	0	0
> 20 links	0	0	0
Missing	3	3	6
TOTAL LINKS ASSOCIATED WITH GRANTHOLDER	**37**	**37**	**37**