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ASSESSING THE IMPACT OF APPLIED RESEARCH ON COMMUNITIES

by

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DECLARATION

I, Maurice Oscar Dassah, declare that the contents of this thesis represent my own unaided work, and that the thesis has not previously been submitted for academic examination towards any qualification. Furthermore, it represents my own opinions and not those of the Cape Peninsula University of Technology.

Signed

March 20 2008

Date

ABSTRACT

Since 1992 the National Research Foundation and the Department of Trade and Industry, with support from industry, have been running a funding initiative under the auspices of Technology for Human Resources in Industry Programme (THRIP). This initiative provides funding to qualifying academics/researchers in South Africa's tertiary institutions and science councils to conduct research and development-oriented (or applied) research.

This collaborative funding of applied research is geared to facilitating cross-transference of knowledge, skills and resources across academic institutions, government science, engineering, technology institutions and the industrial sector. It is also expected that research and project outputs will be commercialised to improve the competitiveness of South African industry in the face of globalisation and technological advancement.

With public money spent on research projects of national importance, impact and value for money become vitally important, hence the need for impact assessment. A non-probabilistic sample of 52 research projects in seven standard industrial classification categories or sectors conducted by 44 project leaders (who are academics/researchers) based in seven traditional universities, one former technikon (now university of technology) and three divisions of the Council for Scientific and Industrial Research, were assessed for impact. A non-experimental design was used, involving synergising the goal-attainment and side-effects evaluation models, and reinforcing them with two elements of causal tracing, temporal precedence and coherence, to facilitate attribution of benefits and impacts.

THRIP's strategic objectives served as relevant indicators for impact asssessment since projects' objectives co-terminate with them. In the context of the research, a definition of 'performance indicator' as "evidence of what has actually happened" was adopted, lending weight to project leaders' reports of projects' impacts. 'Success', defined in terms of projects' not only accomplishing their objectives, but also yielding value to beneficiaries and stakeholders, is posited as a possibly problematic term given that different stakeholders might have different criteria of judging it. Responses obtained from questionnaires administered to project leaders and industry partners' or sponsors' contact persons, the latter for triangulation, were analysed and categorised into four broad thematic areas: human resource development/intellectual, commercial/economic, social and technological.

A number of findings emerged from the main questionnaire. A little more than half (56%) of the projects were completed and 44% were ongoing; majority (85%) were implemented according to plan; three categories of primary beneficiaries were cited by project leaders; projects were meant to address multiple problems/situations; they had multiple objectives; and majority (92%) were successful and made many impacts. Managerial strategies, supplemented by environmental and other factors, contributed to projects' success. Several reasons were offered for failure or inconclusiveness.

Based on the findings, the following conclusions may be drawn. First, majority of projects did not experience implementation problems. Secondly, projects' main objectives were substantially achieved, but project leaders and contact persons seemed to focus on achieving different objectives. Thirdly, majority of projects were successful and backed up with relevant indicators. Projects were implemented to address various problems or situations in the commercial/economic, human resource/intellectual development, technological, and social domains, but projects yielded mostly human resource development/intellectual benefits and impacts for industry partners and other stakeholders. Further, some positive unintended impacts or spin-offs, negative unintended impacts, and contrary impacts occurred. In addition, projects made many differences in addressing the problems or situations that prompted their implementation. The findings also led to the conclusion that although some impacts are immediate, many will manifest themselves only in the medium- to long-term. Project leaders used a number of managerial strategies in achieving success, but environmental and personal factors also played a role. Uncontrollable factors, but also poor project management skills, acccounted for some projects' failure and inconclusiveness.

Respondents expressed a range of views through comments. There was recognition of positive role THRIP plays in promoting and funding applied research. Working relationships among THRIP, academics/researchers and industry partners were seen in positive terms. Collaboration is a defining feature of the relationship. Some aspects of funding were also viewed positively, but negative comments were made particularly about funding and THRIP's role as facilitator of applied research. The online application and reporting system was also severely criticised.

In view of the comments, and to improve the chances of future projects' success, certain issues need addressing. THRIP needs to streamline procedures for releasing funds, simplify the online application and reporting system, provide very clear guidelines to project leaders, give necessary feedback and, encourage the following of established project management principles.

IN-TEXT CITATION CONVENTIONS

Dates of publication and page numbers are provided for all authors whose ideas are quoted or paraphrased. Double quotation marks or indentation are used in the case of direct quotations. Exceptions to providing dates and page numbers are where the general focus of an author is referred to or material is sourced from the Internet for which no dates and/or page numbers exist.

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DEDICATION

This thesis is dedicated to the blessed memory of my father, Gratiano Dassah; my sister, Claire; and my brother, Gaeten. Also to my brother Harry, who sent me to school, but most importantly to Reuben as a challenge and inspiration to aim for and achieve higher goals.

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GLOSSARY

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In the context of this research the concepts or terms indicated here have these respective meanings unless otherwise stated:

Applied research (also named invention or technological research)

This is research undertaken to determine uses for the findings of basic research or to determine new ways of achieving some specific, predetermined objectives-often solutions to problems society may experience. In its investigation, the findings of basic research may be used in an effort to discover new scientific knowledge that has specific commercial objectives with respect to new products, services, processes, or methods (University of Newcastle, 2001:n.p., National Science Foundation, n.d.:n.p.).

Applied research *always* has a specific application in mind since its motivation is to answer specific questions. Such research normally has a shorter time line, aiming at immediate application.

Basic research (also referred to as academic, fundamental, pure, theoretical or 'blue sky' research)

This is research organised and systematised in search of new principles and facts aimed at extending the boundaries of knowledge but unconnected to any identifiable product or process. Thus, basic research may be said to be development or production of knowledge for its own sake.

The fact that basic research is undertaken primarily to acquire new knowledge or advance existing knowledge without a specific application in mind means there is no long-term economic or social benefit attached to it (University of Newcastle, 2001:n.d.:n.p.).

Basic research is described as *blue sky research*, ostensibly because it operates at the cutting edges of knowledge in certain disciplines where "the sky is the limit" (Imenda & Muyangwa, 1996:2)

Holland (2006:2) defines basic research as follows: "basic research refers to laboratory, bench, or other modes of experimental research based on *big science*."

Beneficiary

Any individual or entity that stands to gain directly or indirectly from the implementation of applied research. Beneficiaries may be primary or main (industry partners and related industries) or secondary (for example, entities not in the same line of business)

Community

'Community', as used in the title of this thesis and in the text, is broad. It encompasses the common meaning of people living together as an identifiable group who may or may not have shared interests. More importantly, however, the term is used to here to include academics and\or researchers as groups, industry partners, stakeholders and the public at large.

Cost-Benefit Analysis

This is analysis that compares the relative costs of operating a programme/project to the individual and collective gains (outputs or outcomes) that are realised. This kind of analysis assesses the cost of meeting a single goal or objective and is aimed at identifying the least costly alternative to meet that goal (GAO, 1998:5). According to Rossi and Freeman (1982:274), cost-benefit analysis is the relationship between costs (direct and indirect inputs), mainly money expended in implementing a programme, and net benefits or gains (tangible and intangible) derived from a social action programme.

Creativity

Creativity involves "the ability to take existing objects and combine them in different ways for new purposes." In other words, it is the ability to generate novel and useful ideas and solutions through unique combinations to solve everyday problems and challenges (Definitions of Creativity, 2001:n.p.).

Development

This refers to activities that draw on research findings or other scientific knowledge for the purpose of producing new or significantly improving products, services, processes or methods. It involves the creation of reliable and satisfactory new products, services or processes.
(National Science Foundation, n.d.:n.p.).

Evaluation (see section 1.5.1)

Evaluation research (programme evaluation)

This is an area of applied social science research that employs a number of methods to evaluate or assess the conceptualisation, design, implementation and utility of social intervention programmes (Rossi & Freeman, 1982:20). In simpler terms, it is an area of social science research that concerns itself with finding out how well action programmes work (Weiss, 1972:3-4).

Formative evaluation

A type of process evaluation of new programmes, projects or services aimed at providing feedback for changes or adjustments to be made, which will strengthen or improve them in their initial stage. An appropriate analogy for formative evaluation would be a situation where a cook tastes soup *before* it is served.

Impact

In simple terms, impact is the difference results of a programme or project make in peoples' lives whether or not they were directly involved in its delivery (Diem, n.d.:n.p). Generally, impact refers to the benefits society reaps from the implementation of policies, programmes or projects.

Valdez and Bamberger (1994:22) define impact as "the expected effect (or effects) of a project on a target population". These effects may be short or long-term depending on when they occur and how long they last. They may also be intermediate or final, depending on whether or not they were planned or expected.

According to Vedung (1997:50), side-effects, perverse effects and null effects are different from the "central substantive impacts" intended to be achieved. These effects are briefly defined below.

i. Side-effects

These are negative or positive effects or impacts outside the target area of a programme.

ii. Perverse (or contrary) effects

These effects occur in the target area, but are counter to what is intended.

iii. Null effects

Null effects are effects expected in the target area, but which fail to materialise.

Impact/Summative evaluation (also called impact assessment/monitoring or outcome monitoring, performance measurement or just monitoring, Wholey, 1983:154).

This is a type of outcome evaluation that focuses on broader, long-term results, for eaxmple, on the extent to which a programme or project has caused (intended) changes in a target population. Impact evaluation may also be described as any notable change, effect or action to have arisen from an activity.

Summative evaluation is a type of outcome evaluation of completed activities that assesses the effects, results or outcomes of a project. Essentially, summative evaluation focuses on overall effectiveness, the ultimate aim being to generate information that may be used for funding, termination or purchasing decisions.

Impact evaluation is used when external factors are known to influence a programme's or project's outcomes as a way of isolating the programme's or project's contribution to the achievement of objectives. As a form of outcome evaluation, impact evaluation assesses the net effect of a programme by comparing outcomes with an estimate of what would have happened in the absence of the programme (GAO, 1998:5).

Innovation

The following definition will apply in this research study with the provision that at least one of the 'new' is present: "systematic application of (new) knowledge to (new) resources to produce (new) goods or (new) services" (Soltynski, n.d.:n.p.).

It is important to distinguish an innovation from an invention. An innovation is not the same as an invention. Innovation involves converting an idea into a new process or product but the invention involves extending the utilisation of a product or process. This implies one can be creative without being innovative.

Innovation may involve an improvement (doing something existing better or different) as a result of 'market pull' or it may involve the establishment of something new or altogether different as a result of 'technology push' (Ross, n.d.:n.p.).

Input-Output or programme outcome model

An input-output or programme outcome model, based on Morra-Imas and Rist (n.d.:2:2-8) is as follows:

Inputs: human, financial and material resources that are deployed in a programme or project. These resources are dedicated to or consumed by the programme.

Transformation/implementation: interaction of inputs with the technical and organisational systems and procedures. This involves activities undertaken with inputs to achieve goals and objectives.

Outputs: the products or services a programme or project actually delivers from its activities to an intended target group/population to produce expected impacts.
Outcomes: benefits yielded accruing from programme or project.

Impacts: changes or effects (short or long-term, intermediate or final, intended or unintended) that a programme or project has on a target group or population.

Although 'impact' might suggest a clear, identifiable, measurable and direct relationship, there is often no direct or linear progression from inputs to impact. Rather, the relationship is often multi-layered and unpredictable (Commonwealth of Australia, 2000:10).

A typical input-output model might be represented as follows:
Inputs → Activities (transformation) → Outputs → Outcomes → Impacts
(Morra-Imas & Rist, n.d.:2:2-8)

Monitoring and evaluation

The use of the conjoined terms 'monitoring and evaluation' in policy, programme and projects contexts tends to give the impression it is one activity. In reality, the two are distinct activities. Kusek and Rist (2004:13) provide a distinction between these complementary terms. The former provides information on *where* a policy, programme, or project is at any given time ... relative to respective targets and outcomes whereas that latter gives evidence of *why* targets and outcomes are or are not being achieved. This distinction is better captured in the complementary roles monitoring and evaluation play.

Monitoring	**Evaluation**
Clarifies programme objectives	Analyses why intended results were or were not achieved
Links activities and their resources	Assesses specific causal contributions to objectives of activities to results
Translates objectives into performance indicators and sets targets	Examines implementation process
Routinely collects data on indicators, compares actual results with targets	Explores unintended results
Reports progress to managers and alerts them to problems	Provides lesson, highlights significant accomplishments or programme potential, and offers recommendations for improvement

Objectives

These are specific time-based operational aims or statements of a project that explain how it will be accomplished. Objectives typically indicate verifiable (measurable) outputs and outcomes to indicate the desired accomplishments. Objectives should be SMART: specific, measurable, achievable, realistic and time-bound.

Patent

A patent is a formal indication of the creation of some new technology essentially different from existing technologies and the production of useful, industrially applicable technical knowledge. (Finnish Science and Technology Information Service, 2001:n.p.).

Performance indicators

These are quantitative or qualitative measures or indicators that show achievement. They are associated with performance targets and describe how well a programme is or has been in achieving its objectives. Indicators act as descriptors (management information), as warning bells about failure to meet objectives and as drivers to encourage the delivery of critical targets or objectives (Evaluation Associates Ltd, 1997:n.p.).

Performance indicators may be described as criteria used to assess programme performance. They enable the evaluator to specify the type of data that are required to be collected in order to make an assessment of programme impact. Such criteria translate intangible concepts into tangible and observable expressions (IDRC, see International Research Development Center, 1997:28).

Refer to section 4.3 for the operating definition of 'performance indicator' in this research.

Performance targets

These are short statements of ...
What change(s) a programme intends to achieve with each objective,
Who the programme needs to reach for change to occur and how they will express that reach (for and with whom the programme will work),
How the change will be generated (i.e. through which activities and outputs and,
When (the 'time-period' over which) the programme plans to do so.

In short performance targets are quantitative (numerical) and qualitative (descriptive) interim and final targets for performance indicators (IDRC, 1997:17).

Qualitative evaluation (also known by other labels: naturalistic evaluation, fourth-generation evaluation, ethnographic evaluation, Babbie & Mouton, 2001:356).

This is evaluation that mainly uses non-numeric methods of data collection (words, thoughts and phrases from programme participants, staff and people in the community) and analysis to examine the *qualities and outcome* of a programme or project. Three main data collection methods used in qualitative evaluation are: interview, direct observation and written documents derived from fieldwork (Patton (1990:10). Information yielded from such methods is considered "soft" data. Qualitative evaluation/assessment typically answers: "How *well* did we do"?

Quantitative evaluation

This is evaluation that mainly uses numeric measures for data collection (such as numbers and statistics) and analysis to compare programme or project results. It relies on standardised measures such as a limited number of close-ended questions, thus ensuring comparison and statistical aggregation of the data (Patton, 1990:14). Information gathered from such measures is considered "hard" data. Quantitative evaluation or assessment answers the question: "How *much* did we do?"

Research and Development (R &D)

This is a broad term that covers planned, systematic pursuit of new knowledge or understanding (basic research); the application of knowledge to meet a specific, recognised need (applied research); the application of understanding aimed at producing or improving a product, service, process, or method (development). (National Science Foundation, n.d.:n.p.)

Scientific objectivity and method of study

According to Frechtling and Sharp (1997:1-5), it is believed that quantitative methods yield more objective and accurate information because of standardised data collection methods employed, use of sophisticated statistical techniques in data analysis and the possibility of replication. Consequently, it is thought that for judgements on the value of programmes or projects to be plausible, summative evaluations need "hard" (quantitative) measures. On the other hand, it is assumed that qualitative methods, lacking the ability to be analysed by sophisticated statistical techniques, are less scientifically rigorous and thus, are more suited to formative evaluations.

Frechling and Sharp (1997:1-7) stress that the quantitative-qualitative debate is ongoing in the academic community. What is clear is that quantitative and qualitative methods have their respective merits and weaknesses. With this in mind, quantitative researchers are increasingly less dogmatic in believing their methods always produce absolute and objective truth. This is because respondents to surveys may not always fully understand questions to which they respond and may also experience faulty recall of events. Responses are also limited to structured questions, often making no provision or leaving scope for additional input from respondents.

Consequently, while adhering to the scientific approach, quantitative researchers are discovering ways of accommodating the measurement of social phenomena.

Qualitative researchers, on the other hand, are developing better techniques for classifying and analysing large volumes of descriptive data.

On the whole, it can be said that while quantitative methods may appear to be scientifically superior, findings may be less useful and valid since the cultural context in which projects operate cannot be totally ignored. R&D projects are introduced into complex social environments (not laboratories) and this fact cannot be ignored. This is because social environments have certain features that affect project failure or success. In effect, then, ignoring the environments in which projects are introduced tends to diminish the utility or value of (summative) evaluations.

As Patton (1990:14) puts it: "Because qualitative and quantitative methods involve differing strengths and weaknesses, they constitute alternative but not mutually exclusive, strategies for research."

On the basis of pragmatism, therefore, integration of qualitative and quantitative methods in the same evaluation is preferable. It leads to effectiveness since the advantages or strengths of quantitative and qualitative methods are maintained and their weaknesses eliminated (Frechtling & Sharp, 1997:1-7–1.8).

Social action or intervention programme (also referred to as intervention programme or project)

Rossi and Freeman (1982:16) describe a social action programme as a programme or planned effort purposely designed to achieve intended changes or effects on a target population.

An intervention programme or project is any funding or policy vehicle designed to achieve specific results.

Technology transfer (push-pull mechanisms)

This is the process by which technology, knowledge, and/or information developed for one organisation, market, or function is applied and utilised in another organisation, in another area, or for another purpose (TRECC, see Technology Research, Education and Commercialization Center, 2001:n.p.).

Put another way, technology transfer is the process of utilising technology, expertise, know-how or *facilities* for a purpose not *originally intended by the developing organisation*. This implies that a technology developed for one sector is used in a totally different area (ESA, see European Space Agency, n.d.:n.p.).

Technology-push mechanism involves researchers setting their research agenda unilaterally and, using their dominant relationship, *pushing* their results onto product developers and/or end users. A typical case is that of nuclear power following the technological breakthrough that has seen efforts to force its use on some communities.

Demand, market or technology-pull mechanism involves product developers *pulling* work out of researchers. This is the "normal" form of interaction between the technology source and the user organisation. It makes for better interaction since the technical problem or opportunity is located within the end user organisation (Willis & Ashworth, 2002:270). In times of war the technology pull often demands quick results, for example, radar development and others.

Technology transfer may be achieved through several mechanisms:

- Discussion and interchange of ideas and information at conferences or symposia;
- agency and industry consulting or collegial interchange of information;
- contracts for supply of goods and services to the government;
- cost-shared in-cash or in-kind contractual arrangements between government and industry;
- cooperative research and development agreements; and
- grants and co-operative agreements (assistance instruments) to support or stimulate research (TRECC, see Technology Research, Education and Commercialization Center, 2001:n.p.).

Triple helix

Viole and Ghiglione (1998) define 'triple helix' as "a spiral (versus traditional linear) model of innovation that captures multiple reciprocal relationships among institutional settings (public, private and academic) at different stages in the capitalisation of knowledge."

The three spheres, hitherto at arms' length, are converging at the "micro", "meso", and "macro" levels.

Ernø-Kjølhede, Husted, Mønsted and Wenneberg (2000:3) characterise triple helix as a concept "which seeks to describe efforts to establish an integrated research system that is responsive to social needs and capable of addressing targeted problem areas."

Etkowitz (2002:2) sees the 'triple helix' as a spiral model of innovation that reflects multiple reciprocal relationships at different points in the process of knowledge capitalisation. Three dimensions are involved: internal transformation of each helice, their influence on each other, and formation of trilateral networks and organisations from the interaction of the helices.

CHAPTER 1: INTRODUCTION TO THE RESEARCH

1.1 Changing attitude towards applied research

Basic science has long been held as the essence of science because it takes place in the pure disciplines, contributing to theory-building and new knowledge generation (Holland, 2006:2-3). Applied research, on the other hand, has often been viewed as "having lesser value because it takes place in the professions rather than in core, pure disciplines." Owing to technological, intellectual, financial, and accountability pressures, however, people in and outside institutions of higher learning now view academic excellence and the nature of research differently. This, according to Holland (2006:1), is helped by Boyer's (1990) portrayal of academia as "not simply a collection of separate research, teaching, and service silos, but as an interactive pursuit of discovery, teaching, application, and integration."

There is growing realisation that "in a complex learning society where discovery, learning and engagement are integrated activities that involve many sources of knowledge generated in diverse settings by a variety of contributors" (Holland, 2006:3), collaboration and participation are the way to go. In view of this, shifts are emerging in institutions of higher learning worldwide that "modes of networked, collaborative research ... will be an essential element of academic excellence in the 21st century university."

The driving force behind engaged research, or the transformation of scholarly work into a new mode of research and dissemination, is the emergence of new modes and sources of knowledge production and application occasioned by the "impact of global technology and communication on the generation, dissemination, and accessibility of knowledge" (Holland, 2006:3).

Gibbons, Limoges, Nowotny, Schwartzman, Scott and Trow (1994:vii) juxtapose the traditional mode of research (Mode 1) with the emerging engagement mode (Mode 2) that has become increasingly important in institutions of higher learning. To distinguish between the two, Mode 2 research is pure, disciplinary, homogeneous, expert-led, hierarchical, peer-reviewed, and almost exclusively university-based.

Mode 2, on the other hand, is applied, hybrid, demand-driven, entrepreneurial, heterogeneous, network-embedded and not necessarily led by universities. While Mode 2 is not meant to replace Mode 1 research, it is more flexible in approach to knowledge generation in recognition of "the rapid diffusion of knowledge and the integrated roles of discovery and application" (Holland, 2006:4). Transdisciplinarity, a mode where knowledge is produced in the context of application, is central to Mode 2.

Transdisciplinarity is necessitated by the wide social distribution of knowledge (Gibbons *et al.,* 1994:4), facilitated by technology that "has made knowledge, data, and information so widely available that much research now requires dynamic, interactive networks across different organizations, sectors, individuals, and even nations" (Holland, 2006:4).

Foray (2004), according to Holland (2006:4), acknowledges shifts in research paradigms "driven by the rapid creation of new knowledge and the expansion of access to data across societies and economies." Foray's proposed models for knowledge production are: research mainly advanced by universities or large industries (Model 1); research that introduces user needs into knowledge production (Model 2); and integrative knowledge, that is research requiring collaboration across organisations and creating a capacity to solve increasingly complex problems (Model 3). Foray's Model 3, undoubtedly, approximates to Mode 2 of Gibbons *et al.* (1994) and applied research or research and development (R&D)-oriented research of the type supported by the National Research Foundation (NRF), under the auspices of the Technology for Human Resources in Industry Programme (THRIP).

In the face of globalisation and increased economic competition and technological change, strategic partnerships between enterprises and academia are inevitable as "knowledge means money and money means access to knowledge" (Hernes & Martin, 2000:59). They further say it is "believed that innovation increasingly relies on effective interaction between the science base and the business sector", hence the need for networking and collaboration among different actors locally, nationally and internationally. Along similar lines, Doutriaux and Sorondo (2005:2) state that:

> Knowledge and innovation are increasingly recognized as sources of global competitiveness and economic well-being. Research on systems of innovation has shown that a country's capability to introduce the new and innovative products and services that contribute to its wealth is related to its research activities, to its proportion of scientists and engineers, to its policies and programs supportive of research and its commercialisation.

Beesley (2003:152) states that "the establishment of linkages between industry and science are considered paramount to the realization of an economy that emphasizes the role of knowledge and technology in driving productivity and economic growth". In recognition of this, the government-academia-industry collaboration in South Africa, evident in THRIP, that puts innovation, technology transfer, development of science, engineering and technology (SET) human resources, and other priorities at the forefront of national development, is laudable.

1.2 Background to research problem

The advent of majority rule in South Africa has exposed many problems requiring solutions if the newly-gained freedom is to be meaningful to the majority of the population. These problems are mainly socio-economic: reducing poverty and unemployment; equipping people with relevant skills; fighting diseases and delivering better health care; alleviating hunger through food security; improving basic living conditions such as providing housing, electricity and water; providing affordable quality education; promoting economic growth and competitiveness; among others.

Finding solutions to the problems just outlined necessitated government (re)thinking and (re)focusing of financial and other support to SET to find ways of dealing with specific problems in areas such as agriculture, the environment, education, health, electricity, gas/water supply, manufacturing and food processing, mining and quarrying, and other areas. Support for R&D-oriented programmes and projects in these and other areas has been, and is still, a priority emphasising quality of life and economic competitiveness (South Africa's National R&D Strategy, 2002:9).

In response to the (re)focusing of efforts on SET, academics/researchers in the country's tertiary institutions and science councils, in collaboration with private sector partners, are breaking new grounds in "innovation pull", rather than "science push" (South Africa's National R&D Strategy, 2002:9) initiatives. In this, they are actively supported by the Department of Trade and Industry (DTI) through the NRF.

The research agenda of many higher educational institutions and science councils has tended to focus on finding solutions to real-life problems besetting the country in an attempt to eliminate or, at least, mitigate the negative effects of certain well-known problems.

Some academics/researchers in the higher education sector, comprising traditional universities and the new universities of technology (previously technikons), and researchers in science councils, are recipients of funding through the NRF's THRIP. A long-standing partnership has developed among the government, industry and academia that facilitates the launching of R&D-oriented programmes and projects yearly with potential benefits and positive impacts that might accrue not only to specific beneficiaries, but to the South African economy and society at large. Government and industry support in the form of funding has increasingly been allocated to SET R&D-oriented efforts.

The triad of public (government), academia (researchers), and private (industry) collaboration is commonly referred to as triple helix (Viole & Ghiglione, 1998). Historically, these three institutional spheres have operated separately in capitalist societies.

Government, academia and industry have, however, been increasingly converging in the innovation process. The triple helix approach to R&D-oriented effort in South Africa calls for a new paradigm in managing and evaluating public-private-academic research. Regarding the capacity of developing countries to use science to produce benefits at the macro level, Davis and Carden (1998:1-2) remark that:

> Although the "developing world" is vast and varied, nearly all developing countries have relatively weak capacity to purposefully produce science or apply it to obtain economic or social benefits. Their ability to mount effective mission-oriented research programs or diffuse improved technology to users is relatively limited. Nor are their national scientific or educational institutions able to drive significant amounts of science-based economic activity.

South Africa, as part of this "developing world", shares in this general characterisation. While the observation is true for the "developing world" in general and more aptly describes the situation typical of Africa than most parts of the "developing world", in South Africa, however, unlike many countries on the continent, government-academia-industry collaboration is increasingly harnessing creativity and innovation in SET for national development and to enhance the people's quality of life. Undoubtedly, there is a realisation of the decline of linear innovation and the ascendancy of innovation paradigms that stress interactivity (Davis & Carden, 1998:3).

Given what has been said in the preceding paragraph, there are good reasons for industry partners or sponsors, THRIP, the government, other stakeholders and the public at large to be interested in knowing what demonstrable or potential impacts THRIP/industry funded projects have and the benefits stakeholders and the country stand to reap by investing in SET R&D-oriented projects. An impact study with this aim is important from the point of view of public accountability, transparency and the right of the people to know how their money is being used and what difference SET-oriented applied research is making in their lives. This would be of interest to the government. project managers, sponsors and other stakeholders.

A more important consideration is that a single, independent sectoral and cross-sectoral study could provide insight into the management of selected SET R&D-oriented projects and identify best practices that could serve to roadmap successful management of such projects. Above all, such information could be used as a basis for making crucial decisions that might include: targeting existing effective projects for expansion (adapting, improving and strengthening them), designing and initiating new or similar projects, preparing long-range plans, and garnering support for innovative projects.

Other decisions are: engaging other collaborators, recruiting and retaining talented staff, retaining or increasing funding, gaining favourable public recognition, attracting new participants (United Way of America, 1996).

1.3 Motivation for researching into the impact of THRIP projects

A growing emphasis on the tangible demonstration of the socio-economic benefits of research (Esterhuizen & Liebenberg, 2001:233) in South Africa makes impact assessment, a form of evaluation, essential. This is linked to the public funding of applied research and the expectation that South African SET research can, and should, contribute to solving problems in a number of areas at the people, institutional, and national levels.

In 2006, the Australian government implemented a Research Quality Framework that "differs from existing international research assessment methods by considering research impact in addition to the more conventional quality measures normally used in the academic community" (Duryea, Hochman & Parfitt: 2007:8). This signals the importance of research impact or "the beneficial application of research to achieve social, economic, environmental and/or cultural outcomes". More than anything else, this is the direction research assessment should be taking in developing countries.

According to Castells (1996), as cited in Human Sciences Research Council (2003:2) audit report (hereinafter referred to as HSRC, 2003), "the ability of countries to compete in the international economy is directly related to their technological potential". Thus, innovative R&D is the key to development in Africa. In this connection Kahn (2004:3) says "governments know that there is a positive relationship between economic competitiveness and spending on research and development". The reality, however, is that low priority, if any at all, is accorded R&D by African governments.

With the stripping of the South African military-industrial complex between 1990 and 1994, the country has experienced a decline in the percentage of its gross national product spent on R&D, from 1.1% in 1990 to 0.7% in 2002 (South Africa's National R&D Strategy, 2002:90). An encouraging sign, however, is the fact that in 2004 the country spent 0.76% of gross domestic product (GDP) on R&D (Kahn, 2004:3). This, according to Kahn, was an improvement over 0.69% in 1997, but well below the Department of Science and Technology target of 1% for 2005. This expenditure compares poorly with the European Union's target spending of 3% on R&D by 2010 for member states, as set out in the Barcelona Declaration (Kahn, Ntakumba, Batatu, Rumbelow & Burns, 2005:8) but it is a fairly good start.

In the 1980s, the United Kingdom and United States each spent about 2.4% of their GDP on research. By 2001, this had increased to 2.8% for the United States but declined to 1.9% for the United Kingdom (Pouris, 2004:5). According to Nordling (2006:2), Sub-Saharan Africa accounted for 0.4% of the world's gross expenditure on R&D in 2002. In short, then, for a developing country, South Africa is doing reasonably well and probably excelling against the rest of the continent.

Since 1992 the DTI has been funding THRIP, a R&D business unit of the NRF, managed through a Memorandum of Agreement between the DTI and the NRF. According to a HSRC (2003:17) audit report, citing DTI THRIP *Guide to Research Support* (1998), THRIP aims to:

> improve the competitiveness of South African industry by supporting scientific research, technology development and technology diffusion activities and enhancing the quality and quantity of appropriately skilled people.

HSRC (2003:17) audit report also indicates that THRIP has three primary objectives. The first is to increase the number and quality of people with appropriate skills for the development and management of technology for industry.

The second is to promote increased interaction among researchers and technology managers in indudtry, higher education and government SET institutions, with the aim of developing skills for the commercial exploitation of science and technology.

The third objective involves stimulating industry and government to increase their investment in research, technology development, technology diffusion and the promotion of innovation.

These objectives are re-echoed in THRIP (2003:4). The HSRC (2003:16) audit report further indicates that THRIP projects are specifically structured either as higher education-industry or SET institutions-industry partnerships. In this way they facilitate the cross-transference of knowledge, skills and resources, including human resources across academic institutions, government SET institutions and the industrial sector. Further, the study says THRIP projects are structured to ensure research outputs and project outputs can be commercialised to achieve improvement in the competitiveness of South African industry in the context of globalisation and technological advancement.

Three main mechanisms are used in funding THRIP projects. First, they may be structured as projects led by a researcher or researchers in higher education institutions. A second mechanism involves participation of government SET institutions in THRIP projects.

Thirdly, various options of Technology Innovation Promotion through the Transfer of People (TIPTOP) may be used (HSRC, 2003:18-19). Most THRIP projects, however, are structured using the first mechanism.

To qualify for funding, projects need to satisfy three eligibility requirements directly linked to THRIP's mission statement. Firstly, projects must promote and facilitate scientific research, technology development, and technology diffusion, or any combination of these. Secondly, projects must include a human resource development component. Thirdly, projects must have a technological focus decided on by industrial participants and their partners (HSRC, 2003:18).

The establishment of THRIP represents a bold effort by the South African government to "provide essential services and globally-competitive products" (Annual Report, 2001/2002:3). Jointly-funded, THRIP/industry projects are of strategic national importance. Funding is based on a R2:R1 cost-sharing formula between industry and THRIP. The latter puts in at least a third of industry's contribution and, if a project meets certain conditions, THRIP may contribute up to 50%. These funds are "invested" in a wide range of projects spanning different scientific, engineering and technological fields: agriculture, mining and quarrying; manufacturing and processing; electricity, gas, water supply and usage; transport, storage and communication; and health, among others. With the increasing involvement of public money in "sectors that potentially have the most impact on the lives of South Africans and our economy" (THRIP Annual Report, 2001:3), THRIP projects command public interest not merely because issues of accountability and effectiveness are involved.

From the large pool of THRIP/industry-funded projects, a sample is drawn for this research study to assess (potential) impact. The motivation for this research is that although two independent reviews have been conducted at the instigation of the NRF itself to test the relevance and success of THRIP (Annual Report, 2001/2002:4), they focus on THRIP itself, as an entity, rather than on the benefits and impacts of individual projects. Focusing on the latter, this research is the first academic effort to assesss the benefits and impacts of THRIP/industry-funded research projects for degree purposes on a sample of more than 50 individual projects.

The essence of impact assessment in evaluation of research is informed by relevant national and international approaches (Duryea *et al.*, 2007:8), thus giving relevance to the applied focus of research. Opponents claim that focus on research impact "devalues the assessment process by moving beyond the scholarly domain" and may lead to "undue emphasis on research that can demonstrably show short-term economic or other gains."

It is, however, argued that "the absence of an assessment of impact seriously unbalances the evaluation of research and its importance to national and global priorities".

1.4 Research problem

Mouton and Dowling (2001:69) identify four levels at which evaluation of R&D-oriented projects are undertaken: individual researcher, project or programme, institutional, and systemic or national levels. Different stakeholders are involved at each level. The existence of these levels and the different stakeholders involved, however, make the purposes of evaluation at these levels radically different.

At the first (individual) level evaluation follows the human resources approach in appraising the individual researcher's past output. The researcher's reputation is sometimes linked to the potential success of a new project he or she is undertaking. A simple performance appraisal is typically made for resource allocation and rating purposes.

The second level of evaluation is the project or programme level and usually involves formative evaluation in the form of evaluability assessment, mid-term or site reviews, impact assessment and cost-benefit analysis. The key concerns are quality control, allocation of resources, management and accountability.

Institutional R&D evaluation, the third level, concerns evaluating entities such as universities and their divisions, which may be departments, institutes, centres or units, for purposes similar to those at the project level but also for strategic management and prestige.

The fourth level is national or systemic and typically involves the government, national funding and/or policy-making bodies, international funding agencies or the general public (Mouton & Dowling, 2001:72). The chief concerns here are national science and technology audits and reviews (Mouton & Dowling, 2001:69).

According to Mouton and Dowling (2001:75) several writers, including Martin and Irvine (1983), and Moed *et al.* (1985), distinguish between four dimensions of measuring research performance. The first is quantity, referring to research output in the form of the number of publications, patents or presentations produced. Second is impact, "the longer-term (and sustained) outcomes (and benefits?) that accrue from research" (Mouton & Dowling, 2001:75). Thirdly, R&D evaluations measure importance in hindsight through peer reviews. The last dimension is quality, the scientific value attached to research. This is arrived at through peer review.

This research focuses on evaluation at the project or programme level. Numerous applied research or R&D-oriented projects spanning many sectors have been launched in South Africa since the attainment of majority rule in 1994. Many more are launched yearly by universities and universities of technology, science councils, government departments, non-governmental, and industrial organisations. In the main, such projects are aimed at eliminating or, at least, mitigating the negative effects of identified problems.

On the industrial side, R&D-oriented projects have assumed national priority and strategic importance. In an area such as manufacturing ways are being found to improve processes. In addition, making products that are globally competitive is vital. In the field of energy studies harnessing solar power to rural communities' needs has, as in the case of Kliprand, for example, put South Africa at the forefront of the using solar technology to serve people.

Since the setting up of THRIP by the NRF in collaboration with the DTI, it has seen sustained increased funding of R&D-oriented projects across a wide spectrum of sectors. To date, no independent research has been undertaken to determine the impact of THRIP projects. Neither has there been an investigation into their contribution to enhancing the lives of communities and the operations of stakeholders. Yet the need to assess the (potential) impacts of these projects exists and is paramount. With THRIP/industry-funded projects attracting public funding as well as industry partners' financial contributions, accountability and effectiveness remain important, but solving uniquely South African problems has assumed prominence.

The problem this research sets out to address is vital and may be stated as follows: *to assess how successful a sample of THRIP/industry-funded research projects has been in achieving stated objectives and what impact, if any, the projects have had on primary beneficiaries and the country at large.*

1.5 Review of international literature on definition, purposes, reasons and (potential) benefits of programme evaluation

Any discussion of evaluation has to take cognisance of how the term 'evaluation' has been defined in literature over the years and views expressed about its benefits, purposes and reasons for conducting evaluations. This is important as definitions given and/or statements made by different authors tend to hint at (potential) benefits and uses of evaluation, which themselves may constitute why evaluations are undertaken.

With this in mind, this section outlines definitions and statements about purposes, reasons and benefits of evaluation, adopting a more or less chronological perspective to highlight how the definition of 'evaluation', its benefits and purposes have progressively broadened.

1.5.1 Definitions of 'evaluation'

There are many definitions of 'evaluation' "but there is no widespread consensus about which definition most faithfully represents the field" (Canadian Evaluation Society report, 2002:9, hereinafter referred to as CES report). Weiss (1972:1) describes 'evaluation' as "an elastic word that stretches to cover judgements of many kinds". It is probably not an understatement to say there are as many definitions of 'evaluation' as there are evaluators across the disciplines evaluation overarches. This might be attributed to the fact that "evaluation is a very young discipline – although it is a very old practice" (Scriven, 1996:395).

In fact, there is no all-inclusive definition of 'evaluation' (Douglah, n.d.:1) since no single definition adequately reflects its nature, purpose, functions or methodology. Evaluation has become such a global phenomenon that the elasticity of the term 'evaluation' is indicative of its varying content found in 21 different countries studied in Furubo, Rist and Sandahl (2002:3). The state of evaluation globally is examined in a forthcoming article in *Journal of Public Administration* (see Appendix G, page 259). Rutman and Mowbray (1983:12) recognise the difficulty in giving a precise definition to 'evaluation': "programme evaluation has no uniform and consistently applied definition" and "has become a subject of a variety of interpretations in relation to its purposes, scope, and methodology".

That 'evaluation' is a particularly difficult term to define without methodological or epistemological bias is illustrated by Lincoln and Guba (1986:8) who provide four definitions that are linked to different kinds of evaluation:

- determining the congruence between performance and objectives;
- obtaining information for judging decision alternatives;
- comparing actual effects with demonstrated needs; and
- critically describing and appraising an evaluation through connoisseurship.

Scriven (1980:7) states that "evaluation is what it is, the determination of merit or worth, and what it is used for is another matter". Much later, he asserts: "Bad is bad and good is good and it is the job of the evaluator to decide which is which" (Scriven, 1986:19). He disagrees with other evaluators who define 'evaluation' in terms of providing information to decision-makers. In his view, evaluation is the science of valuing (Shadish, Cook & Leviton, 1991:74).

For Scriven "value, worth, quality, or merit are ... constructs from observable variables, just as aptitudes and achievements and motivation and anxiety are" and the validity of value claims can be established in ways similar to establishing the validity of other scientific constructs (Shadish *et al.*, 1991:75).

Needless to say, Scriven's assertion that evaluation is solely concerned with valuing is highly controversial. On the contrary, some evaluators hold a view that "the purpose of evaluation is solely to provide the information needed to make such judgements, not to actually make those judgements" (CES report, 2002:9).

Scriven (1991:139) re-echoes his enduring definition of 'evaluation':

> Evaluation refers to the process of determining the merit, worth, or value of something, or the product of that process. Terms used to refer to this process or part of it include: appraise, analyze, assess, critique, examine, grade, inspect, judge, rate, rank, review, study, test.... The evaluation process normally involves some identification of relevant standards of merit, worth, or value; some investigation of the performance of evaluands on these standards; and some integration or synthesis of the results to achieve an overall evaluation or set of associated evaluations.

Posavac and Carey (1997:2), having outlined six reasons for conducting evaluations, define 'programme evaluation' as a:

> ...collection of methods, skills, and sensitivities necessary to determine whether a human service is needed and likely to be used, whether the service is sufficiently intensive to meet the unmet needs identified, whether the service is offered as planned, and whether the service actually does help people in need at a reasonable cost without unacceptable side effects. Utilizing research methods and concepts from psychology, sociology, administration and policy sciences, economics, and education, program evaluators seek to contribute to the improvement of programs.

Posavac and Carey (1997:13), however, proclaim that "there is one overall purpose of program evaluation activities: contributing to the provision of quality services to people in need". They stress the role evaluation plays in providing feedback that enables decision-makers to make changes to programmes or decide what services to offer.

Patton (1997:23) defines 'evaluation' as "... the systematic collection of information about the activities, characteristics and outcomes of programs to make judgments about the program, improve program effectiveness, and/or inform decisions about future programming". This definition hints at three key areas where the findings of evaluation are beneficial: making overall *judgements*, facilitating *improvements* and generating *knowledge*.

Continuing in the same vein as Posavac and Carey (1997), Rossi *et al.* (1999:4) stress the benefits of evaluation in their definition:

> Program evaluation is the use of social research procedures to systematically investigate the effectiveness of social intervention programs. More specifically, evaluation researchers use social research methods to study, appraise, and help improve social programs in their important aspects, including the diagnosis of the social problems they address, their conceptualization and design, their implementation and administration, their outcomes and their efficiency.

The CES report (2002:ii) notes that "there is no universally acceptable definition of program evaluation" and that there is "no widespread consensus on where the line that defines evaluation should be drawn, and how inclusive it should be." This is because the field is diverse and evolving, which calls for flexibility and adaptation, rather than prescription.

It can be said that the problem of defining 'evaluation' or 'programme evaluation' is a significant one that has been exacerbated by the fact that evaluation is a diverse and evolving field that accommodates flexibility and adaptation. Any attempt to impose a single, rigid definition would have to spell out what counts as evaluation and what does not. This would be tantamount to narrowing the field to only some specific activities, leading to a rather untenable state of affairs. In essence, then, the definition problem can essentially be reduced to one basic issue: "where the line that defines evaluation should be drawn, and how inclusive it should be" (CES report, 2002:14). A wider view of evaluation as opposed to that espoused by Scriven (1980) has the advantage that it recognises the diversity of activities and benefits that can accrue from evaluation.

1.5.2 Purposes, reasons and benefits of evaluation

In this subsection the purposes, reasons for and benefits of evaluation as given by various writers are briefly sketched. However, those attributed to Chelimsky (1997) by Rossi, Freeman and Lipsey (1999:39-44) as well as those emphasised by the CES report (2002), which is a synthesis of major evaluation literature, are elaborated.

Weiss (1972:4) points to the purpose of evaluation research as the measurement of effects against goals to be achieved. This is to facilitate decision-making and improve on future programmes. Closely allied to this concept of evaluation is utilisation of findings.

Stake (1975:15) states: "people expect evaluation to have many purposes." This, as will be clear from the views of other writers outlined here, seems to be a widely held expectation.

Anderson and Ball (1978:3-4) outline six major non-mutually exclusive purposes of programme evaluation:

- contribution to decisions about program installation;
- contribution to decisions about programme continuation, expansion, or "certification";
- contribution to decisions about programme modification;
- to obtain evidence to rally support for a programme;
- to obtain evidence to rally opposition to a programme; and
- contribution to understanding basic psychological, social, and other processes.

The fourth and fifth purposes are much more in line with the use of evaluation for political ruses or public relations and to bring about social change, discussed in sections 1.5.2.4 and 1.5.2.6, respectively.

For Rutman and Mowbray (1983:24), there are three major purposes of evaluation. First, from a restricted accountability perspective of evaluation "the worth of the program must be reported and thereby demonstrated if it is to deserve continued legislative, financial, and public support". From the point of view of outsiders several penetrating questions may be asked, including: is implementation in line with original authorisation and funding? Are the objectives of the programme being achieved? If so, are they being accomplished in the most efficient way?

Secondly, from a management perspective, programme evaluation is seen "as a tool for making improved decisions about the design of programmes and their delivery and about the type and amount of resources that should be devoted to the program" (Rutman & Mowbray, 1983:26). In this sense evaluation is a source of management control, producing information for managerial action. According to Rutman and Mowbray (1983:27) "the major rationale for program evaluation in this context is that responsible management requires the types of information it can produce".

Thirdly, programme evaluation "can be used to produce knowledge that may or may not be of immediate use to decision makers". In this way, it contributes to the state of the art in different fields of practice. These purposes, the authors point out, are not mutually exclusive.

The purpose of evaluation as conceived by Shadish *et al.* (1991:21) is a problem-solving activity that identifies a problem, generates alternatives to reduce its symptoms, evaluates these alternatives and then adopts those results that will reduce the problem satisfactorily.

Seven typical reasons for conducting evaluations, according to Posavac and Carey (1992:4-6) are to:

- devote resources to meet unmet needs;
- verify that programmes are delivering services;
- examine results;
- determine which programmes are producing the best results;
- select the types of programmes offering the most needed services;
- provide information needed to maintain and improve quality; and
- look out for unintended/unplanned side effects.

Leeuw, Rist and Sonnichsen (1994:4) acknowledge the role evaluation plays in organisational learning, although this is by no means a linear process. Organisational learning may be "single-loop" or "double-loop". The former "occurs when individuals detect a match or mismatch of outcomes to organizational expectations" (Leeuw *et al.*, 1994:3) while double-loop learning involves the questioning of underlying organisational policies, norms, theories, and objectives (Leeuw *et al.*, 1994:4). However, the learning process needs an exchange of information between the organisation and its internal and external environment. This can occur under only four conditions. Firstly, the organisation should be capable of sensing, monitoring, and scanning relevant internal and external environments; secondly, information obtained should be compared to the organisation's guiding norms and values; thirdly, significant deviations from the norms or procedures that guide the organisation must be detected; lastly, deficiencies should he corrected through appropriate action.

Wholey, Hatry and Newcomer (1994) echo a similar sentiment as Weiss (1972) in stressing that evaluation should also identify ways of improving performance, not only assess programme results. This expresses a broader view of the purpose(s) of evaluation than that of Scriven (1980).

Vedung (1997:101) asserts evaluation has three major overall purposes: accountability, intervention improvement and basic knowledge advancement. She further states that accountability and improvement are "the most eminent rationales for doing evaluation". According to Vedung, both Chelimsky (1978) and Arvidson (1986:627) outline three purposes that are "somewhat" different from hers: accountability, management and knowledge while Hudson, Mayne and Thomlinson (1992:5) state four purposes: "increase knowledge, improve program delivery, reconsider program direction, and provide for accountability."

Chelimsky, in Chelimsky and Shadish (1997:9) lists the following as purposes of evaluations:

- measuring and accounting for the results of public policies and programmes;
- determining the efficiency of programmes, projects, and their component processes;
- gaining explanatory insights into social and other public problems and into past and present efforts to address them;
- understanding how organisations learn;
- strengthening institutions and improving managerial performance;
- increasing agency responsiveness to the public;
- reforming governments through the free flow of evaluative information; and
- expanding results or efficiency measurement from that of local or national interventions to global interventions.

Like Patton (1997), Chelimsky (1997) identifies three general perspectives into which the purposes of evaluation and the questions they try to address may be categorised: evaluation for accountability, evaluation for development and evaluation for knowledge.

Babbie and Mouton (2001:337) cite several purposes of evaluation: programme management, improvement and refinement, financial accountability, to satisfy public demand, to meet accreditation requirements, and for purposes of quality assurance and control. They refer to Patton's (1997) collapsing of these purposes into three main classes: to make judgements of merit or worth, to improve programmes, and to generate knowledge.

Varied as they are, or may conceivably be, programmes and projects are initiated for broadly similar reasons although implemented under different circumstances. According to Chelimsky (1997), as cited in Rossi *et al.* (1999:39), "evaluations are generally done for one or more of the following broad reasons". These broad reasons are: programme improvement, accountability, knowledge generation, and political ruses or public relations. They are discussed together with other reasons in the following section.

1.5.2.1 Accountability

Public funds are used to finance programmes and projects with the expectation that society will benefit in certain ways. With this goes the responsibility on the part of programme and project managers to manage resources effectively and efficiently to produce the intended effects. Summative evaluations are undertaken "to render judgment on certain critical aspects of ... performance" (Rossi *et al.*, 1999:40).

The findings of summative evaluations are relevant to a number of people or bodies with decision- making and oversight responsibility, including upper management, funders, political decision-makers, and others such as concerned citizens, constituents and critics.

Virtually all evaluations have an element of accountability, even where programmes and projects are privately funded but accountability is particularly expected where public funds are involved. Various stakeholders have vested interest in the performance of programmes and projects. Through evaluation information relating to the implementation of intended programmes and projects, their efficiency, effectiveness, intended as well as unintended effects and whether or not their money has been well spent is made available.
Thus, transparency, public scrutiny and judgement are guaranteed. Another way in which evaluation supports accountability is through meeting the formal requirements set by programme and project funders.

The accountability dimension is cited by the CES report (2002:15) as one of the five categories of (potential) benefits of evaluation (see section 1.13.2.4). According to the CES report (2002:15-16), evaluation provides accountability for programme performance and spending in two ways: it provides information for stakeholders and meets the requirements of funders.

Concerning the first aspect, various stakeholders have interest in knowing how the programmes or projects their money supports are doing. Access to such performance information is a right and is vital to enable stakeholders scrutinise and make judgements. Evaluation facilitates accountability because it is by nature transparent, collective and public. In this way, evaluation helps stakeholders to:

- verify that planned programmes are implemented as planned;
- assess the efficiency of a programme, or its components;
- determine the extent to which a programme is having the intended effects, as measured against objectives, benchmarks, standards, or targets;
- identify any unintended effects of the programme; and
- judge whether the programme is worth the resources that are devoted to it.
  (CES report, 2002:15)

The second dimension of accountability is the fact that evaluation tends to meet the formal requirements of funders and proves to them there is genuine accountability and continuous organisational learning (CES report, 2002:17).

Accountability evaluations focus on cause-effect questions in trying to establish a direct/indirect relationship between the implementation of a programme or project and its outcomes or results. Such evaluations also try to link costs to benefits and/or compare the costs and benefits of one programme or project to another.
The purposes of accountability evaluations are:

- analysing efficiency and effectiveness;
- measuring and accounting for the results of public policies and programmes;
- determining the efficiency of programmes, projects and their component processes;
- increasing agency responsiveness to the public;
- assessing programme benefits relative to cost;
- verifying that planned programmes do provide services;
- analysing cost compared to outcome;
- determining programme quality; and
- providing timely and convincing evidence of effectiveness (CES report, 2002: Appendix C:3).

According to Chelimsky (1997:11), methods that are typically used to deal with accountability issues in evaluation include randomised designs, quasi-experimental designs, controlled designs, cost-effectiveness designs, research synthesis and, occasionally, case study designs.

1.5.2.2 Knowledge generation

Some evaluations are conducted with scientific rigour because they "make contributions to the social science knowledge base" and their findings are disseminated through scholarly journals, conferences and other media. For such evaluations, sponsors are the main audience together with anyone with interest in the programme or project or the methodology employed (Rossi *et al.*, 1999:42).

The CES report (2002:19) mentions knowledge and skills as one of the categories of (potential) benefits of evaluation and indicates evaluation contributes to knowledge and skills in three ways. Firstly, knowledge and skills may be gained through increased understanding of the programme evaluated.

Stakeholders stand to gain a clearer and more objective understanding of programmes from evaluation. Such understanding includes the objectives, the political, ideological or organisational environment within which the programmes or projects are expected to operate. It also involves how the programmes or projects will serve society, the logic and assumptions that underpin the programmes or projects, as well as the part individuals and/or groups are expected to play.

A clearer understanding is also gained about the targeted beneficiaries, the day-to-day activities, and the strengths, weaknesses and results of programmes or projects. This kind of knowledge equips stakeholders with information and enables managers to make improvements, be accountable and to institute a regime of proper allocation of resources (CES report, 2002:9-20)

Another dimension of knowledge gain cited by the CES (2002:20) pertains to building awareness about existing/potential needs, and about programming that addresses such needs. Evaluation increases knowledge of needs and problems; increases knowledge of effective practices and programmes; and increases knowledge of programming.

Evaluation increases knowledge about needs and problems by equipping stakeholders with increased awareness of a variety of needs; how prevalent and severe. In addition, they get to know the origins and contexts of such needs. This facilitates the development of more relevant and effective programmes or projects.

Evaluation can lead to an increased awareness of practices that are effective in fulfilling specific needs in specific situations. Practices and lessons learnt can be transferred to other programmes or projects. Further to this, knowledge of why certain practices do not work is also gained. This leads to the design and implementation of more appropriate programmes and projects. In addition, a good understanding of where and why programmes arise can be gained from evaluation. Much may also be learnt about factors affecting organisational learning and innovation.

Evaluation also helps to build capacity for effective programme design, assessment and improvement. According to the CES report (2002:21), there are three ways evaluation builds capacity for effective programme design, assessment and improvement. Firstly, it develops more critical thinking about programmes. Evaluation helps managers to think critically about programmes in many ways:

- to develop objectives clearly and critically analyse programme design;
- systematically collect data and blend formal and informal processes for reflection, discussion, and review;
- focus on how to implement and monitor;
- pose critical questions about programmes;
- focus on improvement, and strategically allocate resources to achieve maximum impact;
- visualise possible results and consider how to assess them;
- be cautious about claims of effectiveness and causal links; and
- to base their decisions on evidence.

Secondly, evaluation contributes to knowledge and skills by improving attitudes. Organisations that evaluate their programmes create an atmosphere where evaluation and accountability are valued.

This leads to greater efforts to achieve quality, continuous improvement and staff pre-occupation with analysing the strengths and weaknesses of programmes.

Finally, evaluation helps develop the capacity to understand, use and/or conduct evaluation. Participation by stakeholders in evaluation leads to their understanding it and makes them prone to using it knowledgeably and appropriately. Evaluations conducted from this perspective deal with a wide range of issues such as:

- providing evidence of what works and what does not;
- understanding how organisations learn;
- expanding results or efficiency measurement from that of local or national interventions to that of global interventions;
- assessment of programme impact;
- devoting resources to meeting unmet needs;
- determining which services produce the best results;
- selecting the types of programmes that offer the most needed services;
- helping policy makers and managers decide realistically what their programmes can do; and
- gaining explanatory insights into social and other public problems and into past and present efforts to address them (CES report, 2002: Appendix C:3).

Other purposes of evaluation cited by Chelimsky (1997:13-14) are:

- finding out why certain technologies succeed in some places but fail in others;
- establishing reasons for certain socio-economic malaise;
- finding out which policies and programmes best address certain problems; and
- determining what theories underlie such policies and programmes.

1.5.2.3 Programme improvement

According to Rossi *et al.* (1999:40), findings of formative evaluations provide information that helps to guide or shape programmes. The audience for such evaluations include programme planners concerned with programmes at the planning stage, programme administrators, boards charged with responsibility to oversee programmes, or sponsors eager to ensure optimum effectiveness. These stakeholders are typically interested in aspects of programmes such as: whether there is a need, the concept and design, how it is has been implemented, its impact and/or efficiency. Information needed for programme improvement tends to focus on the timeliness and concreteness of findings as well as how immediately useful such information is.

Issues that evaluation from the development perspective deal with relate to the quality of research evidence that can be used in formulating a new programme or modifying an existing one and the best way to structure demonstrations to provide evidence on the value of the intervention being tested (Chelimsky, 1997:12-13). From this perspective, the main purposes of evaluation could be any or a number of the following:

- identifying weaknesses and strengths of programmes;
- making programmes less vulnerable;
- strengthening institutions and improving managerial performance;
- monitoring how well programmes are functioning;
- examining results;
- providing information needed to maintain and improve quality;
- gaining direction for improving programmes;
- helping agency managers run programmes; and
- helping policy makers and managers improve ongoing programmes (CES report, 2002: Appendix C:3).

According to Chelimsky (1997:12) the purposes of evaluation in relation to programme improvement are to:

- set the research agenda in an agency;
- improve the design of projects;
- measure and recommend changes in organisational activities;
- develop indicators and performance targets needed to improve institutional effectiveness and responsiveness;
- monitor how projects are being implemented across a number of different sites;
- see how cooperation is occurring (or not occurring) among collaborators on a programme; and
- find out how beneficiaries feel about the agency and its programmes.

The CES report (2002:18-19) mentions programme improvement, an aspect of decision-making, as one of the (potential) benefits of evaluation. Policy-makers, programme managers and staff may use evaluation to help improve programmes in several ways: to improve programme design; improve programme implementation; improve programme cost-effectiveness, supporting effective management practices; and making more effective use of evaluation.

In terms of improving programme design, properly conducted evaluations can inform managers and staff about design that would increase programme efficiency and effectiveness.

Evaluations alert managers to necessary corrections to be made that might increase the likelihood of achieving objectives. With such information they would also be able to set more realistic objectives, identify and deal with incorrect assumptions and/or weaknesses in design, determine effective and ineffective components, reduce overlap in the case of similar programmes, eliminate ineffective activities and add effective ones, identify and avoid unwanted effects.

Through evaluation improvements can be made to the implementation of programmes as managers are equipped with information as to whether implementation is according to plan. In this way problems can be identified and dealt with, time-tested good practices introduced, unwanted effects avoided and mistaken assumptions changed.

Further, through evaluation, managers and staff are better able to weigh costs against outcomes and to select and use methods that work best. This results in reducing cost for desired outcomes or even better outcomes for the similar cost.

Evaluation can also help managers to become more effective. Since they understand the programmes or projects intimately and the appropriate tools and systems, they know what works best and what standards are expected. They can create and/or improve management information and performance measurement systems to make informed decisions and effectively manage change. Managers can also use the early stages of evaluation to gain insight into how appropriate or otherwise it would be is to evaluate a programme, the exact time to evaluate, what needs to be measured and how.

Methodology-wise, evaluations from the development perspective employ process and outcome designs, formative methods such as monitoring and case studies, internal and empowerment evaluation, cluster evaluation, performance measurement, qualitative and quantitative research synthesis (Chelimsky, 1997:13).

1.5.2.4 Political ruses or public relations

According to Rossi *et al.* (1999:42) "virtually all evaluations have some elements of political maneuvering and public relations among their instigating motives". This effectively means not all evaluations are undertaken simply to yield performance information. Some are conducted for unsavoury reasons. Administrators or boards may initiate an evaluation in the belief it would be good public relations that might impress funders or makers of political decisions. Evaluation may also be undertaken from a desire to find a public context to justify behind-the-scene decisions or as a "delaying tactic to appease critics and defer difficult decisions".

Palumbo (1987:12) refers to the use of evaluations to support or build the images of programmes as "political evaluation". This, according to him, is the last of three and the only negative way in which politics and evaluation are related.

According to the CES report (2002:150), "twelve broadly stated benefits ... may be derived from evaluation. These benefits are grouped into five categories: accountability, decision making, knowledge and skills, social change, and cohesion and collaboration". Sections 1.5.2.1, 1.5.2.2 and 1.5.2.3 discuss accountability, knowledge generation and programme improvement, an aspect of decision-making, respectively. In sections 1.5.2.5, 1.5.2.6 and 1.5.2.7, decision-making; social change; and cohesion and collaboration, with their associated benefits, are sketched.

1.5.2.5 Decision-making

Evaluation can help in making better decisions about programme direction in two ways. Firstly, evaluation plays a vital role in better decision-making. It provides the tool for programme directors, policy-makers, managers and funders to make better decisions in terms of setting goals, priorities and objectives that mirror the values and ideologies of stakeholders. Further, it helps them focus on real needs, and on needs that are subject to change or are more important in terms of being prevalent, serious and/or pressing (CES report, 2002:17).

Evaluation can also help in reviewing goals and priorities. It can assist in determining the validity and/or relevance of current goals and priorities and for necessary changes to be effected. In this way, it facilitates the process of reviewing organisational goals and priorities (CES report, 2002:17).

Secondly, evaluation can play a vital role in making decisions about resource allocation. To begin with, it can help to determine the value of programmes. Determining the value or worth of programmes cannot be effectively done without relevant information being obtained through evaluation where multiple criteria for judging the merits of programmes, assessing their expected and unexpected effects and determining whether or not these effects are attributable to the programme serve this purpose (CES report, 2002:17).

In addition, with resources such as time, money and effort committed to programmes, evaluation gives information that enables resource allocation decisions, such as the following, to be made. Thus, evaluation can be used to allocate resources to programmes through:

- termination on grounds of inefficiency and ineffectiveness;
- expansion of effective programmes;
- reduction or increase in programme funding where necessary;
- minimisation of potential future costs; and
- selection of programmes on the basis of achieving outcome at the least cost or better outcome at the same cost (CES report, 2002:18).

1.5.2.6 Social change

This aspect has some common ground with the use of evaluation for political ruses and public relations hinted at by Rossi *et al.* (1999) and discussed in section 1.5.2.4. First, according to the CES report (2002:22), evaluation can be used in promoting, defending, or opposing specific methods, approaches, or programmes. Evaluation findings are a very powerful weapon in the armoury of proponents and opponents of programmes alike. Such findings can be used by proponents to:

- promote programme goals;
- secure funding for the programme;
- gather public support for the programme;
- gather political support for the programme; and
- lobby for organisational or legislative changes that favour the programme.

Similarly, opponents can use evaluation findings to further their agenda, in terms of:

- gathering opposition to the programme;
- arguing against funding; and
- blocking organisational or legislative changes that favour the programme.

In short, the findings of evaluation can be a double-edged sword: supporters as well as opponents can use them as a tool to lend credibility or support for political decisions that are difficult to make.

Evaluation can also be used to shape public opinion. One way to achieve this is by using it to advocate for the rights of communities living on the fringe, that is disadvantaged or marginalised groups. This is a legitimate cause, as evaluation is one of the ways of correcting imbalances in society.

Further, evaluation can be used in supporting pluralism and democracy through exploring diverse views. All-inclusive evaluation is a forum where the views of all can be heard and shared, particularly the views of the marginalised.

This gives full expression to pluralism and creates an atmosphere where inclusiveness and diversity are respected.

Secondly, evaluation may be used to support a more democratic decision-making process. The opportunity for service delivery staff and participants to collaborate in making future design and delivery decisions is increased through evaluation. In organisation settings, free dissemination of information can lead to reforms and create more appreciation for the working of democratic practice.

1.5.2.7 Cohesion and collaboration

The CES report (2002:23) cites facilitation of inter-departmental/or inter-organisational sharing of knowledge, creation of a platform for common understanding, delivery, monitoring and evaluation of programmes as one of the potential benefits of evaluation. It also helps those working in similar, but different, processes to develop bonds.

Evaluation is also said to help in building energy and enthusiasm within a programme team by building pride and confidence. It is said pride and satisfaction among managers and staff following evaluation can arise as the worth of the programme may have been deeply studied; and better ways of serving clientele by meeting objectives may also have been found. The realisation they have made a difference in the lives of others may also serve to increase staff satisfaction.

In addition, evaluation can help build cohesion and enthusiasm. Having undertaken evaluation, staff members are likely to see themselves as a team dedicated to a set of common goals. This can boost morale, buy-in and commitment to what the programme represents.

The benefits of evaluation are, undoubtedly, multifarious. It should, however, be borne in mind these benefits are not guaranteed. As the CES report (2002:10) directly points out, "evaluation does not automatically provide benefits". Rather, as the authors of the report quickly, and quite correctly, indicate, benefits "will only be realized under certain conditions, which may vary by benefit type".

According to the CES report (2002:Appendix C:3), Patton (1999) sees an additional benefit of evaluation. This expands on the three benefits outlined in Patton (1997:65). The evaluation process itself, in Patton's view, is a benefit. This is because it leads to changed thinking and behaviour in individuals and groups as a result of learning.

For Patton, then, the evaluation process provides an opportunity for individual, group, programme and organisational learning.

The CES report (2002:Appendix C:2) points out that the three key categories of purposes of evaluation identified by Chelimsky, in Chelimsky and Shadish (1997), and Patton (1997) are quite similar and provide a suitable framework for organising the numerous benefits of evaluation put forward by others. It also indicates (CES report 2002, Appendix C:4) that Wholey *et al.* (1994) and Chelimsky (1997) both refer "to other benefits that are somewhat different from the three main ones" (accountability/making overall judgements, development/facilitating improvements, and knowledge/generating knowledge). These benefits relate to advocacy: evaluation plays a role in shaping public opinion about government and also helps to reform governments through the free flow of valuable information.

1.6 Utilisation of evaluation

Browne and Wildavsky (1987:149) cite three common criticisms of evaluation, namely: weak methodology, irrelevance and under-utilisation. Carlson and Crane (1989) outline some of the arguments that question the utility of evaluation. Although these arguments are specific to the United States' Health Resources and Services Administration they, undoubtedly, are relevant to other contexts. They include: minimisation of ministerial responsibility in times of rapid change, concern that evaluation information may not yield practical benefits that exceed cost, lack of personal incentives for sponsoring evaluations, length of time needed to begin evaluations and length of time required for evaluations to yield results. Utilisation is a very important topic in evaluation. For a discussion of ways of achieving more effective utilisation, see Dassah and Uken (2007:119-136), attached as Appendix H (page 260).

To sum up, section 1.5 has focused on reviewing international literature. It brings out various definitional approaches, purposes, reasons for and (potential) benefits of evaluation. This section provides a vital background to Chapter 2. The section that follows reviews programme evaluation literature in the South African context.

1.7 Review of literature on programme evaluation in South Africa

In the South African context, De Vos (2002:373-374) distinguishes between 'programme evaluation' and 'intervention research' thus: "programme evaluation *assumes the prior existence* of a programme or intervention designed and developed by someone else, perhaps long before the evaluator ever entered the field" whereas "when intervention research is attempted something new is created and then evaluated".

Writing just after the attainment of majoriy rule, Louw (1995:351) points to the existence of strong awareness among individuals and organisations (non-governmental organisations and government departments) of the need to evaluate and anticipation of difficult decisions to be made on policies and.programmes in the future. To address the ills of the apartheid era, the Reconstruction and Development Programme (RDP) was launched to meet "basic needs in education, health, housing, electricity and water as a primary development strategy". The expectation that the RDP would put emphasis on evaluation, however, did not materialise.

According to Louw (1995:352), formal evaluation education and training opportunities at degree level are non-existent and supply of expertise is scarce: "programme evaluation ... at present attracts a relatively small number of practitioners and researchers. Very few are independent practitioners/consultants with evaluation as full-time or major-time activity, and there are even fewer contract research firms." Most evaluators work full-time in university departments (education, sociology, psychology) or at health and educational policy units of universities or the HSRC or the Medical Research Council. In attempts to address evaluation skills shortage in early 1990s, two prominent American experts, Mark Lipsey and Carol Weiss, were invited to conduct methodology seminars. David Fetterman was also invited to facilitate a symposium that might have been an embryonic evaluation association.

Meyer and Hofmeyr (1995) explore evaluation needs in post-apartheid South Africa in relation to expected developments in the field of education. They focus on the part evaluation should play in reforming the five phases of education and training, in multi-sectoral initiatives and in the processes of policy developments. Educational assessments and examinations, system quality control, teacher appraisal, programme evaluation and international comparisons are some types of evaluation examined. Of interest to this research is their illuminating discussion of evaluation paradigms in the South African context.

Meyer and Hofmeyr (1995:360) outline five evaluation paradigms that have taken root in the South African context. According to these authors, the scientific paradigm, which aims at establishing cause-effect relationships using experimental designs and various quantitative techniques, has not been commonly used and is "confined to the Afrikaans-speaking universities and parastatal institutions" (Meyer & Hofmeyr, 1995:360). Non-use of this paradigm in most English-speaking universities is attributed to anti-positivist sentiment.

The naturalistic paradigm, with its reliance on qualitative evaluation methods, "is well loved and well used in South African evaluations" (Meyer & Hofmeyr, 1995:360). Adherents to this paradigm try to understand variables and their meanings in their natural contexts, employing ethnography and using observation and interviews as methods of data collection. It is said to be the preferred route of most English-speaking institutions with the result that "recent generations of South African university students are not well versed in quantitative techniques and very often they opt for qualitative approaches simply because they cannot manage quantitative methods" (Meyer & Hofmeyr, 1995:360).

The eclectic approach, involving a mixture of "the best of the scientific and naturalisic paradigms and a range of qualitative and quantitative techniques" (Meyer & Hofmeyr, 1995:360) became popular in South Africa between 1985 and 1995, although the quantitative aspects has tended to involve inferential statistics. Evaluators following this approach use a combination of scientific and naturalistic elements together with an array of qualitative and quantitative techniques.

The most recent approach, critical inquiry, focuses on social justice and is concerned with "who pays and who benefits and whether things should continue that way in the future" (Meyer & Hofmeyr, 1995:360). According to the authors, critical inquiry has been easily accepted by South African evaluators because of its relation to the social justice and the anti-apartheid struggle. While the motives of critical inquirers might be good, methodological weakness is their bane.

Empowerment evaluation aims at self-determination and focuses on helping people to help themselves. Meyer and Hofmeyr (1995: 361) indicate that South Africa is fertile grounds for empowerment evaluation. This approach "focuses on helping people to help themselves" (Meyer & Hofmeyr, 1995:361), a refrain that still resonates, given that "although the struggle for a democratically elected government has been won, the need to build capacity and give a voice to ordinary people ... has not". Training, facilitation, advocacy, illumination and liberation are forms of empowerment evaluation.

Louw (1998:256) sees the field of programme evaluation as diffuse and fragmented, exacerbated by the diversity of communities of practice. According to Louw (1998:258), "generally speaking the field is ... much less developed locally than in countries with a longer tradition of programme evaluation". He mentions only four master's courses in universities that have elements of programme evaluation:

Department of Education, University of the Witwatersrand;

Department of Psychology, University of the Western Cape;

Department of Psychology, University of Cape Town; and

Department of Sociology, University of Stellenbosch.

Evaluation is a new and growing field in South Africa and there is much yet to be done in fields other than education (Babbie & Mouton, 2001:336-337). According to the authors many evaluations have been conducted, though not initiated by organisations directly accountable to the public. As such, there is paucity of material in the public domain in the form of publication in textbooks, magazines, journals and other published sources.

According to Babbie and Mouton (2001:336) educational evaluation generally became a major "industry" and in the late eighties and early nineties many educational evaluations were conducted. Organisations cited as having been actively involved in educational evaluation in the late 1980s and early 1990s include the Desmond Tutu Educational Trust, Independent Development Trust, Joint Educational Trust and the Department of Education. The authors report that the United States Agency for International Development (USAID) and Ford Foundation had been active in conducting evaluations of development projects for accountability and efficiency purposes.

The dawn of majority rule and introduction of the RDP has, according to Babbie and Mouton (2001) led to some government departments such as Land Affairs, Public Works, Health and Social Welfare establishing monitoring and evaluation units to monitor and study the impact of programmes in diverse areas such as poverty relief, land reform, pensions, welfare and public health. They indicate the need for evaluation is also strong in non-governmental organisations as funding is often based on it as a pre-condition (Babbie & Mouton, 2001:37).

Of evaluations conducted in education in the public domain two formative studies stand out. These are Mouton (1995) and Mouton, Tapp, Luthuli and Rogan (1999). The former was a mainly formative evaluation that employed both quantitative and qualitative methods of data collection and a stratified sample of 48 teachers. It involved more than 2000 grade five students in 48 experimental and control groups in evaluating the effectiveness of an intervention, a new method of teaching English named English and Operacy Programme.

This evaluation authoritatively concluded there had been significant improvements in the overall performance of students resulting from the intervention, particularly in mathematics and social studies.

Mouton *et al.* (1999) evaluated the national implementation of Technology 2005. It was funded by the National Department of Education and focused on three provinces. The sample consisted of schools in the Western Cape and Gauteng, where 36 classrooms selected from 12 schools, and two farm schools each were included, and KwaZulu Natal, with eight pilot schools and two privately funded high schools. The total number of teachers involved was 87.

Mouton *et al.* (1999) used a common set of quantitative and qualitative data collection instruments, including questionnaires, interview schedules, observation schedules, teacher logsheets and focus group schedules to ensure comparability and a degree of standardisation. These yielded empirical results that were both quantitative and qualitative (Mouton *et al.*, 1999:10).

A notable feature of the evaluation of Technology 2005 was that it "did not focus on outcomes or impact" (Mouton *et al.*, 1999:9). It used a formative design because it was primarily aimed at informing the sponsors or funders about what improvements needed to be made to the programme. Consequently, although 'various forms of "outcome" ... have been documented ... a true outcome evaluation has not been done' since the design and methodology were tailored to studying the implementation of the project, that is, identifying factors that seemed to affect implementation, rather than assessing learners' achievement or teachers' effectiveness (Mouton *et al.*, 1999:9). In fact, it would have been premature to undertake an impact evaluation at the time as the project was then being implemented. From this brief and instructive analysis, it is clear outcome or impact evaluations are the exception, rather than the norm, in the South African context.

Esterhuizen and Liebenberg (2001:234) point out the trend towards public demand for transparency and accountability in public resource allocation in South Africa. These authors examine the use of indicators within a comprehensive impact assessment approach applied to three case studies of the Agricultural Research Council. They also discuss the use of impact and performance indicators in measuring direct outcome of research activities, institutional impact and people level impact, and cite availability of data, validity of indicators and correction factors as problems associated with indicators.

The authors also stress the necessity of management using impact information to make decisions for better allocation of scarce resources. Their work is of interest and relevance to this research as they focus on performance and impact assessment using indicators. The latter are touched on in the next paragraph.

Estherhuizen and Liebenberg (2001:234) characterise an impact indicator as "an element or parameter that provides a measue of the significance of the effect" which may be ranked on "good-better-best" or "acceptable-unacceptable". They outline three categories of impact: direct product of research, intermediate, and economic, all of which are asessed by using indicators.

Impact indicators are difficult to collect "mainly because of lags between project *implementation and impact, or ... between the time of impact and the time it is feasible to* collect data relating to impact." Since "the demand for evaluation still outstrips the supply of evaluation expertise" (Louw, 1995:352), universities have taken up the challenge to produce evaluation experts to meets the country's needs. In 2006, the University of Stellenbosch introduced a one-year diploma course in programme evaluation. In the same year, the University of Cape Town also launched certificate, honours and master's programmes in programme evaluation.

In determining whether the topic of this research was open to investigation, searches of various databases and other sources were conducted. With the help of Mr Rolf Proske of the Research Information Support Centre at the then Cape Technikon (now Cape Peninsula University of Technology), local databases of theses and dissertations were exhaustively searched. This was to locate any studies that might have been undertaken focused on the impact of applied research. The search, however, did not produce much significant information in terms of abstracts of research at masters or doctoral level on the impact of applied research on communities in South Africa or elsewhere in the world, except Mashamba (2003). The search was done in the following databases:

Sabinet Online

* *Current and completed research*
* *UCTD (Union Catalogue of Theses and Dissertations)*

The following databases were also searched for relevant information or literature review:

* *Catchword/Ingenta*
* *EbscoHost*
* *Emerald Fulltext*
* *Gale/Infotrac*
* *Springer*

**Scirus/Elserivier [www.scirus.com]*
**Internet searches via:*
www.google.com
www.yahoo.com
gateways/portals - various.

Mashamba (2003) is a case study, focused on the University of Venda for Science and Technology, using only qualitative data collected from one focus group and four individual interviews to examine the relationship between university research and the surrounding communities in developing countries.

The author concluded that no positive relationship existed and that the communities did not see themselves benefiting from the existence of the university or through its research projects. This resulted from the institution focusing on basic research that did not address the real needs of the surrounding communities (Mashamba, 2003:74). Even worse was the finding that the surrounding communities "are even more disadvantaged by the its presence" (Mashamba, 2003:iii). Although useful in highlighting how relevant universities may be to their immediate human settlements, this thesis does not offer much to the current research in terms of research design and methodology.

A direct personal telephonic request was also made to Cheryl Lombard, then manager of technikon programmes at the NRF, for assistance in locating relevant any information on Nexus, the NRF database. Hender van der Berg, programme leader of the Nexus Database System, undertook an exhaustive search that did not unearth any information relating to studies conducted on the impact of applied research.

Paucity of published academic research in programme evaluation in general and on the impact of applied research in particular, is a reflection of the reality that evaluation research is not yet fully-developed, although an important field of knowledge in South Africa. It is as much a 'virgin forest' in South Africa as it is in the rest of the continent. If our knowledge base on what works and what does not is to be broadened, this being necessary in an era of competing uses of resources, there is a real need for research such as this one and similar exercises, to be undertaken to generate, document and share knowledge in programme evaluation.

That South Africa, widely perceived as the economic and technological power-house on the continent, lags behind developing countries elsewhere in this burgeoning field is a true reflection of how evaluation is viewed in Africa.

There is no denying the fact that an inextricable link exists between evaluation, innovation, effective use of (financial) resources and development. Evaluation provides the yardstick for measuring how well scarce human, financial, material resources are utilised in achieving the objectives of R&D projects and, indeed, development objectives in general.

South Africa embraced programme evaluation at governmental level in 2004 and is using it for developmental imperatives. The country has a great need to launch diverse R&D-oriented projects directed at improving the quality of life of its people, (re)skilling them, creating job opportunities, enhancing economic growth and competitiveness and promoting technology transfer. To an appreciable level, this is beginning to happen and evaluation is the instrument to gauge effectiveness and impact and provide informed guidance for the future. Given the relevance of evaluation and its increasing adoption by African countries, Dassah and Uken (2006:705-720), attached as Appendix J (page 260), examine monitoring and evaluaton in Africa with special reference to Ghana and South Africa, while measures of stimulating demand are discussed in Dassah and Uken (2005:733-743), attached as Appendix K Page 261).

1.8 Aims of the research

This research, that of necessity is empirical, has several aims. Among others, it aims at:

1. establishing the objectives of projects under investigation and the extent to which they were achieved;
2. establishing how successful these projects were from the perspective of researchers and sponsors;
3. outlining the key indicators of success;
4. Assessing specific ways in which the projects investigated have benefited industry partners/sponsors;
5. making comparison across sectors of projects' success in achieving their objectives;
6. establishing factors/conditions common to successful projects (that is, finding critical factors that underpin their success) and determining factors/conditions common to or implicated in not-so-successful projects;
7. drawing comparisons between successful and not-so-successful projects within and across sectors; and
8. making suggestions, in the light of research findings, measures (conditions, guidelines, policies, strategies) for achieving, maintaining and improving projects' success across sectors.

An indication of whether these aims have been accomplishment is provided in section 5.4.

1.9 Research questions

Given the importance increasingly attached by the South African government to SET in general, and applied research in particular, the aims outlined in the preceding section, the research investigates and seeks answers to the following specific fundamental questions:

1. What was the status of the projects at the time of the investigation?
2. Did the projects experience implementation problems that might have adversely affected their chances of success?
3. What specific implementation problems, if any, were experienced and how severe were they?
4. Who were the primary beneficiaries of the projects?
5. Who were the secondary beneficiaries of the projects?
6. What problems were the projects launched to address?
7. What difference did the projects make in addressing the problems?
9. What were the main objectives and to what extent were they achieved?
10. What reasons can be given for the ratings given in the preceding question?
11. What specific benefits did projects yield?
13. What positive unintended impacts or spin-offs were realised from the projects?
14. What negative unintended impacts resulted from the projects?
15. What, if any, contrary impacts occurred and how serious were they?
16. Were the projects successful, unsuccessful or inconclusive?
17. What were the indicators of success?
18. What managerial strategies were used to achieve success?
19. What did not go well for unsuccessful or inconclusive projects?
20. What could have been done differently to ensure success?
21. What standard industrial classification groups (or sectors) did the projects represent?
22. What was the duration of each project?
23. What was the total funding amount for each project?
24. Comments, if any.

1.10 Methodological considerations

These important aspects are the subject of Chapters 3.

1.11 Ring-fence area of study

The research was restricted to assessing the success and impacts of 52 THRIP/industry-funded applied research projects. It did not purport to measure net benefits, for which cost-effectiveness or cost-benefit analysis would have been necessary.

Of necessity, the study was limited to completed and ongoing projects that had been in operation for at least two years.

The sample was drawn from a pool of projects spanning seven standard industrial classification categories including Agriculture, Fishing and Hunting; Mining and Quarrying; Manufacturing and Processing; Electricity, Gas, Water Supply and Usage; Construction and Environment; Transportation, Storage and Communication; and Health. All the projects were started before 2000 and up to 2003, both dates inclusive, and involved collaborations between academics and/or researchers in seven South African universities, one technikon (now a university of technology) and three divisions of the Council for Scientific and Industrial Research (CSIR), on the one hand, the public (government) and private sector or industry partners, on the other. A decision was also made to limit the sample to three geographical areas (provinces), namely Gauteng, KwaZulu Natal and the Western Cape for time, financial and logistical considerations.

1.12 Significance of the research

Although the research aims at making a summative assessment it has a formative dimension. For all the projects in the sample, the study assesses success in achieving their objectives. In other words, it seeks to determine how successful they have been in solving or reducing the problem(s) or improving on the situations that necessitated their launching. It also assesses (potential) impacts, that is the value or short-term (immediate), medium-term and long-term benefits and effects.

The hope is that findings on ongoing projects will yield useful information that could be used to improve or strengthen some aspects of the management of current projects and, generally, provide a backdrop against which other THRIP/industry-funded projects could be better implemented and managed.

The research is expected to demonstrate various kinds of intended and unintended positive impacts (commercial, economic, human resource development/intellectual, environmental, social and technological) and benefits at the micro level to stakeholders such as industry partners, researchers, and their respective institutions and other beneficiary entities and at macro level, on the country. These impacts and benefits, it is hoped, will provide impetus for sustained public and private funding of applied research to encourage innovation, technology transfer, improve across-the-board quality of life, stimulate economic growth and promote South Africa's economic competitiveness in the world.

The study will also fill a vacuum in the academic arena since extensive search of the Union Catalogue of Theses and Dissertations, the Index to South African Periodicals, South African Bibliographic Information Network, the National Inquiry Services Centre, and NEXUS, the NRF database of Current and Completed Research Projects, indicated that no academic study has been conducted on the impact of applied research in South Africa at the master's or doctoral levels. Being the case, this research might be breaking new grounds.

Overall, the significance of the study lies in the fact the findings will constitute a body of knowledge, uniquely South African, reflecting the effectiveness and impacts of diverse applied research projects. This body of knowledge will be relevant to various stakeholders: the government, academics and evaluation researchers, industry partners, other sponsors and funders, donors, project managers, project staff, end users and the public at large.

1.13 Expected outcomes, results and contribution

Successful completion of this research study is expected to be beneficial to THRIP and a range of stakeholders outlined in the preceding paragraph. It will contribute to the existing body of knowledge in evaluation research in the following ways:

The research will culminate in the generation of a set of success factors or essential conditions and/or criteria for success that are applicable to research projects across sectors in the South African context. Further, it will lead to the identification of best practices and the formulation of a body of working strategies and/or guiding principles that THRIP, researchers and sponsors can follow to improve effectiveness and ensure meaningful success of future THRIP/industry-funded projects and other applied research projects. This will have important implications for the effective and efficient management of future projects in South Africa, in particular, and across the African continent.

1.14 Summary

To conclude, Chapter 1 has grounded the focus of the research study by examining shifting attitudes towards Mode II or applied research and indicating the growing support it is receiving from the South African government. The chapter has also provided background to the research problem, given the motivation for the research, stated the research problem, and explored international and South African literature on evaluation. The international literature provides a good foundation for understanding programme evaluation by highlighting perspectives on definition, purposes, reasons for and benefits of evaluation.

A review of local literature highlights the paucity of published information in the public domain. The aims of the research study, research questions, ring-fence area, significance, expected outcomes, results and contribution are also outlined.

CHAPTER 2: PROGRAMME EVALUATION IN PERSPECTIVE

2.1 Introduction

Chapter 1 has established the paradigmatic shift towards applied research, or research in the context of application, driven by the need to use knowledge in achieving global competitiveness. The South African context has been explored as background to the research, and the motivation for focusing on THRIP/industry-funded research projects given, and the research problem indicated. A review of international literature on the definition, purposes, reasons and (potential) benefits of programme evaluation, as well as programme evaluation in South Afica, is provided. The aims and significance of the research; research questions; and expected outcomes, results and contribution have been stated. Chapter 2 traces the history of evaluation research to its early days in the United States of America, proceeds to examine evaluation phases and evaluator roles, types of evaluation studies, and strengths and weaknesses of some approaches.

2.2: Historical background of evaluation research

That systematic evaluation research is a relatively new phenomenon (Patton, 1978:14-15) is echoed by Rossi *et al.* (1999:9): "despite historical roots that extend to the 17th century, systematic evaluation research is a relatively modern development." The evolution of evaluation research is deeply rooted in the Depression and New Deal era when the American Government took great interest in human service programmes. Evaluation at that time was nothing more than an assessment of (programme) staff sincerity or an attempt to determine who was in favour of and who was opposed to certain programmes (for elaboration, see The Charity Model and The Pork Barrel Approach in sections 2.1.1 and 2.1.2, respectively). From this humble localised beginning in the United States, evaluation research has evolved into a global phenomenon with dimensions more serious than simply assessing staff sincerity.

The evolution of evaluation research is briefly sketched here. Before World War I, evaluation focused on assessing social programmes such as "literacy and occupational training programs and public health initiatives to reduce mortality and morbidity from infectious diseases" (Rossi *et al.*, 1999:10). In the 1930s rigorous research methods were introduced. Other developments relevant to evaluation included the practice of boiling water in the Middle East, social experimentation, action research and leadership studies and the Western Electric experiments that culminated in the Hawthorne effect.

During World War II evaluation took the form of monitoring soldier morale and evaluating personnel policies and propaganda techniques as well as monitoring the morale of civilians. There were also efforts at determining how the efficiency of price and media controls and campaigns mounted to get Americans to change their eating habits (Rossi *et al.*, 1999:11).

The aftermath of World War II saw the launching of many major social programmes "to meet the needs of urban development and housing, technological and cultural education, occupational training, and preventive health activities" (Rossi *et al.*, 1999:11). At the same time, spending on international programmes such as family planning, health and nutrition and rural development increased and there was a craving to assess the benefits accruing.

In the 1950s, social scientists in the United States, Europe and other industrialised countries were routinely engaged in areas of evaluation such as delinquency prevention programmes, psychotherapeutic and psychopharmacological treatments, public housing programmes, educational activities and community organisation initiatives. In the less developed countries, family planning, nutrition, health care, agricultural and community development were increasingly evaluated.

The landmark Soviet launch of *Sputnik* in 1957 spurred the growth of evaluation in the United States by raising fears that the Soviet Union was forging ahead technologically. Questions were raised about the quality of American education, particularly in the light of the Supreme Court in 1954 ruling in *Brown vs Board of Education* that separate and unequal education was inherently unconstitutional. This landmark decision placed a duty on the American government to provide equal and integrated education to all Americans irrespective of race. In the years that followed, evaluations were undertaken to measure the effectiveness of such measures. The *Sputnik* era saw the demise of Tylerian evaluation owing to the fact it had been designed "in conformity with a decentralized concept of curriculum making and teaching that had suddenly gone out of style in the cynicism of the time" (Guba & Lincoln, 1981:10). Consequently, it proved inadequate in dealing with the evaluation needs of huge projects that followed.

The Kennedy and Johnson years marked a watershed in the history of United States' evaluation research. In 1965 policy analysis and evaluation research became an independent branch of study following the introduction of large-scale social interventions. This resulted from the initiation of the War on Poverty-Great Society programmes and the establishment of the Planning-Programming-Budgeting system at the federal level.

The Poverty-Great Society programmes were "often hurriedly put in place, and ... a significant number were poorly conceived, improperly implemented, and ineffectively administered" (Rossi *et al.*, 1999:17).

Consequently, evaluation findings tended to highlight ineffectiveness and poor value for money resulting in much resistance to continued expansion of government programmes characterised the 1970s.

Publication of evaluation literature increased in the late 1960s and 1970s. Streuning and Brewer (1983:15) state that "impetus to the rapid development of program evaluation as a field of applied social research came from the Great Society programs of Lyndon Johnson's administration in the 1960s." These programmes, initiated by the Office of Economic Opportunity, were aimed at eliminating poverty, hence the label "War on Poverty" programmes. Including education, they focused on a number of fronts: physical and mental health, housing, manpower, services integration, community planning, urban renewal, welfare, and other areas. Money spent on them was dubbed "butter" expenditure, as opposed to the "guns" expenditure of the Vietnam War (Patton, 1978:15). Since these programmes were federally-funded, they tended to be effectively evaluated. Consequently, the approaches to assessing the effectiveness of programmes in the 1960s and 1970s, namely The Charity Model and The Pork Barrel Approach (elaborated in sections 2.1.1 and 2.1.2) had to give way and a serious note of governmental accountability was introduced through evaluation research.

The epitome of evaluation research was during the 1970s when it became a distinct specialty field in the social sciences. This was crowned with the writing of various books and the establishment of *Evaluation Review* and other major journals.

Meetings of academics and practitioners involved in evaluation studies led to the subsequent formation of professional associations. By the 1980s evaluation research had been so firmly established in the United States that Cronbach and others could proclaim: "Evaluation has become the liveliest frontier of American social science" (Rossi *et al.*, 1999:12).

In the 1990s, under the Democratic administration of President William Clinton, evaluation trends began to change because of a combination of conservative fiscal policy, scepticism about social programmes and the devolution of evaluation function to the states, many of which did not have the capability or will to undertake rigorous evaluation.

The evolution of evaluation as field after World War II, in the view of Rossi *et al* (1999:12-13) can be attributed to two factors. One has been the significant advance made in research methods, specifically in systematic data collection as a result of "refinement of measurement and survey procedures". Another is the computer revolution that has made it possible to "analyze large numbers of variables by means of multivariate statistics" and also greatly facilitated data collection (Rossi, *et al.*, 19991:13).

2.2.1 Problems with evaluating public policies

Public policies, particularly the "Great Society" Federal programmes instituted under Johnson's administration in the 1960s, were the initial drivers of evaluation. Today, public policies remain targets of evaluations in the United States of America, even if to a lesser extent than before. What needs to be made clear here is that evaluating public policies can sometimes be problematic. Programme goals and objectives may be ambiguous and unrealistic (Rossi & Freeman, 1989), or the language may be so imprecise that they may be interpreted in different ways (Parlett, 1977). Vedung (1997:44) refers to this as "terminological inexactitude" (refer to section 3.1.5.2, page 75). Further, March, 1972; Parlett & Hamilton, 1977; Marra, 2000 argue that goals are fluid and, for that reason, initials goals may change in the course of the programme (see section 3.1.5, page 72).

This is not to say that public policy programmes cannot be evaluated. Notwithstanding these limitations, it is not only possible, but necessary, to evaluate them.

To conclude this outline of the history of evaluation research, an observation by Rossi *et al.* (1999:3) is worth noting:

> In its early years, evaluation was an endeavour shaped mainly by the interests of social researchers. Evaluation is now sustained by policy-makers, program planners, and administrators who use the findings and believe in the worth of the evaluation enterprise. It is also supported by the interests of the general public and the clients of the programs evaluated.

A brief characterisation of The Charity Model and The Pork Barrel Approach to evaluation follows to illuminate these methods of programme assessment and why they had to fall away in favour of scientific evaluation of programmes.

2.2.2 The Charity Model

The Charity Model uses "the sincerity of funders and program staff" as its criterion for assessing how effective a programme has been. It is based on the Good Samaritan principle that "program organizers care enough to try their best..." (Patton, 1978:13). In effect, then, there is no real evaluation.

Since organisers are implicitly trusted to do what they have set out to do, the outcome and effectiveness of their effort can only be judged by God. This model is the preferred form of evaluating most philanthropic, privately-funded human service programmes, and church-related welfare activities in areas such as health, education and welfare (Patton, 1978:14).

2.2.3 The Pork Barrel Approach

According to Patton (1978:14), this approach takes the strength and leverage of programme constituents as its criteria, making political expediency or efficacy the guiding principle in assessing programmes. Using this approach, a programme is judged by either how much support it has from powerful political supporters or the political gains that accrue from supporting rather than opposing it. The political clout of those who support the programme becomes the essence of its implementation and continued existence. Efficiency in use of funds is immaterial and effectiveness in terms of meeting stated objectives count for nothing. In short, partisan and parochial interests assume inordinate importance.

The Pork Barrel Approach is favoured not only by politicians, but also by philanthropic foundations and service agencies that need to satisfy their own constituencies.

From this brief description, it is clear that these models of assessing programmes could not stand the rigour of scientific evaluation of programmes that was needed in the Depression and New Deal era. They had to give way to evaluation research owing to the recognised need for increased governmental accountability. Two lessons served as impetus for the birth of programme evaluation. These lessons, even today, ought to be borne in mind by funders and programme managers alike: firstly, "there is not enough money to do all the things that need doing" and, secondly, "even if there were enough money, it takes more than money to solve complex human and social problems" (Patton, 1978:16).

2.3 Generational evaluation phases and evaluator roles

Guba and Lincoln (1989:22-49) provide an illuminating account of the evolution of different aspects of modern day evaluation, pointing out the influences, distinctive features and shortcomings of each generation, culminating in what they call fourth generation evaluation, a brief sketch of which follows.

2.3.1 First generation: measurement

First generation evaluation was characterised by measurement. Several direct and indirect factors combined to influence this development. Firstly, there was a concerted effort to measure attributes of American school children. This involved using mainly oral tests "to determine whether students had 'mastered' the content of various courses or subjects to which they had been exposed" (Guba & Lincoln, 1989:22).

Another important factor in the evolution of measurement in evaluation was an attempt to introduce efficiency in the American School system by expanding the curriculum. Though this failed, a spelling test was devised to reflect pupils' level of achievement. However, no correlation was found between the time students spent on learning spelling and their performance in tests.

Testing in schools was also tried in France in an attempt to isolate mentally retarded children from "normal" ones through psychometric measuring techniques. This attempt failed, but mundane tasks such as counting coins and identifying household objects were used to determine the coping capacity of children. The underlying rationale was that mentally retarded children would not cope as well as "normal" children. Through this, the intelligence quotient (IQ) test found its way into the American educational system.

The third and most important factor in the evolution of evaluation was the need to screen American army recruits during World War I. This led to the development of the first group intelligence test, the Army Alpha, by the American Psychological Association. It was administered to more than two million service personnel with great success and later adapted for use in schools.

Other factors that had an indirect bearing on testing influenced first-generation evaluation. Guba and Lincoln (1989:25) indicate that J S Mill's call in 1843 for social scientists to apply the scientific approach to the study of human/social phenomena was an important factor and that social scientists like Galton and Wundt, reasoning along Darwinian lines, speculated that small differences among humans could help explain human developmental patterns. This brought the field of psychology close to the hard-core sciences.

Scientific management also contributed to the importance attached to testing. Starting from just after World War I up to the 1920s, time and motion studies were conducted "to determine the most effective methods of working" (Guba & Lincoln, 1989:25). The principles of scientific management were extended to schools.

The Hawthorne Studies did little to dispel the notion that schoolchildren could be seen in much the same light as raw materials to be subjected to tests to see the extent to which they measured up.

All these factors resulted in testing becoming the standard form of evaluation in the second and third decades of the twentieth century. In first-generation evaluation, the evaluator was expected to be technically competent and able to use, and even devise, appropriate instruments to measure any phenomenon. Its focus on students as objects of evaluation was a major shortcoming that needed to be remedied.

2.3.2 Second generation: description

Second-generation evaluation arose as a consequence of the weakness the first generation displayed in addressing problems posed by the influx of inadequately prepared students into American secondary schools just after World War I. This development meant that the object of evaluation had to shift from students *per se* to college curricula.

There was a need to re-assess college-preparatory curricula to equip students with skills different from what had been provided to previous generations of students. Schools were not able to deliver the kind of teaching expected of them and there was strong resistance to curricula change by colleges and universities because they feared that such change would lead to the demise of the Carnegie Unit system, their admission criteria.
Universities would, consequently, be compelled to absorb students who could not cope with higher education studies.

To address the new situation, an Eight Year Study was launched in 1933 under R W Tyler which sought "to demonstrate that students who were trained by ... unorthodox curricula would ... be able to succeed in college" (Guba & Lincoln, 1989:27). A need to assess the effectiveness of the new curricula was clearly evident. Secondary schools which participated in the Eight Year Study defined their desired learning outcomes or objectives.

According to Guba and Lincoln (1989:28), information on the extent to which the outcomes were achieved and the strengths and weaknesses of the curricula implementation were collected and analysed to "*refine the developing curricula and make sure that they were working*". Programme evaluation was born with Tyler as father, focusing on describing the patterns of strengths and weaknesses in terms of achieving specific objectives. The evaluator's role was one of describer. Measurement ceased to be equated with evaluation. Rather, it was seen as a tool among others that might be employed in evaluation.

A significant contribution of second generation evaluation was the inclusion of non-human items such as programmes, materials, teaching strategies, organisational patterns, and "treatments" as objects of evaluation (Guba & Lincoln, 1989:31).

2.3.3 Third generation: judgement

Third-generation evaluation was ushered in by the Soviet lead in space exploration that saw Yuri Gagarin land in space in 1957. This prompted the introduction of course improvement programmes by the National Science Foundation. Description, the essence of second-generation evaluation, was deemed inadequate (Guba & Lincoln, 1989:29). The "*other* countenance or face of evaluation", judgement, was absent from second-generation evaluation. Third-generation evaluation combined the evaluator's roles of judgement, technical expertise (measurement) and describer. Judgement of the merit, that is the inner or intrinsic value, of the object and its worth, that is extrinsic or contextual value, were emphasised.

Three problems had not been adequately dealt with by first- and second-generation evaluation. Firstly, goals had been seen as sacrosanct and not subjected to evaluation. Secondly, standards which are essential for making judgements, had been neglected. Thirdly, evaluators did not want to see themselves taking the role of judges (Guba & Lincoln, 1989:30). All this had to change. The realisation resulted in the proliferation of new evaluation methods all of which, to various degrees, embraced judgement as the cornerstone of evaluation.

Although each of the three generations advanced the field of evaluation in its way, collectively, three major deficiencies were apparent: the tendency towards managerialism, a failure to accommodate value-driven pluralism and an over-commitment to the scientific paradigm of inquiry. These deficiencies provided grounds, according to Guba and Lincoln (1989:21-32) to re-examine the measurement, description and judgement bases of evaluation with a view to introducing a fourth.

2.3.4 Fourth generation: negotiation

Recognising the shortcomings of the first three generations of evaluation, Guba and Lincoln (1989:50) suggest a new approach called responsive constructivist or fourth-generation evaluation. They define it as:

> ... a form of evaluation in which the claims, concerns, and issues of stakeholders serve as organisational foci (the basis for determining what information is needed), that is implemented within the methodological precepts of the constructivist inquiry paradigm.

The terms 'responsive' and 'constructivist' are so central to fourth-generation evaluation that elaboration is necessary. The former refers to a focus on establishing the parameters and boundaries of evaluation such that the claims, concerns, and issues held by different stakeholders are discovered by the evaluator and addressed in the evaluation. Claims are stakeholder assertions that are favourable to the object(s) of evaluation. Concerns are assertions that are unfavourable and issues are affairs people may not agree about (Guba & Lincoln, 1989:40). To address these, responsive evaluation calls for "an interactive, negotiated process that involves stakeholders and that consumes a considerable portion of the time and resources available."

The first three generations established the parameters and boundaries of evaluation *a priori* (Guba & Lincoln, 1989:38). This means that as part of the design process evaluators and clients determined beforehand, through negotiation, the boundaries and parameters of the evaluation. This, according to Guba and Lincoln is referred to by Stake (1975) as preordinate evaluation.

'Constructivist' interpretive, hermeneutic or naturalistic, refers to an approach or a methodology to evaluation that is fundamentally different and provides an alternative to the scientific mode anchored on the positivist paradigm, hitherto predominant in evaluation. The constructivist paradigm postulates there is no objective reality. It asserts reality as a social construction of the mind and that there are as many realities as there are individuals. Science, argue Guba and Lincoln (1989:43), is one such construction. This paradigm does not admit to a dichotomy between an object of evaluation (the observed) and the evaluator (the observer).

Rather, the approach claims that interaction between an evaluand and an evaluator creates the result of the inquiry. Furthermore, the constructivist paradigm advocates a dialectic (hermeneutic) process of inquiry and rejects the controlling, manipulative approach of science.

Responsive constructivist evaluation, according to Guba and Lincoln (1989:42) has four phases:

- solicitation of stakeholders for claims, concerns and issues they may wish to raise;
- invitation of comments from all stakeholders about claims, concerns and issues;
- making unresolved claims, concern and issues focal elements (advance organisers; and
- seeking negotiations and consensus among stakeholders on unresolved concerns and issues.

In all, the changing roles of the evaluator from first- to fourth-generation evaluation may be summarised thus: from technician in first-generation measurement-oriented evaluation to describer in second-generation objectives-oriented evaluation, to judge in third-generation judgementally-oriented evaluation, to a retention of all the three roles together with a host of new roles: collaborator, learner/teacher, reality shaper and mediator and change agent (Guba & Lincoln, 1987:220).

2.4 Types of evaluation studies

Patton (1982:44) indicates that "different types of evaluations ask different questions and focus on specific aspects of the evaluative function." It follows, then, that different types of evaluations serve different purposes. In this section the classifications of the American Evaluation Society (AES), Rossi and Freeman (1993), Posavac and Carey (1997), Kusek and Rist (2004), and Trochim (2002) are briefly outlined.

2.4.1 American Evaluation Society classifcation

Six categories of evaluation, not mutually exclusive, are identified by the AES Research Society Standards Committee, according to Patton (1982:75-47), namely:

2.4.1.1 Front-ended analysis

Front-end analysis refers to evaluation that is undertaken before a programme is implemented for purposes of guidance in terms of planning and implementation and to decide if the programme should even be implemented.

2.4.1.2 Evaluability assessment

This refers to activities such as establishing the scope of an evaluation, technical matters, design limitations, and cost parameters that are undertaken to assess the feasibility of various evaluation approaches and methods before a more formal evaluation is undertaken.

2.4.1.3 Formative evaluation

This can be developmental or process. Such evaluations are undertaken with a view to providing information for programme improvement, modification and management.

2.4.1.4 Impact evaluation

Impact evaluation may be of the summative, outcome or effectiveness type. These types of evaluations seek to determine the resulted and effects of a programme so as to facilitate the making of major decisions relating to continuation, expansion, reduction and funding.

2.4.1.5 Programme monitoring

This involves many different kinds of activities ranging from checking to ensure compliance with policy to checking of services delivered and 'counting' of clients.

2.4.1.6 Meta-evaluation

This is variously referred to as secondary evaluation, evaluation of evaluation and evaluation audit and includes activities such as professional critiques of evaluation reports, re-analysis of data, and review of internal evaluations by external experts.
Within the six categories outlined (Patton, 1982:45-47), Patton indicates that there are numerous types of specific evaluations and mentions as many as 33, each with a specific focus determined by the question(s) it seeks to answer. He also refers to an additional 100 mentioned in *Creative Evaluation* (1981).

The proliferation in types of evaluation reflects not only the lack of a clear-cut distinction between "types" and "models" but also the complex and diverse nature of the field. This is compounded by the absence of a definitive vocabulary. The result is that "the same labels or words mean different things to different evaluators and decision makers (Patton, 1982:47). The author cautions against confusion caused by popular usage of terms like 'formative' and 'summative' evaluation that has resulted from imprecise usage over time. He argues that Scriven's (1967) original use of 'formative' and 'summative' was meant to draw attention to different evaluation purposes, not types.

The purpose of summative evaluations is to make judgements about the merits and worth of a programme whereas formative evaluations are aimed at programme improvement. The former tend to focus on outcomes (though not excluding evaluating implementation); the latter tend to focus on programme processes (but do not exclude measuring outcomes). Patton's argument implies that formative and summative evaluations do not exist as types.

2.4.2 Rossi and Freeman's classification

Rossi and Freeman (1993:33-43) identify three categories of evaluation studies, briefly outlined:

2.4.2.1 Analysis related to conceptualisation and design of interventions

This category of evaluation studies focuses on programme objectives. More specifically, such studies try to establish how well programmes have been designed to serve the actual needs of target populations, after all social programmes exist only because they are meant to remedy certain defects in the human condition. Studies aimed at diagnosing social problems, needs assessment studies, for example, forms part of this class.

2.4.2.2 Programme monitoring studies

These studies are conducted for three reasons. The first is to give programme managers relevant information to efficiently manage and administer their day-to-day activities. In this sense, monitoring serves as a management tool. Secondly, programme monitoring studies are meant to assure sponsors and other stakeholders their money has been used for the designated purpose. This is the accountability dimension. A third reason is to ensure the programme has been properly implemented as a pre-condition for undertaking outcome or impact assessment.

2.4.2.3 Programme outcome

Programme outcome or impact assessment deals with two different issues. The first is an attempt to establish what level of change in a pre-conceived direction has resulted from implementing a programme. This facilitates comparison with competing programmes but it also helps to establish how well innovative programmes are working. A second issue concerns how efficiently money has been used. In other words, there is often a need to show that the beneficial effects have not been achieved at a prohibitive cost. This involves cost-benefit analyses.

2.4.3 Posavac and Carey's classification

Posavac and Carey (1997:7-10) classify evaluation studies into four types, namely:

2.4.3.1 Evaluation of need

Evaluation of need is aimed at identifying and measuring the unmet needs of a target group. This is an essential step before any consideration can be given to the various ways in which the needs can be met (programme planning). The decision to select certain approaches to meeting the identified needs and reject others is in itself part of programme evaluation.

2.4.3.2 Evaluation of process

Evaluation of process involves addressing new sets of questions that relate to the context or setting such as:

- Do the needs of the target group match or approximate to those assumed in the planning stage?
- Are the needs being met?
- Is the implementation according to plan?
- Is it vitally important for lessons to be learnt before implementing the programme at other places or extending it to other target groups?

2.4.3.3 Evaluation of outcome

Evaluation of outcome is undertaken after implementation has been properly executed. The focus of attention becomes an assessment of the intended (planned) and unintended (unplanned) outcomes or effects of the programme.

This may be elementary; for example showing whether programme participants are doing well after the treatment, or challenging: comparing the performance of the treatment group with a control group or even more challenging such as establishing that treatment is the actual cause of positive change. Impact assessment and product evaluation, which are examples of programme outcome studies, aim at establishing the success of an intervention.

2.4.3.4 Evaluation of efficiency

Evaluation of efficiency takes the alternative uses of money into consideration and goes beyond success to measure costs against benefits from programmes. In other words, it is simply not good to spend more resources on a programme yielding similar outcome as another requiring fewer resources. The key issue here is cost-effectiveness.

Evaluations of efficiency, therefore, address such questions as:

- Are financial resources used for the intended purpose?
- Has the programme achieved success at a reasonable cost?
- Does the programme achieve a higher level of success than others that cost the same or less to administer? (Mouton, 1998:341).

Posavac and Carey (1997:10) sound a cautionary note about the relationship among these types of evaluation:

> ... there is a logical sequence to these four general types of evaluation. Without measuring need, planning cannot be rational; without effective implementation, good outcomes cannot be expected; and without and without achieving good outcomes, there is no reason to worry about efficiency.

Babbie and Mouton (1998:340) note an overlap between the classifications of Posavac and Carey (1997) and Rossi and Freeman (1993). The former distinguish four types of evaluation while the latter identify three, with Posavac and Carey's third and fourth categories falling under Rossi and Freeman's third category.

To sum up, the traditional distinction between formative and summative evaluation warrants some attention, the more so because most evaluations can be subsumed under them. The terms 'formative' and 'summative' were coined by Scriven in 1967 in the context of curriculum evaluation. Scriven (1980:6-7) distinguishes between formative and summative evaluation as follows:

> Evaluation may be done to provide feedback to people who are trying to improve something (formative evaluation); or to provide information for decision-makers who are wondering whether to fund, terminate, or purchase something (summative evaluation).

From this, it seems fairly clear that Patton (1982) is correct in asserting that Scriven (1980) intended the terms 'formative' and 'summative' to be used in relation to purposes of evaluation rather than types. In fact, Scriven (1996:20) sees the formative-summative dichotomy as indicative of the entire array of evaluation purposes:

> *Formative evaluation* is evaluation designed, done, and delivered to support the process of improvement, and normally commissioned or done by, and delivered to, someone who can make improvements, *Summative evaluation* is the rest of evaluation: in terms of intentions, it is evaluation for, or by, any observers or decision makers (by contrast with developers) who need evaluative conclusions for any reasons besides development.

Patton (1996:131) disagrees with this view and proceeds to cite knowledge generation, development evaluation, and the use of evaluation processes to support interventions or empower participants as falling outside the ambit of formative-summative evaluation. Chen (1996:163) also disagrees with Scriven's position that the formative-summative distinction is exhaustive of all evaluation activities. He sees the distinction as narrow. As will be seen in section 2.3.5, Scriven is not alone in holding this controversial view.

2.4.4 Kusek and Rist's classification

Kusek and Rist (2004:121-126) distinguish between seven types of evaluation strategies that may be used to generate evaluation information. They note that each is appropriate to specific kinds of evaluation questions.

2.4.4.1 Performance logic chain assessment

This is used "to determine the strength and logic of the causal model behind the policy, program, or project" (Kusek & Rist, 2004:122) with a view to avoiding "failure from a weak design that will have little or no chance of success in achieving the intended outcomes". Deployment and scheduling the activities or resources to facilitate the desired change in existing circumstances is addressed by the causal model while the plausibility of achieving the change is addressed by the evaluation.

2.4.4.2 Pre-implementation assessment

This strategy is used prior to implementation to ensure that failure is not programmed in from the beginning of implementation" (Kusek & Rist, 2004:122). It addresses three main standards: firstly, whether objectives are defined so as to facilitate measurement. Secondly, whether a coherent and credible implementation plan is in place to show how various implementation steps can differentiate successful from poor implementation. Thirdly, it sets a clear rationale for deploying resources in line with the requirements for achieving stated outcomes.

2.4.4.3 Process implementation evaluation

Process implementation is similar to monitoring and is concerned with implementation issues such as planned activities that were and were not implemented, congruence between what was intended to be implemented and what actually was implemented, appropriateness and closeness to plan of costs, time, staff capacity and capability, availability of financial resources, facilities, staff and support (Kusek & Rist, 2004:123).

2.4.4.4 Rapid appraisal

Rapid appraisal is a multi-method evaluation approach that uses different data collection methods to enable "quick, real-time assessment and reporting, providing decisionmakers (*sic*) with immediate feedback on the progress of a given project, program, or policy" (Kusek and Rist (2004:123). It is particularly useful in development evaluation. Methods used in rapid assessment include: key informant interview, focus group interviews, community interviews, structured direct observation, and surveys.

2.4.4.5 Case study

A case study is suitable for obtaining in-depth information on a single policy, programme or project. A trade-off is usually made between depth and breadth, with the former gaining priority.

2.4.4.6 Impact evaluation

Impact evaluations are typically after the fact and they are aimed at determining what changes have occurred and to what they can be attributed.
Difficulty in attribution is associated with the length of time between intervention and attribution which may enable other factors to interfere positively or negatively to influence the expected outcome(s).

2.4.4.7 Meta-evaluation

This type of evaluation uses certain criteria and procedures to examine existing evaluations on one or many initiatives with an aim to summarise trends that could serve as confidence or cautionary measures.

2.4.5 Trochim's classification

Trochim (2002) disagrees with Patton's assertion that formative and summative are not "types" of evlauation. For him, perhaps the most important distinction in evaluation types is the formative-summative dichotomy. Formative and summative evaluations are, however, not just single, self-contained types as such, but umbrellas for a number of evaluation types. A brief characterisation of formative and summative "types" of evaluation, based on Trochim, is given in this section.

2.4.5.1 Formative evaluation

Aspects of formative evaluation include:

(a) Needs assessment

Needs assessment aims at determining who is in need of the programme, how great us the need and what might work to meet that need.

(b) Evaluability assessment

Evaluability assessment determines whether an evaluation is feasible and how stakeholders can help shape its usefulness.

(c) Structured conceptualisation

Structured conceptualisation helps stakeholders to define the programme or technology, the target population and possible outcomes.

(d) Implementation evaluation

Implementation evaluation aims at monitoring the fidelity of a programme or technology delivery.

(e) Process evaluation

Process evaluation sets out to investigate the process of delivering a programme or technology, including alternative delivery processes.

2.4.5.2 Summative evaluation

Summative evaluation is subdivided into a number of types, briefly outlined as:

(a) Outcome evaluation

Outcome evaluation investigates whether a programme or technology has caused demonstrable effects on specifically defined target outcomes.

(b) Impact evaluation

Impact evaluation assesses the overall or net effects (intended or unintended) of a programme or technology as a whole.

(c) Cost-effectiveness evaluation

Cost-effectiveness and cost-benefit analysis address issues of efficiency by standardising outcomes in terms of cost and value.

(d) Secondary analysis

Secondary analysis re-examines existing data to address new questions or use methods not used before.

(e) Meta-analysis

Meta-analysis integrates outcome estimates from multiple studies to arrive at an overall or summary judgement on an evaluation question (Trochim, 2002).

Table 2.1 (Appendix A, page 177) shows commonalities among evaluation types outlined by the American Evaluation Society, Rossi and Freeman (1993), Posavac and Carey (1997), Kusek and Rist (2004), and Trochim (2002), with proposed all-embracing names that capture the essence of the various "types" of evaluation.

To conclude this section on types of evaluation studies, it is important to note that in spite of a plethora the traditional fundamental distinction between formative and summative evaluation seems to hold. While the former focuses on process (planning and execution), the focus of the latter is on effects.

Since cost-benefit analysis is important in economic decision-making, measuring outcomes enables different programmes to be compared on the basis of costs. Thus, this approach is the blueprint for measuring the outcomes of government programmes against goals typically using the Follow Through evaluation paradigm. Systems Analysis works well "when outcome measures can reasonably be reduced to a few possibilities and to simple cause-and-effect relationships" (House, 1980:227). It would even work better when the number and types of indicators are increased.

The Systems Analysis Approach is, however, faulted on two grounds. In the first place, it assumes the viewpoint of government managers and economists and tends to ignore the interests and concerns of programme participants at the bottom of the social ladder. Secondly, it engenders the view that only certain approaches can lead to the truth by focusing on objectivity, equating it with reliability, at the expense of impartiality and validity. This is the result of relying heavily on indicators.

2.5.1.2 Behavioural Objectives (or Goal-based) Approach

House (1980) indicates the popularity of this approach among evaluation practitioners. It involves taking the goals of a programme, as set out before implementation, and using them as the only source of standards and criteria. Evidence is then gathered to determine whether the programme has achieved what its initiators set out to achieve. Its success is measured by the degree the outcomes approximate to the pre-determined goals.

According to House (1980:26), Tyler (1950) applied this approach to educational evaluation when he advocated that the yardstick for achieving educational outcomes and objectives should be defined by specific student behaviours after the intervention, hence the name "behavioural objective" or Tylerian model of programme development and evaluation.
An important development in the Behavioural Objectives Approach is its application beyond the confines of education to other fields. Management-by-objectives in business and government circles is based on it.

The Behavioural Objectives Approach is credited with having "a great deal of face validity" in that it legitimises the evaluation by specifying the goals and objectives the programme/project sets out to achieve. That apart, it has a well-defined technology: a series of "scientific" steps to follow (House, 1980:229)

Although the most popular approach among evaluation practitioners, it is criticised for being irrelevant to teaching or curriculum development. In addition, it is contented the definition and specification of goals is arbitrary. That is to say, goals are often insufficient and the manner in which important goals are selected leaves room for suspicion.

2.5.1.3 Decision-making approach

This approach provides a link between evaluation and decision-making and implies evaluation should be structured by actual decisions that are made by people at the top. In the educational field Stufflebeam (1973), according to House (1980:28) is its chief advocate. He defines three decision settings (homeostatis, incrementalism and neomobilism), four types of decisions (planning, structuring, implementing and recycling), three steps in the evaluation process (delineating, obtaining and providing) and four types of valuation: context, input, process and product (House, 1980:28).

2.5.1.4 Goal-free approach

The Goal-Free Approach is Scriven's (1973) response to the effect of perceived bias in evaluation when the evaluator uses the goals of the programme. It is based on consumers' needs rather than producers' goals. Scriven insists the evaluator should be completely ignorant about goals to enable them search for all outcomes, including unintended positive or negative side-effects.

Although the purpose of the Goal-Free Approach is to reduce bias occasioned by the evaluator being familiar with the goals of the programme and his/her close association with its personnel, it enjoys little support among evaluators in the social services area. According to House (1980:30), the goal-free approach is the least used in evaluating social programmes. Although a few evaluations have been tried, its status as a major model is questionable.

2.5.1.5 Art criticism

Based on the analogy of judging works of art, some evaluators have thought of a model suitable for evaluating educational programmes qualitatively. According to House (1980:32), Eisner (1979) views criticism not as "the negative appraisal of something but rather the illuminating of something's qualities so that an appraisal of its value can be made." Art criticism has three aspects: the descriptive, the interpretive, and the evaluative. The third distinguishes the critic from the social scientist.

Eisner, according to House, contends anything can be the subject of criticism and suggests a role for the educational or curriculum evaluator analogous to that of the art literary, theatre or film critic. Central to this role of the educational critic is a distinction between connoissuership and criticism.

The former is the art of appreciation which increases awareness and enables the critic to recognise the qualities of something without having to make a public judgement or description. Citing Eisner (1979:197), House says "criticism is the art of disclosing the qualities of events or objects that connoisseurship perceives" (House, 1980:33).

According to House (1980:33), Eisner (1979), McCutcheon (1978) and Vallance (1978) specifically apply criticism to the field of education but there is no uniform approach. While Eisner likens educational evaluation to art, literary, theatre and film criticism, Kelly (1978), according to House, sees a parallel only between evaluation and literary criticism. Another contentious area is that criticism varies even within a subject area. This fact, House indicates, is noted by Jenkins and O'Toole (1978) in the case of literary critics.

Art criticism could form part of the repertoire of approaches to evaluation. It is appealing to the extent that it would allow the evaluator to "draw upon his own experience and intuitive reasoning to judge what is happening and express these judgements in language and concepts that non-experts understand" (House, 1980:235).

The application of art criticism to (educational) evaluation is fraught with problems. First of all, the analogy between art criticism and evaluation is limited. This is because works of art do not change with time, whereas classrooms do change in significant ways. Moreover, educational evaluators deal with entire programmes rather than with single classrooms. Again, it is not clear what criteria would be used and on what values they would be based. Finally, the question of whose understanding and appreciation is to improved remains unclear.

2.5.1.6 Professional (accreditation) review

This is traditionally used by professional bodies (surgeons, professors, lawyers, and others) to evaluate their colleagues through the peer review system, typically adopting a holistic approach. The criteria and standards of judgement are set by the professionals themselves. The approach is based on the assumption that only professionals can judge fellow professionals. It is also employed in evaluating and accrediting universities and training schools by accrediting agencies.

As form of evaluation, professional review has lost much of its credibility. This loss is a result of the fact that professionals cannot be trusted to be honest to evaluate their peers vigorously. The use of this approach by accreditation bodies for institutional evaluation is also questionable since it does not guarantee that programmes are actually of good quality. The issue of confidentiality versus the right of the public to know is another area of concern.

2.5.1.7 Quasi-legal (adversary) approach

Mock trials or other forms of adversarial proceedings are used to resolve issues concerning social programmes in England and the United States. Such proceedings have been part and parcel of policy-making. However, legal adversary proceedings have also been used to evaluate programmes. In reality, many of these proceedings such as "blue ribbon" panels and trial by jury are essentially non-adversarial even though they follow quasi-legalistic procedures (House, 1980:37).

The approach generally involves the setting up of a panel, commission or tribunal which operates with a set of rules to hear adversary teams presenting arguments for and against the programme before a "judge" (evaluator) who is an expert in the particular field. "Witnesses" are called to give "evidence" in an atmosphere that approximates to that of a courtroom. The process involves four stages; issue generation, issue selection, argument presentation and the hearing. Citing Owens (1973), House (1980:38) says the underlying rationale of the quasi-legal approach is that "the facts in a case can be best ascertained if each side strives as hard as it can, in a partisan fashion, to bring the most favourable evidence for its side to the attention of the court."

One advantage of adversarial evaluation approach pointed out by House (1980:241) is that it benefits from having the combined procedures and authority of the law. It also enables pressing public issues to be speedily dealt with by commissions or panels. A key appeal of the approach is its potential to accommodate diverse views of the public.

2.5.1.8 Case study (or transaction) approach

According to House (1980:39) the Case Study Approach aims at improving "the understanding of the reader or audience of the evaluation, primarily by showing them how others perceive the program being evaluated." The approach, strongly advocated by Stake (1978), takes the programme processes as well as others' perception as the central focus. It is essentially qualitative in methodology and typically uses interview and site observation.

It is thought to be superior to other modes of inquiry when the aim is understanding, not explanation and propositional knowledge.

The Case Study Approach has two good aspects, although it has difficulty gaining acceptability in a scientific community that believes in objectivity. Firstly, it leads to power and utility of information because it provides "rich and persuasive information that is not available from other approaches" (House, 1980:245). It also allows the representation of diverse points of view and different interests". This makes it superior to other approaches, particularly the systems analysis approach.

The Case Study Approach has several intractable problems and weaknesses. First is the difficulty for the evaluator in balancing and resolving diverse interest. There is also a debate as to whether it is better for the evaluator to write recommendations or leave readers to draw their own. Third, is its apparent non-universal usefulness in comparison with other forms of evaluation. Fourthly, there is a lack of methodological guidelines and procedures for writing case studies. According to House (1980:247), "the lack of methodological guides, strictures, and procedures often leads to poor work quality."

2.5.2 Posavac and Carey's overview of models

Posavac and Carey (1997:23-27) outline a number of evaluation models briefly discussed in this section which, according to them, are adapted from House (1980), Madaus, Scriven and Stufflebeam (1983), Scriven (1981) and Shadish, Cook and Leviton (1991).

2.5.2.1 Traditional

In a real sense traditional evaluation is not evaluation because it is not free of bias and does not seek to determine formally the results of others' efforts. Rather, it involves recording the impressions of supervisors informally in settings such as schools and hospitals. It also involves self-evaluations by professionals such as doctors but, lacking disciplined analysis, bias cannot be discounted.

2.5.2.2 Social science research model

To introduce scientific rigour and objectivity into programme evaluation and eliminate bias, some evaluators settle on using the social science research approach. This involves setting up two groups (one treatment, experimental or service and the other control group) and observing them.

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Alternatively, after the programme, evaluators make group members respond to questionnaire based on some dependent variables. Statistical procedures are then applied and success is determined by whether or not the contrast between the groups is significant.

2.5.2.3 Industrial inspection

This model is similar to evaluation in the manufacturing industry which typically takes the form of inspecting products at the end of the production line and fixing damaged items. It is based on quality control principles. The model bears similarity to the social science model "in that evaluation does not occur until the product is completed (or the client is about to leave the program)" (Posavac & Carey, 1997:24). A major shortcoming is that information comes too late to correct problems and, therefore, leads to higher costs.

2.5.2.4 Black box

This is the approach used by consumers when they want to purchase sophisticated technical products such as cars or televisions. In making such decisions, consumers are interested in what the product can actually do (capability or performance) not in how or why it is or unable to perform. The problem with this approach is that it cannot be applied to R&D or social programmes because evaluation is after the fact. Therefore, no feedback is available to make improvements.

2.5.2.5 Objectives-based

The rationale behind objectives-based evaluation is that a programme is implemented to accomplish clearly defined goals and objectives. It stands to reason, therefore, to evaluate a programme in terms of the extent it has achieved, what it was designed to achieve (its goals and objectives). Over-focusing on goals and objectives, however, takes evaluators' attention away from other important aspects such as discovering why programmes have succeeded or failed, determining whether there are other positive or negative side effects, or even questioning how appropriate were the goals.

2.5.2.6 Goal-free

The temptation an evaluator may seek information that will support predetermined goals has spawned an approach that deliberately conceals goals from the evaluator so that he/she is compelled to study or observe the object of evaluation and make his or her own assessment.

At a later stage, the evaluator's findings are examined to determine how compatible they are with the purposes of the programme and client needs.

2.5.2.7 Fiscal

This is an objective approach used when the benefits of implementing a programme need to be weighed against its cost. Since investment cannot disregard cost, this evaluation approach involves using financial consideration (return on investment) as the criterion for deciding whether or not to invest in a programme. While some programmes or projects are not expected to yield cash dividends it is, nevertheless, the case that they require resources that have alternative uses and involve costs. These considerations are taken note of in evaluations. However, many decisions as to what programmes, projects or services to offer are not made on a purely financial basis.

2.5.2.8 Accountability (or audit)

These models are an outgrowth of fiscal evaluations and focus strictly on complying with regulations. The rationale is that programmes funded from the public purse must direct the needed resources towards those activities for which they received funding.

2.5.2.9 Expert opinion

This approach incorporates quantitative as well as qualitative data in evaluating large, complex and unique entities. It overcomes the limitations of the traditional, black box and fiscal approaches by utilising the services of experts. For accreditation purposes, higher educational institutions are evaluated by a team of experts who look at quantitative data, infrastructure and hold discussions with a range of stakeholders.

2.5.2.10 Naturalistic

In naturalistic evaluation, evaluators immerse themselves in the programme and become the data-gathering instrument through personally observing all relevant aspects.
By using this qualitative approach and not focusing on explicitly stated goals, the evaluator's vision of the programme is broadened and the evaluation enriched as a result.

2.5.2.11 Improvement-focused

Posavac and Carey (1997:27) favour an improvement-oriented model of evaluation that is less concerned with particular methodologies, but more focused on programme improvements by identifying discrepancies between, for example, programme objectives and target needs, between programme implementation and plans, between target population expectations and actual services rendered, or between projected and achieved outcomes. *For them, the improvement-focused model "best meets the criteria necessary for effective* evaluation" (Posavac & Carey, 1997:27).

2.6 Summary

To summarise, that there is a plethora of approaches, models and types of evaluation is beyond doubt, as can be seen from the various classification of types by the AES, House's taxonomy (1980), Rossi and Freeman (1993), Posavac and Carey's overview (1997), Kusek and Rist (2004) and Trochim's outline of formative and summative evaluation. Table 2.2 (Appendix A, page 178) depicts a compendium of evaluation approaches based on House's taxonomy and Posavac and Carey's overview discussed in sections 2.4.1 and 2.4.2, respectively while Table 2.3 (Appendix A, page 178) relates the approaches, models and types examined in this chapter to timing, an important element in evaluation, thereby bringing out their respective roles.

CHAPTER 3: METHODOLOGICAL CONSIDERATIONS

3.1 Research design

3.1.1 Introduction

Chapter 2 dealt with programme evaluation in perspective, examining its historical background, generational phases and evaluator roles. Categorisation of evaluation study types by the AES, as related by Patton (1982), and classifications by Rossi and Freeman (1993), Posavac and Carey (1997), Kusek and Rist (2004), and Trochim (2002) are briefly discussed. The strengths and weaknesses of various approaches presented as House's taxonomy (1980) are discussed. Finally, Posavac and Carey's overview of models (1997), adapted from various authors, is presented.

Chapter 3 focuses on methodological issues. Section 3.1 deals with design of the research, while 3.2 is concerned with sampling and data collection. The projects focused on are applied research or R&D-oriented projects funded with public and private money. There is a need to assess them not only to meet the requirements of accountability and transparency but also to determine their effectiveness and impact. Given the inadequacy of the Charity Model and The Pork Barrel Approach in evaluating public programmes and projects highlighted in Chapter 2, sections 2.1.1 and 2.1.2, respectively, it is evident that neither is a useful tool in doing what this research sets out to do: assess project performance, determine how effective projects have been in addressing the situation(s) that prompted their implementation, to specify benefits that accrued from them, and assess their impact.

The goal-attainment approach is suitable approach for impact assessment. Its theoretical underpinnings, strengths and weaknesses are presented. The weaknesses are addressed by incorporating key aspects of the side-effects model into the main data collection instrument, the questionnaire for project leaders. The section outlines designs used in impact assessment and justifies the use of "one-shot" or post-test only design in this research.

3.1.2 What does impact assessment involve?

Difference made by a project is the central concern of impact assessment. The relationship or connection between an evaluation and its impact is, however, not linear or simple (Trochim, 2002). It is unarguable, however, that benefits cannot be realised and impacts occur unless project objectives have been accomplished.

Section 3.1.6 looks at causal tracing, some elements of which are used to complement project leaders' input to attribute the benefits and impacts reported to specific projects following their implementation and after having attained their pre-specified objectives. Short, intermediate and long-term impacts are of paramount interest in this research study.

Since applied research is conducted to determine new ways of achieving some specific, predetermined objectives - often solutions to problems society may experience, assessment of its impact takes *into consideration the lasting or significant changes, whether positive or* negative, intended or not, brought about in the lives of people (Kruse, 2003:10), civil society or the even the national economy. According to Kruse (2003:14) impact assessment is a process, not an event. So, changes unfold over a period of time not overnight.

Assessment of impact "can only happen when a project has matured and change can possibly be observed" (Kruse, 2003:14). Focusing on non-governmental organisations, Kruse (2003:15) spells out certain conditions that should be met for impact measurement to take place. These conditions are:

- existence of clearly articulated and operational objectives;
- a successful and known process of implementation;
- need for a comparison and a proper evaluation design;
- sufficient time, technical and financial resources and funding; and
- stakeholders' agreement on indicators and M&E arrangements.

Unarguably, these conditions are equally valid for assessing the impact of applied research. On attribution, a central concern of impact assessment, Kruse (2003:15) states that "it is most often impossible to determine causality precisely". Rather, "the best that can be done is to demonstrate through reasoned arguments that a given input leads logically to a given change, even if that cannot be proved statistically, but more through qualitative analysis." For this reason, the research relied on the input of respondents (project leaders and industry partners' contact persons), reinforced by two aspects of causal tracing for attribution.

Kruse (2003:15) recommends more and better triangulation of methods to arrive at "a more reliable and valid picture." Specifically on project performance, Kruse says that "a promising direction for impact assessment appears to lie in the application of methods which allow all interested parties to have a say in defining means and ends." The bringing together of multiple perspectives makes the interpretation of impact more objective. It is in heeding this advice that an attempt was made to incorporate the perspectives of two key stakeholders: *project leaders and sponsors' (industry partners' contact persons).*

Ezemenari, Rudqvist and Subbarao (1999:3) state that impact assessment involves "*assessing outcomes and, thus, the short or medium-term developmental change from an intervention.*" Assessment is essentially a process that involves examining the linkages between project inputs, outputs and outcomes or impact. Intervention-impact(s) relationship, in some cases, is linear but, invariably, it tends to be circuitous. Project inputs may be mediated by other variables which, in turn, affect outcomes. Also, the project may affect observed or unobserved intervening factors leading to certain outcomes. Other outcomes might occur contemporaneously with project implementation though not caused by it. Essentially, then, the problem of evaluation may be reduced to a fundamental question asked by Ezemenari *et al.* (1999:3): "what would have happened in the absence of the intervention?" This is the essence of impact assessment.

In connection with attribution of impacts, the position taken in this research is that without the implementation of the specific research projects that constitute the sample, the benefits, outcomes and impacts reported would not have resulted. A diagrammatic representation of the evaluation problem posed follows.

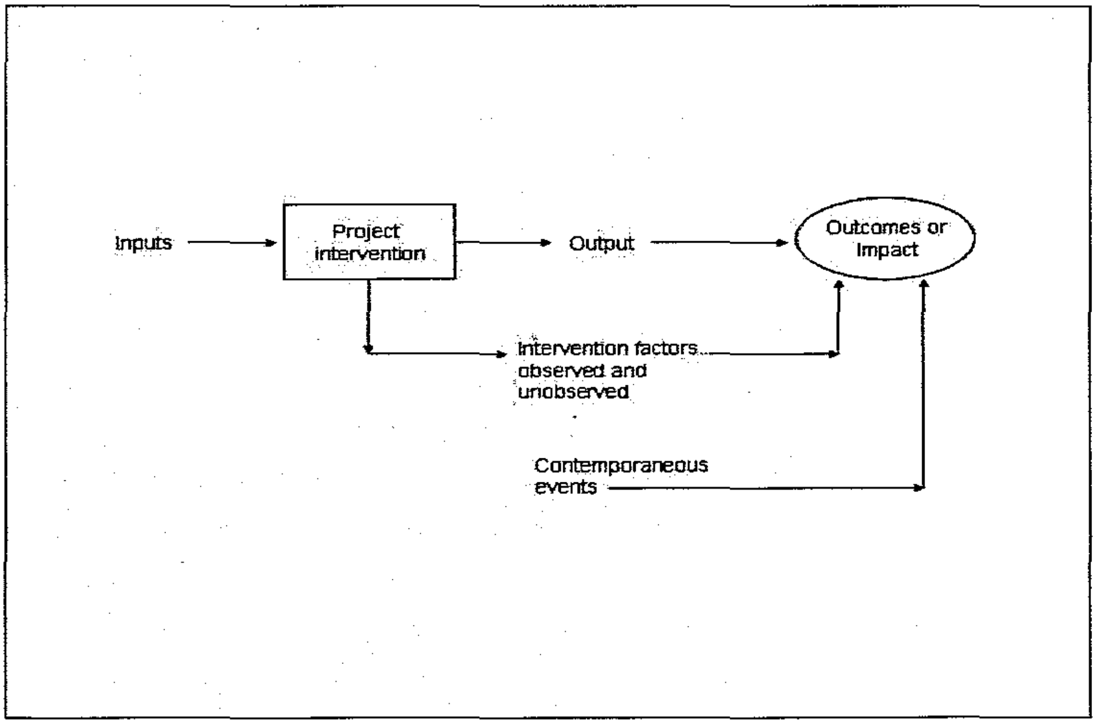

Figure 3.1: Disentangling project effects from intervening factors
(Adapted from Ezemenari, Rudqvist & Subarao, 1999:4)

In evaluation (or impact assessment) various elements, namely inputs, activities, outputs, outcomes and impacts are involved. Inputs, according to Morra-Imas and Rist (n.d.:2:2-7) are resources such as money, staff, facilities, equipment, and technical expertise committed to a project. Project activities then take place, leading to outputs, the (quantifiable) services or products.

Outcomes refer to the effect or result of the activities and outputs while impacts are the longer term consequences or goals achieved. Logically, it should be easy to attribute all outcomes and impacts to a specific project if the process of attributing outcomes and impacts were a strictly linear one. As will be seen in section 3.1.4, it is a far more complex issue.

3.1.3 Designs for impact assessment

According to Morra-Imas and Rist (4:4-7), evaluation questions may be divided into three broad categories:

i. descriptive questions describe "what is"

ii. normative questions compare "what is" to "what should be"

iii. outcome/impact questions determine change or difference brought about by an intervention.

It is the third set of questions this research study sets out to address. These, according to Morra-Imas and Rist (5:5-2), pose the greatest challenge because "the evaluation design must be able to rule out other feasible explanations for the observed results in order to conclude that the intervention had an impact". In short, the change needs to be correctly attributed to the intervention and nothing else.

Of three evaluation models mentioned by Morra-Imas and Rist (2:2-7–2-11), namely: the programme outcome model, programme theory (or theory-based evaluation) and logical frameworks (logframes), the programme outcome model which encompasses impact assessment is relevant to the purpose of this research.

Impact evaluation designs fall into three categories. First is experimental design which, according to Morra-Imas and Rist (5:5-10), "is considered the strongest for impact questions because it rules out most other possible explanations". It typically involves comparison groups randomly assigned with before (baseline) and after treatment measures. These are often called *pre-* and *post-tests*. Because experimental studies are usually small in size, generalisability is difficult.

Second is the quasi-experimental design which differs from experimental design mainly by virtue of the use of non-random comparison groups. While some comparison groups may be formed by matching key characteristics, at other times only groups with similar (but not the same characteristic) may be available.

Thirdly is non-experimental or pre-experimental design used for descriptive and narrative questions. These designs may have a before (baseline) and after measure, but lack a comparison group, or have a comparison but no baseline. In some cases, both baseline and comparison are lacking, giving the apt description "one-shot design" since it reflects an after-intervention situation at a specific time (Morra-Imas & Rist, n.d.:5:5-13).

Owing to the absence of key design elements, the non-experimental design is the weakest for impact assessment. In terms of rigour, then, from least to most rigorous, the order of the three research designs outlined here is: non-experimental, quasi-experimental and true, randomised experimental.

Designs typically used with the goal-attainment or programme outcome model are *ex-post facto* or simple *pre-test post-test*. The main weakness of these designs, however, is low internal validity. In other words, it is difficult to rule out the influence of extraneous factors or variables on the impacts or outcomes of the projects. This apparent weakness in the *ex-post facto* design used in this research is addressed by engaging two elements of causal tracing.

According to Wholey (1983:115), experimental and quasi-experimental designs involve comparing data to determine the extent to which a programme has caused the observed results and are needed when rigorous evaluations are needed. Gribbons and Herman (1997) state that "experimental designs are particularly useful in addressing evaluation questions about the effectiveness and impact of programs" and underline the importance of using comparative data to increase "confidence that observed outcomes are the result of a given program or innovation instead of a function of extraneous variables or events." Ginsberg and Rhett (2003:491) note that "experimentation is the *sine qua non* of evaluation for assessing impact" and that "for well-defined programs and interventions, properly executed experimental designs provide the most solid test of success."

3.1.4 Attribution and choice of approach

Attribution and generalisability are the chief concerns of research design (Rutman & Mowbray, 1983:79). The former has to do with the degree of confidence with which one can say that measured accomplishments are in fact produced by the programme rather than by extraneous events. Attribution is of paramount importance in this research. While this is easily achieved through experimental and quasi-experimental designs it can equally be achieved in a purely non-experimental design with alternative sources of evidence.

Citing Cook and Campbell (1979:10), Vedung (1997:168) highlights the lack of a solution to the causality problem in the social sciences, particularly in evaluation, thus: "The epistemology of causation, and of the scientific method more generally, is at present in a productive state of chaos" and concludes that since it is impossible to know the counterfactual with certainty, "we must argue through more or less reliable analogies to sort programmatic from non-programmatic effects" (Vedung, 1997:169).

Generalisability deals with "whether or not the nature of the research allows results to be related to situations not covered by the research" (Rutman & Mowbray, 983:29). This aspect is not of particular importance here, as the sampling technique used was not aimed at yielding a representative sample.

While accepting the efficacy of the experimental design in evaluating impact, it has to be acknowledged there is no single correct design for impact evaluations. The choice of design is dictated by the need to maximise the credibility and usefulness of the findings (see Government of Canada, Human Resources Development Canada (HRDC, 1998).

It is further said that "in summative evaluations the key concern is to be able to ascribe the outcome to the program as opposed to innumerable other possible causes." This involves minimising threats to internal validity caused by the environment and the evaluator (history, maturation, selection, mortality, statistical regression, testing, and instrumentation), thereby isolating the the impact of the programme from the impact of other potential causes.

The choice of evaluation design depends on the primary purpose of evaluation, but it is also determined by the questions to be answered and the complexity of the programme (Posavac & Carey, 1997:143). These authors also indicate that rigorous evaluations are not needed where programmes are relatively inexpensive, unharmful to participants, and fairly standard.

This research, although involving some expensive projects, does not aim at the methodological rigour of a true, randomised experimental design owing to the uniqueness of the projects, nor does it even aim at meeting the requirements of the less rigorous quasi-experimental design. Rather, the research employs a purely non-experimental design and, in the absence of baseline data, uses *after only* data from project leaders to assess projects' success in achieving their objectives and attributing impact. Employing a "one-shot design", it might be argued that this raises an attribution problem, namely: whether or not the projects investigated can rightly be credited with having caused the impacts or effects ascribed to them.

Three main considerations lay behind the choice of a non-experimental design for this research. First, was the immediate non-availability of baseline data on the projects and the time, financial commitment and logistics of having to initially collect such data on a fairly sizeable number of projects.

Secondly, the nature of the research, its purpose, the questions it sought to answer, and that the sample involved unique projects, rather than human service interventions like rehabilitation of drug addicts or effects of AIDS campaign, made a non-experimental design suitable. Thus, while the findings may not be generalisable, they will be suitable in providing insight into particular projects.

Thirdly, a non-experimental evaluation design relying on mainly qualitative data is relatively simple to conduct, economical and yields data suitable for purposes of the research. In fact, the qualitative paradigm brings out rich data and allows for exploring the depth of respondents' perceptions. Rather than the conventional criteria of reliability, validity and generalisabilty used in assessing quantitative research, qualitative research is assessed on the broad concepts of validity and relevance but with due regard to the aims of the research.

Finally, without using an experimental or quasi-experimental design, the findings of a non-experimental research study such as this can still meet general standards of acceptability provided the issue of attribution is adequately addressed. In this research, attribution is achieved through project leaders' and contact persons' input and causal tracing.

The goal-attainment model, like the impact model, has effectiveness as its objective. Both models also focus on outcome and have a low internal validity. The main differences between goal-attainment and impact models seem to lie in the main questions they answer. The goal-attainment model deals with the issue of whether or not goals have been attained, whereas the impact model concerns itself with differences a project has made. With respect to forms of evaluation, the former uses *ex post facto/simple pre-test post-test* designs while the latter may employ experimental, quasi-experimental or non-experimental designs. As has been made clear earlier, one cannot assess impact unless project goals have been accomplished. Therefore, if a non-experimental design is used for impact assessment, there is little difference between the two models.

3.1.5 Objectives-based (or goal-attainment) approach and its theoretical basis

The theoretical underpinning of this research is grounded in the long-established Tylerian objectives-based evaluation approach. According to House (1980:26), Tyler (1950) applied behavioural objectives approach to educational evaluation when he advocated that the yardstick for achieving educational outcomes and objectives should be defined by specific student behaviours after the intervention, hence the name "behavioural objective" or Tylerian model of programme development and evaluation.

The influence of Tyler, according to Guba and Lincoln (1981:11-12), is seen in the fact that several new models of evaluation have used objectives as their organisers: Hammond cube (1973), the Provus discrepancy model (1971), Popham's instructional objectives approach (1975), and Stake's countenance model (1967). Bloom (1956) and Mager (1962) also followed the goal-attainment approach (House, 1980:27).

According to House (1980:26), the Behavioural Objectives Approach "takes the goals of a program as stated and then collects evidence as to whether it has achieved thosed goals." In that case, "the goals serve as the exclusive source of standards and criteria." In other words, success of the programme is determined by the degree the outcomes approximate to the pre-determined goals. This is in line with the fact that outputs of programmes or projects, that is their tangible, observable indicators and symbolic manifestations, are not necessarily indicative of the achievement of their stated goals (Nachmias, 1979:3).

Therefore, it is necessary to assess programmes of projects' performance by examining how far predetermined objectives have been met as a precursor to assessing their (potential) effects or impacts. The research is based on the primacy of clearly defined objectives, the achievement of which must precede, pave the way and hence give legitimacy to the assessment of outcomes or impacts, an approach pioneered by Tyler (1942).

Behavioural-objectives or goal-based approach mentioned in House's taxonomy (1980:6-28), objectives-based evaluation mentioned by Posavac and Carey (1997:25) alongside other models, and other objective-oriented approaches are synonymous with the Tylerian model of programme evaluation which underlines the primacy of pre-determined goals or objectives achievement as essential criteria or yardsticks of programme or project success. The rationale behind these approaches is that a programme or project is implemented to accomplish clearly defined goals or objectives. It is only proper, then, to evaluate it in terms of the extent to which it has accomplished what it was designed to achieve, that is its goals or objectives.

An important development in the objectives-based approach is that its application has gone beyond the confines of education to other fields. The popularity of this evaluation approach is underlined by the fact that management-by-objectives is widely used in business and government circles. Thus, the use of the goal-attainment model in this study is more in line with the norm rather than an exception.

In short, this research is based on one of three main trends in evaluation theory and this particular approach (the goal-attainment approach) has endured since the 1950s. In fact, Peled and Spiro (1998:457) state that:

> ... to this date most evaluations are "goal-based" and most evaluators still seem to agree that a rigorous evaluation of program outcomes requires reference to declared or imputed goals, even if they are recognised as changing, controversial and unstable.

The goal-based or objective-oriented approach also finds support in Weiss (1972). The purpose of evaluation research, according to Weiss (1972:4) is "to measure the effects of a program against the goals it set out to accomplish as a means of contributing to subsequent decision making about the program and improving future programming". This establishes the invaluable role goals or objectives play in assessing effects or outcomes. In addition, Weiss suggests that a component be included that shows the level of advancement towards the goal or objective that constitutes success.

The role of goals and objectives in evaluation is riddled with concerns. Factors that may make them problematic in evaluating public policy programmes (see section 2.2.1, page 40) are equally applicable in evaluating projects. Parlett (1977:4) indicates that owing to the impreciseness of language "objectives are either so generalised and diffuse as to be interpretable in numerous ways or expressed so specifically that literally hundreds must be listed". According to McCoy and Hargie (2001), March (1972), Parlett and Hamilton (1977), and Marra (2000) initial goals in reality do change while programmes are under way. Consequently, goals and objectives should not be the only criteria for judging success. How they change and develop should be part of the criteria. March (1972:428), according to McCoy and Hargie (2001:321), points to the fluidity of goals and insists that rather than evaluation being concerned with achieving initial, pre-specified goals, "rather, we can examine what they did in terms of what we now believe to be important".

Evaluators are often faced with ambiguous, unrealistic goals and objectives, according to Rossi and Freeman (1989), cited by McCoy and Hargie (2001:321). Further, McCoy and Hargie (2001:319) indicate that Stufflebeam and Shinklefield (1985) point out the problematic nature of selecting appropriate goals for evaluation given that the process of selection is open to bias.

Verschuren and Zsolnai (1998:156) mention three categories of deficiencies of goal-based evaluations. First, it is said that they are based on an unrealistic assumption of goal rationality of human behaviour. This, the authors indicate, denies the intrinsic value of a social programme.

Secondly, it is claimed that pure goal rational behaviour may lead to injustice, to loss of human capital or to unethical situations. Thirdly, a number of problems are associated with using goals as a basis for evaluation: vagueness, goal multiplicity, and contradictory goals, neglect of side effects, to mention some.

In the light of these perceived shortcomings of the goal-based approach some authors advocate different approaches. Parlett and Hamilton (1977), for example, according to McCoy and Hargie (2001:321), developed illuminative evaluation in response to their dissatisfaction with the use of goals as evaluation criteria.

In spite of the concerns raised above, the rationale for adopting the objectives-based approach in this research relates to its suitability for the investigation. Without establishing the success of a programme or project in achieving its declared goals or objectives, it is pointless attempting to assess its impact(s) or potential impact(s) and the problem of attribution is compounded.

In the context of this research, then, achievement of objectives is a pre-condition for impact assessment as it is considered the best way to gauge project success and enable impact assessment. Consequently, throughout this research, it is consistently maintained that to assess effects or (potential) impacts of a programme or project, it is essential to first determine its success in achieving the objectives it was set up to accomplish.

Vedung (1997:36) indicates a number of effectiveness evaluation models, namely: goal-attainment, side-effects, goal-free, client-oriented, comprehensive, and the stakeholder model. It is significant the goal-attainment model (synonymous with the objectives-oriented approach to evaluation) is central to this research which is aimed at determining effectiveness and (potential) impact. The goal-attainment model (or results monitoring) is a substantive, as opposed to a procedural one. Substantive models of evaluation focus on results whereas procedural ones focus on issues of procedure such as legality, equity, representativeness and so on (Vedung, 1997:350).

The goal-attainmnt model is one of two variants of the goals model of evaluation. The other is the side-effects model. The goal-attainment model itself is one of five effectiveness models outlined by Vedung (1997).

The main question the goal-attainment model seeks to answer is whether goals (or objectives, in the case of this research), have been attained. The model asks two fundamental questions:

- Are results achieved in line with the goals of the programme?
- Can these results be attributed to the programme or project?

Once these questions are satisfactorily answered, effectiveness is established. By focusing on two key issues, this research study has a strong fit with the requirements of the goal-attainment model. The research is concerned with two key issues.

The first is to find out the objectives of the various projects in the sample and determine whether or not results achieved by the projects are in line with their established objectives. This requirement will be satisfied if it can be shown that the projects accomplished the objectives they had set out to achieve.

Secondly, the research seeks to attribute to projects benefits and impacts that are reportedly associated with their implementation. This involves linking the achievement of projects' objectives to benefits accruing from and impacts on academics/researchers, industry partners, and the South African economy or society at large. It will be shown that projects' objectives are directly linked with THRIP's mission and strategies and that the achievement of these objectives made certain positive differences to stakeholders. This requirement will be met by asserting a connection between projects' implementation and the resulting positive effects or impacts.

It will be important to show that the reported results (benefits and impacts) were, in fact, in line with projects' objectives. The goal-attainment method is, therefore, well-suited to addressing the key issues this research is concerned with.

3.1.5.1 Strengths of the goal-attainment model

Vedung (1997:40-43) outlines the chief merits of the goal-attainment model. Firstly, it is grounded in the democratic process in that goals are set through consultative formal decision-making processes.

In this respect, the approach can be credited with having a strong "inherent descriptive theory of valuing" (Vedung, 1997:42).

Since goals (objectives in the case of this study) are focal organisers and, therefore, legitimate criteria, the achievement of which indicates success. Secondly, the model accords with empirical research principles.

The fact that goals or objectives are valid criteria against which performance resulted can be measured ensures objectivity and prevents the evaluator from "taking a personal, subjective stand on the merits and demerits of the programs to be evaluated" (Vedung, 1997:43). Thirdly, the model is simple, easy to understand and apply as it focuses on two major questions. The goal-attainment model is, however, criticised on several grounds.

3.1.5.2 Weaknesses and how they are addressed

Vedung (1997:43-48) outlines several shortcomings attributed to the goal-attainment model. First of all, it is argued that it disregards costs in terms of money, time and human efforts.

The issue of costs, one of the chief criticisms of the goal-attainment model, has to be conceded. This study focuses on effectiveness and impact and uses an effectiveness model of evaluation. It does not purport to address cost-effectiveness or cost-efficiency as its central concern. Nevertheless, the issue of costs is raised indirectly by asking (in the case of failed or inconclusive projects) whether, for purposes of accountability and value for money, public money has been well spent or simply wasted.

The second criticism is an outright attack on the model's very strength, its reliance on goals as impregnable criteria for measuring success. It is argued that goals may be hazy as criteria of merit because they may be indeterminate. This may be because of "terminological inexactitude" arising from goal ambiguity or vagueness, resulting in balancing of goals and trade-offs between diverse goals. Such trade-offs or balancing often makes it impossible for a single "distinct, transparent expected outcome" to be identified (Vedung, 1997:44). Consequently, it is argued that such goals are "not lucid enough to be usable as value criteria against which to measure success, shortcomings, and failures."

Evaluands in this research are applied research projects with specific, precise, measurable and verifiable objectives defined by project leaders and collaborators before implementation. These objectives are the focal organisers and criteria for assessing projects' effectiveness or performance. The evaluands are not policies with broadly-stated and abstract goals.

The third and most serious criticism of the goal-attainment model is that it does not take unintended effects (that is side-effects, perverse effects and null effects) into consideration. To counter this criticism, items 13, 14 and 15 in the questionnaire for project leaders sought information on the three categories of effects. Figure 3.2 shows an evaluation model that considers side-effects but has a goal-orientation focus.

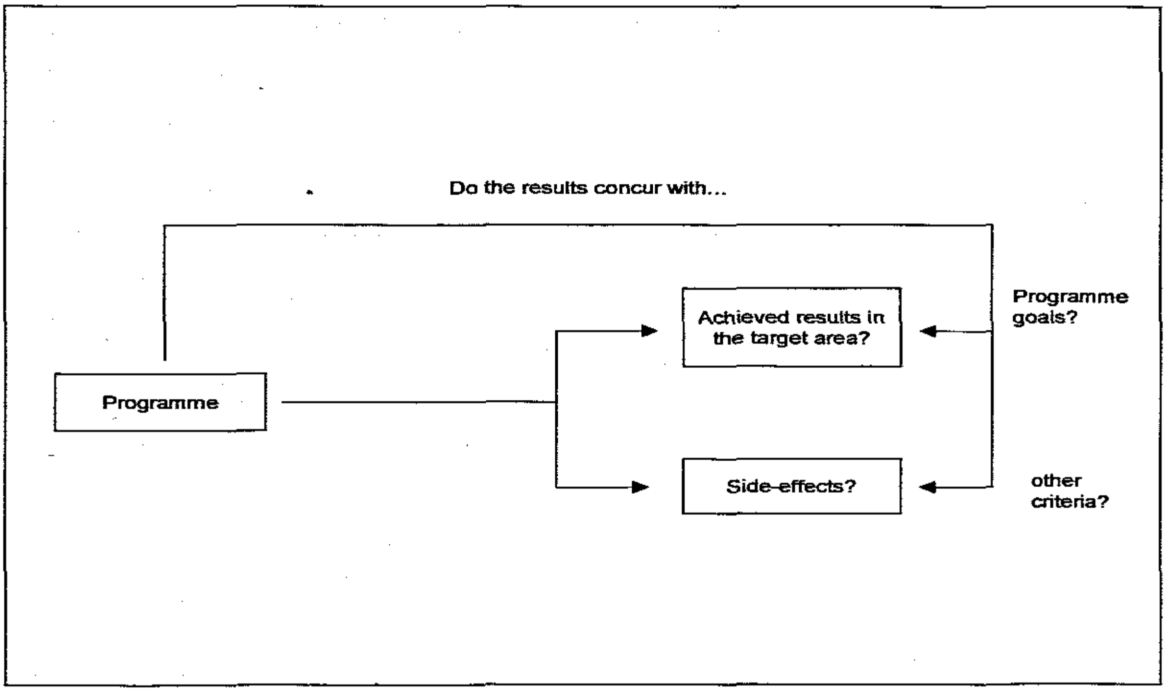

Figure 3.2: Side-effects evaluation
(Source: Vedung, 1997:50)

Fourthly, the model is criticised for disregarding the role of hidden agendas in public decision-making. To answer this criticism, the issue of hidden agendas does not arise in setting the objectives of applied research projects. It might more appropriately apply in a political context where the model is employed in evaluating public programmes or policies.

Further, it is said that because the goal-attainment model focuses on results it assumes that proper implementation of programmes is a given. Undoubtedly, impact assessment is contingent on proper implementation. As Babbie and Mouton (2001:340) rightly observe: "there is no point in being concerned with the impact or outcome of a particular programme unless it has indeed taken place and has been properly implemented". In using the goal-attainment model in this study, mechanisms are built into the main data collection instrument, the questionnaire for project leaders, to gather information on implementation problems and how seriously they may have influenced project performance.

Since the overall objective of the research study is to recommend conditions, measures and strategies that are effective in managing R&D projects and to caution against those that are ineffective, proper implementation is of central importance.

Lastly, the goal-attainment model is criticised for assuming an unproblematic, logically-linear relationship between a programme and its intended results. However, the accusation that the model treats a programme as a "target-seeking robot fulfilling its mission with painsticking technical precision" (Vedung, 1997:48) is weak. On the contrary, the model makes it the evaluator's job to establish whether results attained are in line with original goals and to investigate programme impact in the target area. Figure 3.3 shows the goal-attainment model depicting a problematic, rather than automatic, relationship between a programme, its results and impact.

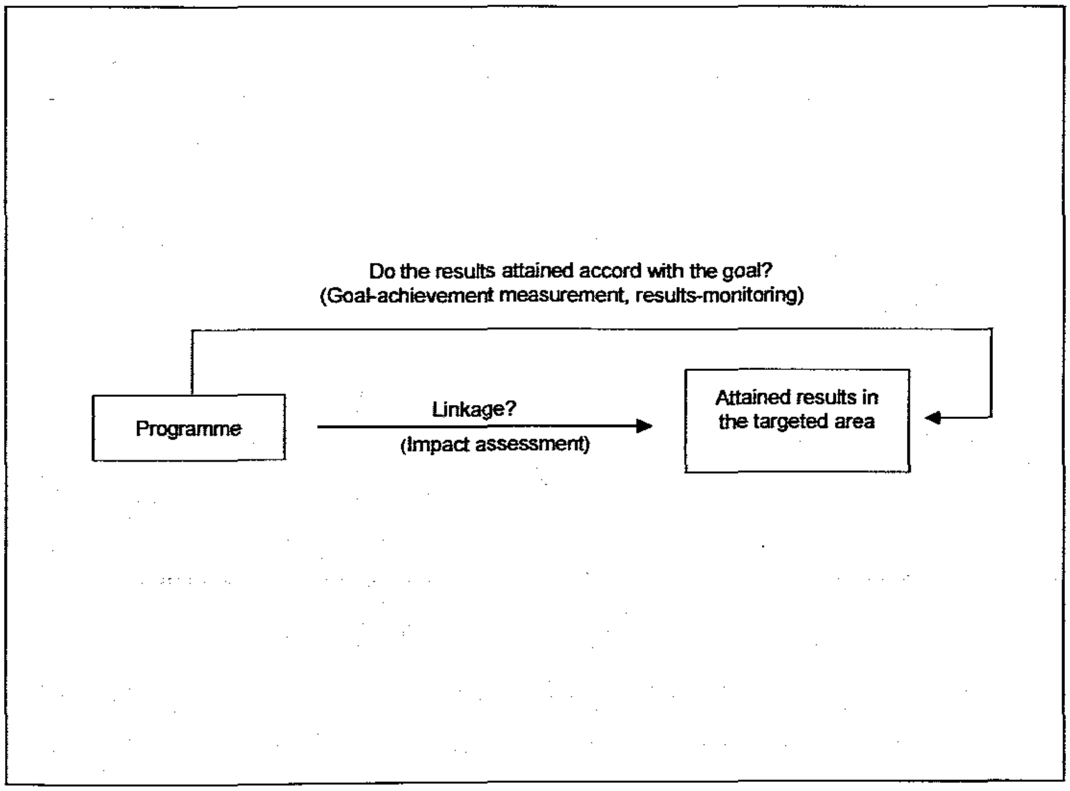

Figure 3.2: Goal-attainment evaluation
(Source: Vedung, 1997:39)

The weaknesses of the goal-attainment model have, thus, been adequately addressed. Given that some of the criticisms are valid, the model has been re-enforced by incorporating aspects of the side-effects model in the main data collection instrument (the questionnaire for project leaders). This producees not only a new model capable of fulfilling the aims of the objectives of the research, but also makes the new *Objectives/Side-effects (O/S-e)* model impervious to the serious criticisms levelled against the stand-alone goal-attainment model. Figure 3.4 portrays the O/S-e model, reflecting the synergy of the goal-attainment and side-effects models, while eschewing their weaknesses. It is superior not only to the stand-alone models from which it is fashioned, but to the four other stand-alone effectiveness models outlined in section 3.5. The *O/S-e* model is shown in the next page.

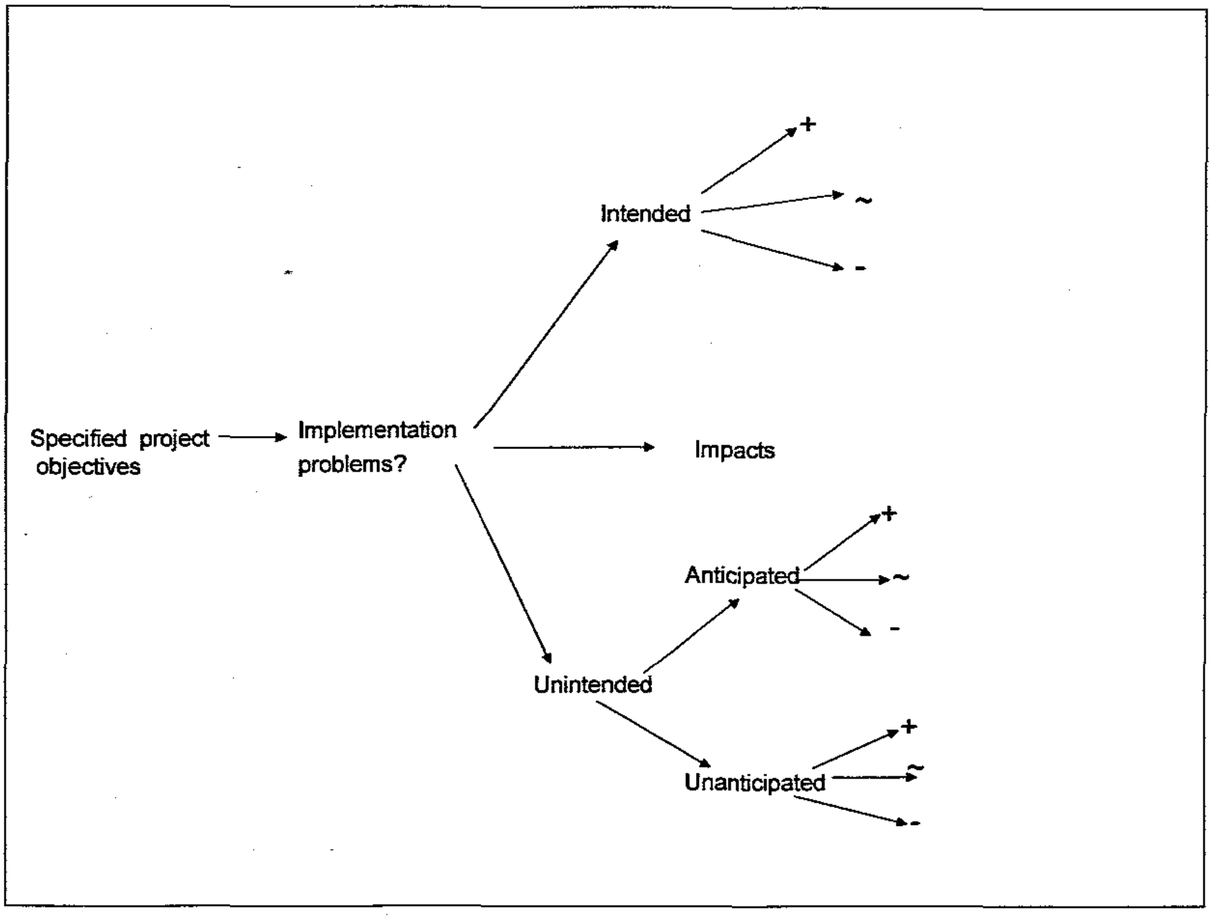

Figure 3.3: Objectives/side-effects model
(Adapted from Sherrill, 1984:28)

Essentially, the *O/S-e* model shows that projects have specific objectives to achieve and that implementation may not be without problems. Once successfully implemented, projects may yield intended as well as unintended immediate, short- and/or long-term impacts. Unintended impacts may be anticipated/expected or unanticipated/unexpected. Both these and intended impacts may be positive (+) or negative (-).

If they fall within the project's target area, they are its side-effects. Additionally, contrary/perverse effects (not shown in the diagram) and null effects (not considered in the research but shown in the diagram) may occur.

3.1.6 Sources of evidence in causal tracing

In connection with non-experimental designs, Davidson (2001), cited by Morra-Imas and Rist (n.d.:5:5-9 – 5-10), offers nine possible sources of evidence that may be used in causal tracing to reliably attribute changes to interventions where "the sample size is small, data collection strategies are largely open-ended, and/or when sophisticated statistical analysis is not possible". These causal tracing strategies, with brief characterisations, are outlined:

1. Causal list inference (if a particular outcome is known to be almost always caused by A, B, C, or D, where neither B, nor C or D occurred, the cause was unmistakeably A).
2. Modus operandi inference is used where more than one possible cause occurred (where it is known that a particular outcome is almost always caused by A, B, C, or D but on this occasion neither C nor D occurred; this narrows the cause to A or B).
3. Temporal precedence (the observed effect only happened after the intervention had begun, not before).
4. Constant conjunction (the effect was observed everywhere the intervention was implemented.
5. Contiguity of influence (where a plausible mechanism links the intervention with the observed effect, if evidence of the mechanism is found the inference is strengthened).
6. Strength of association (where observed change was much stronger in places an intervention was implemented than in places other possible causes were present).
7. Biological gradient (the more of an intervention, the larger the observed change).
8. Coherence (a relationship between an intervention and a change that logically fits with other things known about an intervention and its outcome).
9. Analogy (an established pattern between an intervention and its effects).

This research meets two of the three criteria attributed to Davidson (2001) above: open-ended data collection strategies and impossibility of doing sophisticated statistical analysis. In the absence of baseline data, employment of relevant elements of causal tracing to complement project leaders' input was essential.

To correctly attribute reported effects, impacts and outcomes to the projects that constitute the sample in this research, it has to be shown that the achievement of projects' objectives alone, not extraneous factors, paved the way for the specific effects, impacts or outcomes reported to have been realised.

Since the research design is non-experimental and also lacks baseline data, causal tracing is essential to properly attribute any impacts or solely to the projects following their implementation. Two of the above causal tracing elements are significant in this respect and are briefly discussed in the following paragraphs.

Temporal precedence refers to the fact that any effects, impacts or outcomes reported by respondents for the projects occurred after the projects had been implemented, not before. This effectively means even in the absence of baseline data, the effects, impacts or outcomes can be directly linked to the projects' implementation. For example, more SET graduates emerged from South African universities to swell the ranks of the workforce with THRIP's emphasis on human resource development in collaborative projects than before.

The second aspect of causal tracing relevant here is coherence. This means the impacts or effects reported are associated with other things known about the projects' implementation and the specific outcomes. For example, cost savings in electricity distribution is known to be a direct result of implementing demand side management principles in managing electricity distribution and is associated with a specific research project implemented specifically to achieve that purpose.

Temporal precedence and coherence apply to all the projects in the sample for this research. Together, temporal precedence and coherence suggest that had these projects been implemented, the specific impacts/effects, reported would not have resulted.

3.1.7 Methods of collecting primary data

A variety of methods is available for collecting qualitative data, among which are: observation (structured, unstructured, participant and non-participant), interviews (structured, unstructured, and focused), interviews, content analysis, focus groups, and questionnaires. The use of any method or combination of methods is dictated by the nature, scope and object of the enquiry, as well as by the exigencies of funds, time, degree of precision, and the precision required (Kothari, 1990:139).

Given that data to be collected were extensive and unique to each project, a questionnaire was deemed the most appropriate data collection instrument to obtain specific data from project leaders and industry partners' contact persons.

Although they have some shortcomings, questionnaires are easy to administer, economical in time and cost, good for wide coverage, ideal for direct comparison, have a fairly good response rate and enhance ecological, external and population validity. An additional advantage is that respondents are able to give frank responses and relay their views in their own words, once confidentiality and anonymity are guaranteed.

Kothari (1990:124) acknowledges the widespread use of questionnaires in collecting data. Typically, questionnaires are posted and respondents are requested to return the completed questionnaires by a given date.

There are several advantages in using questionnaires:

- cost-effectiveness is achieved where a large and widely dispersed population is involved;
- interviewer bias is eliminated since respondents answer on their own;
- there is enough time for respondents to give well-thought-out answers;
- unapproachable respondents can be reached conveniently; and
- they enable the researcher to make use of a large sample, making the results more dependable and reliable.

The use of questionnaires, however, also has disadvantages. These include:

- low return rate of completed questionnaires;
- they require educated and cooperative respondents;
- they are inflexible in that once questionnaires are sent the approach cannot be changed;
- possibility of ambiguous replies or omission to certain questions, making
- interpretation difficult; and
- it is the slowest method of data collection (Kothari, 1990:125).

3.1.8 Questionnaire design and triangulation

The use of mixed methods in research is a strength rather than a weakness. Mixed methods involve collecting and analysing data, integrating the findings and drawing inferences using qualitative and quantitative approaches or methods in a single study (Tashakkori & Creswell, 2007:4). In designing the questionnaires for this research, consideration was given to collecting both qualitative and quantitative data to enhance the wealth of information. Morgan (2007:48-76) examines the advocacy for renewed attention to qualitative research and understanding how combining qualitative and quantitative methods could be lifted to a similar level of legitimacy.

Although open-ended questions are usually associated with qualitative studies and close-ended with quantitative research, both were included in the questionnaires for project leaders and sponsors' contact persons. However, most questions were of the open, rather than closed type. This was a deliberate choice, given the nature of the research and the fact that the most intimate and specific knowledge of the projects resided in these potential respondents.

The use of both quantitative and qualitative data collection methods in programme evaluation is common. Each has its strengths and shortcomings in evaluation research (Babbie and Mouton, 2001:368; Patton, 1990:13-14). As such, they constitute alternative but not mutually exclusive strategies (Patton, 1990:14). In recognition of their complementarity, the research combined the two for more comprehensive data collection to capitalise on their individual strengths.

Guion (2002:n.p.) mentions that qualitative researchers use triangulation to check and establish validity in their studies. Literature on qualitative methods of data collection indicates there are five types of triangulation: data, investigator, theory, methodological, and environmental. Data triangulation, the most popular and easiest, involves using different sources of data or information. In theory triangulation, multiple perspectives are used to interpret one set of data or information, validity being established if the same conclusions are reached. With respect to investigator triangulation, several different investigators or evaluators within the same field use the same qualitative method in an evaluation or study. Upon comparison, validity is established if their conclusions are similar. If differences arise, further study is needed. In methodological triangulation multiple qualitative and/or quantitative methods are used to study a programme, with validity being established if similar conclusions are reached. The use of different locations, settings, times, and days of week or seasons of the year to determine key factors, if any, that influence a programme exemplifies environmental triangulation.

Data triangulation was done in this research. The main instrument for collecting primary data was a questionnaire for academics and researchers whose projects were included in the sample. An attempt was made to achieve data triangulation through a second, shorter, mainly open-ended questionnaire that was designed to elicit relevant information from industry partners' contact persons. The rationale was to capture the perspectives of the latter group in order to establish the extent of agreement or congruence between their views and those of project leaders regarding projects' performance.

A one-to-one matching of project leaders' and contact persons' responses for each project would have been ideal. Unfortunately, obtaining data from industry partners' contact persons proved more difficult than originally thought. Various reasons account for the low response rate to questionnaire administered to the latter group. These are outlined in section 3.28.

To sum up, section 3.1 has dealt with issues in and designs for impact assessment; attribution and choice of approach; the theoretical basis of objectives-based evaluation approach, its strengths and weaknesses and how the latter have been addressed by synergising it with the side-effects model. In particular, the use of a non-experimental "one-shot" or *post-test* only design reinforced by aspects of causal tracing is deemed sufficient for attributing impacts/effects to projects in the sample and, therefore, justified. Finally, issues surrounding data collection, questionnaire design and triangulation have been discussed.

3.2 Sampling and data collection

Section 3.1 focused on research design. It examined the essence of impact assessment, and stated the problem of evaluation as: "what would have happened in the absence of the intervention?" The non-linear relationship between a project and its outcomes are hinted at, indicating the need to disentagle project effects from intervening factors. Three impact evaluation models, experimental, quasi-experimental, and non- or pre-experimental designs, are briefly examined. Four reasons are given for adopting the non-experimental design in this research. The theoretical basis of the specific approach used, the objectives-based or goal-attainment approach, is explored. Its strengths and weaknesses are examined, and the latter addressed with aspects of the side-effects model. Two elements of causal tracing, temporal precedence and coherence, reinforce the goal-attainment model. Methods of collecting primary data are briefly examined and the choice of using questionnaire as data collection instrument is motivated. Finally, design of the questionnaire, and triangualation are discussed

Section 3.2 that follows examines the sampling method used and collection of primary data. It explains the rationale behind the initial fairly large sampling frame and why it had to be scaled down, examines the criterion and assumptions behind the inclusion of projects in it, explains the sampling techniques used, how questionnaires were refined and pilot tested, details the actual procedures followed in collection of data, and how the data were reduced, coded and captured for eventual analysis.

3.2.1 Sampling frame and actual sample

The sampling frame for the research included all THRIP/industry-funded projects of R250 000 or more and implemented between 2000 and 2003, both years inclusive. A fairly large sample of 134 projects was initially identified, with every standard industrial classification category or sector represented. This made it possible to include all institutions where applied or R&D-oriented research is conducted, namely traditional universities, universities of technology (former technikons) and science councils, to be represented thereby giving the research study a national character. A larger sample would have made the findings of the study more comprehensive. Owing mainly to cost and time considerations involved in collecting data, however, the sample was scaled down and restricted to academics/researchers in three of the country's provinces: Gauteng, KwaZulu-Natal and the Western Cape.

With the sampling frame thus drastically scaled down, the original plan to include all higher education institutions and science councils enjoying THRIP/industry funding of their research projects fell away.

With a sampling frame of 70 academics/researchers, data were obtained from 44 respondents who undertook 52 different projects and 21 industry partners' (sponsors') contact persons. Table 4.2 (Appendix A, page 179) gives affiliation details of academics/researchers, and the number of projects per province and institution, while Appendix E (pages 244-249) gives details of industry partners' (sponsors') contact persons.

3.2.2 Criterion and assumptions underpinning sample selection

One criterion backed by three assumptions determined the inclusion of projects in the sampling frame.

3.2.2.1 Specific rather than generic

The sampling frame was chosen to reflect specific, as opposed to generic, projects. An effort was made to base the choice of projects on funding directly targeted at achieving specific, beneficial results.

For this reason, only projects thought to have immediate benefits were included and those, like the establishment of Centres of Excellence, which are vague and generic, aimed at a more general promotion of R&D, were excluded.

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3.2.2.2 Size of funding

In addition to projects being specific, an assumption was made that the size of combined THRIP/industry funding is significant. This was based on the reasoning that the bigger the funding amount the more important the project is deemed to be. Behind this assumption is the fact that THRIP acknowledges any investment by industry partners in these projects is a key indicator of relevance and importance (Annual Report, 2001/2002:5). Funding amount is especially important in sustained funding of continuous projects or heavy funding of one-off projects. Thus, projects funded with large amounts (R500 000 or more) were preferred to those with less funding, although the sampling frame included some projects that had received funding of less than R500 000 (see section 4.3.1.1). In fact, the majority of projects, 36 of the 52 (69%), were funded to the tune of between R1 million and more than R8 million, as shown in Table 5.41.

3.2.2.3 Risk, likelihood of success and potential for impact

It was also assumed that size of funding was directly linked to the degree of risk sponsors were ready to take and the expected potential high impact/returns projects might yield in the event of success. For projects in certain sectors, engineering, for example, bigger funding is necessary because of the high capital costs such as laboratory and measuring equipment, followed by extensive field trips to remote areas and transportation. In such cases, THRIP and industry partners take a great risk in the expectation that eventual success would bring high returns on investment. Table 4.3 shows the distribution of single-sector according to size of funding, while Table 4.4 indicates the funding amounts of cross-/multi-sectoral projects.

3.2.3 Sampling technique

In the social and behavioural sciences researchers draw from four taxonomies of sampling techniques, namely probability, purposive, convenience and mixed methods sampling.

Probability sampling is an umbrella for four specific techniques of sampling (random, stratified, cluster and multiple probability) techniques typically used in quantitatively-oriented studies where large units are randomly selected to achieve representatieness (Teddlie and Yu, 2007:77).

Purposive, also variously referred to as non-probability sampling, purposeful sampling or "qualitative sampling" (Teddlie & Yu, 2007:80) techniques are mainly used in qualitative studies, where the selection of units that form the sample is based on specific purposes associated with answering a research study's questions. More importantly, the units are "deliberately selected for the important information they can provide that cannot be gotten from other choices" (Teddle & Yu, 2007:77). Four specific techniques are available: sampling to achieve representation or comparability, sampling special or unique cases, sequential sampling, and sampling using multiple purposive techniques. Patton (1990:169-180) cites 16 different types of purposeful sampling. Convenience sampling is based on ease of accessibility and willingness of subjects to participate and may be captive and / or volunteer samples.

Finally, there is mixed methods sampling. This uses both probability and purposive sampling techniques in selecting units of study. The probability aspect increases external validity and the purposive dimension is meant to increase transferability. This technique, according to Teddlie and Yu (2007:87), has not received as much discussion in research literature.

In this research a purposive sampling technique was used in selecting the sampling frame. Representativeness, comparability and generalisability were not important considerations hence probability sampling was of no relevance. Interest lay in selecting projects that met some criteria of special research interest. Criterion sampling, which was informed by one criterion and three asssumptions outlined in sections 3.2.2.1, 3.2.2.2 and 3.2.2.3, guided the selection of a sample of projects unique in meeting the criteria deemed important.

The sampling frame was, thus, made up of 70 selected projects that met the criteria, but the sample itself was constituted by projects on which data were actually collected. The smaller size of a purposive sample in comparison with a probability sample "leads to greater depth of information" (Teddlie & Yu, 2007:83).

THRIP/industry-funded projects generally fall into 10 categories, identified by their standard industrial classification. However, not all were specific enough to be considered. Centres of Excellence are an example. Of necessity, then, not every project qualified for inclusion in the sampling frame. Even then, the number of projects that could have been included was large but owing to time and funding constraints, the study could only focus on a reasonably small and manageable sample.

In sum, for the sake of convenience and to make the researcher focus on projects with potential for high impact, purposive or judgemental sampling was used to choose a sampling frame of seventy applied research projects. Relevant data were, however, obtained on 52. This constituted the actual sample. The purpose and relevance of the study are enhanced, rather than compromised, by employing this sampling technique.

3.2.4 Sample description

Projects that form the core of this resarch were chosen from a large pool of THRIP/industry-funded projects spanning four financial years, 2000 to 2003. Although the sampling frame was 70 projects spanning seven industrial classification categories, 52 constituted the actual sample. Table 4.2 (page 179) shows the provinces in which data was collected and the specific institutions academics/researchers whose projects constitute the sample are affiliated to as well as the number of projects per province and institution as aproportion of the total number of projects.

It was hoped after project leaders had provided contact and other details of industry partners' contact persons with whom they had worked, the latter would be approached with a second questionnaire designed to elicit their perspectives of the projects. Although the questionnaire was administered the response was rather poor, for reasons given in section 3.2.8.

3.2.5 Classification of projects and adjustment to categories

Projects that constitute the sample fall into seven standard industrial classification categories or sectors. To make the sample more relevant to the study, adjustments were made to some of the original categories to accommodate some selected projects. Category 8, originally representing Financial Intermediation, Insurance, Real Estate and Business services, was substituted with a new one, Health. This new category, which is not reflected in the standard industrial classification scheme, is more R&D-oriented and has been receiving huge sustained funding over the years. In addition, categories 3, 4 and 5 were expanded by adding aspects that make their foci more appropriate and relevant to the investigation. The relevant changes are shown in italics alongside the standard industrial classification codes of the projects in Table 4.1 (Appendix A, page 179).

3.2.6 Screening and pilot testing of questionnaire

The questionnaires for project leaders and industry partners' contact persons, all key informants, were screened and checked for validity (purposefulness) by matching items against the aims of the research and research questions by Professor E-A Uken and Ms Corrie Strumpfer. Professor Uken is the former Director of Research at Cape Peninsula University of Technology (formerly Cape Technikon) and current Head of Energy Research Unit at the Department of Electrical Engineering while Ms Strumpfer is a senior lecturer at the former Multi-disciplinary Applied Research Centre (MARC), now integrated into the Faculty of Informatics and Design at Cape Peninsula University of Technology.

Items in the questionnaires were clarified, simplified, checked for wording and length, and the content reviewed based on input received. The questionnaires were also tested for reliability through a small-scale pilot-test carried out on two doctoral candidates and two lecturers in then Faculty of Management (now Faculty of Business) to ensure that they met the criteria of accuracy, consistency and dependability. Modifications were then made before being used in the field. The main questionnaire, the one for project leaders is attached as Appendix A (page 234), while that of sponsors is Appendix B (page 238).

3.2.7 Administration of questionnaires

3.2.7.1 First phase

The two sets of questionnaires were administered in two phases. The first phase covered project leaders in two provinces: Gauteng and KwaZulu-Natal. They were contacted by telephone and electronic mail for appointments. Once appointments were secured, electronic copies of the questionnaire were went to respondents to familiarise them with the kinds of data sought. This was important as some of the projects had been completed a few years back and time was needed to locate relevant archived data.

Dispatch of questionnaire was followed by field trips to Johannesburg, Pretoria and Durban that took place from October 25 to November 11, 2004. Sending the questionnaire in advance was beneficial, because in many cases respondents had already completed them by the time the scheduled meetings took place, thus saving time. During face-to-face meetings with project leaders some needed clarification before completing the questionnaire.

In cases where project leaders had agreed to meetings, but were later unavailable on the dates their institutions were visited, or were receptive to a meeting, but unable for good reasons to give an appointment, they were requested to complete and return the questionnaire by electronic mail or facsimile transmission.

3.2.7.2 Second phase

The second phase of questionnaire administration covering industry partners' contact persons in Gauteng and KwaZulu-Natal took place from July 5 to July 22, 2005. To administer the questionnaire, information provided by project leaders under item three of their questionnaire was invaluable. This meant that where project leaders did not provide information relating to the specific item, it was impossible to contact the industry partners' contact persons during this phase of primary data collection. Where the information was given, telephonic contact was made with individuals identified as contact persons for the relevant projects. In some cases, project leaders, either deliberately or for some other reasons, did not provide the contact persons' details. Some project leaders were forthright in indicating their unwillingness to give these details, while others cited existence of a confidentiality agreement.

Using the same procedure employed in administering the project leaders' questionnaire, telephonic contact was made with industry partners' contact persons identified by project leaders to secure appointments. Some contact persons had already left industry partners' employment while others had gone on leave or were on official overseas trips and could not be contacted. Of those contacted, some were too busy to have face-to-face meetings, but some agreed to complete the questionnaire if it was sent by electronic mail or facsimile transmission. Others failed to respond to telephonic and electronic requests left with secretaries, some could not be contacted as their details were out of date. Many cited confidentiality.

The questionnaire was dispatched by electronic mail and facsimile to those who had agreed to a meeting or undertaken to complete and return if an appointment was impossible. The fact that some project leaders had not given details of industry partners' contact persons, coupled with factors as outlined, had the effect of making it impossible to obtain a one-to-one matching of project leaders' and contact persons' responses to all projects.

3.2.7.3 Third phase

This phase covered project leaders and industry partners' contact persons in the Western Cape and ran from August to the end of October 2005. The same procedure was followed as in phases 1 and 2 and similar problems were encountered in administering the questionnaires.

3.2.8 Difficulties encountered in collecting primary data

Collecting primary data from project leaders and industry partners' contact persons proved more difficult than originally thought, more so for the latter group than the former. Problems experienced included the following and are reasons or the low response from industry partners' contact persons:

- failure or refusal by some project leaders to reveal industry partners and/or contact persons' details;
- furnishing of outdated details by project leaders;
- unavailability of industry partners' contact persons because of busy schedules;
- confidentiality of data;
- departure of contact persons from industry partners' employment;
- reneging on initial agreement to respond to questionnaire; and
- downright refusal to participate in the data collection procedure.

Analysis of the data and discussion is undertaken in Chapter 4.

3.2.9 Ethical practices in collecting primary data

In administering the questionnaires, all fundamental research ethics were employed. The researcher's identity, background and affiliation as well as purpose were made known initially to all respondents while seeking appointments and in subsequent meetings. As such, participation was consensual and purely voluntary, being based on a decision made after all relevant details about the researcher and the investigation were declared.

In completing the questionnaire, respondents were not required to indicate personal details. Thus, other than the researcher, who had an identification mark on each completed questionnaire, no other person could immediately link a completed questionnaire to a particular academic or researcher.

No harm, intentional or unintentional, was caused to respondents themselves, their projects or respective institutions as result of their participation in the study. Similarly, all information considered confidential that was divulged in the course of private conversations and expressly unintended as responses to items in the questionnaire were not recorded as data. However, it must be acknowledged that respondents voluntarily provided relevant data and were aware that as their projects were publicly-funded the results of this research would be in the public domain. Finally, any significant technical or other limitations of the research study would be acknowledged.

3.2.10 Data reduction, coding and capture

With a mixture of closed and open-ended questions in the two questionnaires, responses to open-ended questions had to be handled in a different way to make the data amenable to analysis while responses to former were left in their readily-analysable form. Taylor-Powell and Renner (2003:1) propose content analysis as an approach for analysing and interpreting narrative qualitative data. Bryman (2001) acknowledges the importance of qualitative (or ethnographic) content analysis in facilitating contextual meaning in text through the development of emergent themes in textual data. Having gone through the data to understand them, attention was focused on each question to focus the analysis. Finally, emergent themes were identified and categorised.

Themes are conceptual linkages embedded in expressions. Theme identification in qualitative responses enables a mass of data to be reduced into manageable and meaningful categories. For this reason, thematic analysis was undertaken to identify sets of themes residing and recurring in the responses. Without thematic analysis and categorisation, description, comparison and explanation are not possible (Ryan & Bernard, 2003:86). Because it would make no sense analysing each respondent's data on their own, thematic analysis and categorisation of responses to each item in the questionnaires was essential.

To facilitate eventual analysis data were coded and captured using a computer-assisted (qualitative) data analysis software package called Statistical Package for Social Sciences (SPSS), version 13.

3.2.11 Collection of secondary data

Dealing with diverse and unfamiliar projects, it was necessary to gain some insight into them. In some cases, this information was provided by project leaders in the form of copies of old applications for funding, or orally in the form of a briefing before the questionnaire was administered at face-to-face meetings. However, documented information on project backgrounds was sought directly from THRIP. For this reason, two trips were made to Pretoria on July 18 and 19, 2005. The first as a follow-up to an earlier request made to the then manager of THRIP for assistance in retrieving funding applications and reports of relevant projects that usually include background information from archive. The second trip was to collect hard copies of the requested documents.

An original plan to gather information on all phases of each project, from conception, planning/design, implementation to termination (where applicable), was abandoned when it became clear from the outset this kind of information was neither available from project leaders nor from industry partners, or even THRIP. For this reason, this research report does not include projects' backgrounds.

3.2.12 Summary

To conclude, Chapter 3 has dealt with issues of methodological relevance to the research. Section 1 has looked at research design, while section 3.2 has focused on sampling and data collection issues. These include the use of judgemental or purposive sampling; the use of a specific criterion and three assumptions in selecting projects for inclusion in the sampling frame; and grouping of projects into standard industrial classification categories and adjustments to some categories. The collection of primary data involved triangulation through the design and use of two questionnaires. The process of developing and refining the questionnaires, which involved screening and pilot testing before they were used in the field, has been described. Each of the three phases of fieldwork to collect primary data has been detailed and problems encountered outlined. Issues concerning maintenance of ethical practices are raised. Finally, procedures involved in data handling in preparation for analysis (data reduction, coding and capture) are stated. In Chapter 4 data are analysed and findings discussed.

CHAPTER 4: DATA ANALYSIS AND DISCUSSION

4.1 Introduction

The previous chapter examined methodological issues in this research. These included the criterion and assumptions guiding sample selection; sampling technique used; sample description; categorisation of projects; screening and testing of questionnaires; questionnaires administration; difficulties experienced in collecting primary data; ethical issues; and data reduction, coding and capture.

In this chapter, responses to the two sets of questionnaire are analysed and discussed. It starts by analysing the questionnaire for project leaders which incorporates the main research questions, the questions the research study seeks to answer. This is followed by analysis of the questionnaire for sponsors' (or industry partners') contact persons. Key information from analysing these questionnaires is captured in Tables 5.1 to 5.79 (Appendix A, pages 177-232). Following the analysis and discussion, Chapter 6 summarises the findings, draws conclusions and makes recommendations.

It is necessary to point out that item 3 in the main questionnaire (for project leaders') requesting for names and contact details of industry partners' (sponsors') contact persons was included solely to facilitate the data collection process and does not form an essential part of data meant to be analysed. Information provided by project leaders on this item is in Appendix E (pages 230-235). Similarly, item 7 was intended to elicit contact details of secondary beneficiaries, if any, for further data collection, although a third questionnaire was never administered for financial, time and other reasons. Item 3 in the questionnaire for sponsors was meant to confirm data provided by project leaders under item 3 of their questionnaire, while item 4 was included to serve the same purpose as item 4 in the questionnaire for project leaders.

4.2 Defining 'success' and linking it with impact

Crucial to this research is the meaning of 'success' and how it is defined in the context of this research. The adoption of a goal-attainment model or objectives-based evaluation methodology would seem to suggest that success is synonymous with a project having accomplished most, if not all, of its declared objectives.

However, one has to question whether success in achieving objectives is all that applied research projects are expected to achieve. It is postulated here that beyond achieving their objectives projects should also yield immediate, short-term or long-term benefits (impacts) to stakeholders; that is their impact or value.

In the context of this research, objectives attainment is a not assumed to be synonymous with impact, but it is a necessary condition for impact(s) to occur. Success entails projects not only accomplishing their objectives, but also yielding value to beneficiaries and stakeholders and/or the South African economy or society at large. Since objectives of the projects that constitute the sample co-terminate with the strategic objectives of THRIP, if the projects do, in fact, achieve their objectives, it is clear that any resulting impacts can only be attributed to them, thereby establishing success.

The research study is focused on THRIP/industry-funded projects. In all these projects three major stakeholders are clearly identifiable: project leaders (academics and or researchers in higher education and researchers in research/science councils), private companies (industry) and the government (DTI). Although these stakeholders may share some common interests, the degree to which they are prized might differ from stakeholder to stakeholder. That apart, each stakeholder might have other interests that do not exactly mirror their common interests. This sets the scene for different stakeholders to see success in slightly different ways. Some project leaders, for example, might see success at a micro level in terms of publications in journals, conference papers, national and/or international recognition, or numbers of students graduated. Industry might pay more attention to commercial/economic or technological gains. On the other hand, the NRF (THRIP) might point to success in terms of long-term macro benefits or impacts such as human capital development (skills training, especially of previously disadvantaged groups), job creation, opening of new market opportunities and/or expansion of existing ones and technology transfer, all of which benefit the country as a whole.

4.3 Operating definition of 'performance indicator' and specific indicators used in assessing projects' performance and impact

Since the essence of the research is to facilitate judgement of effectiveness, the operating definition of 'performance indicator' is that of the United Kingdom's Training and Enterprise Councils, outlined by Helsby and Saunders (1993:59) as "*evidence of what has actually happened*".

The adoption of this definition is based on the reasoning that project leaders had collaborated with their respective sponsors (industry partners) in formulating specific objectives for their projects, set performance targets and criteria, and monitored the projects to assess the extent to which their objectives were achieved and impacts realised. For this reason, reported impacts following the achievement of projects' objectives are legitimate indicators of effectiveness and success. The adoption of this definition is important as it means that it is not the researcher's criteria but those of academics and researchers intimately involved and familiar with their projects. As such, the researcher's prior specification of impact criteria is not required since the "actual outcomes provide ready-made performance indicators by which to gauge success" (Helsby & Saunders, 1993:59).

Following this line of reasoning, reported project outcomes and impacts are taken as genuine indicators of their success. This is in line with the goal-attainment model that takes the achievement of objectives as a valid yardstick for judging performance.

Indicators of success applicable in this research go beyond achieving projects' objectives. Impacts are the critical success factors. Relevant indicators are essentially aspects of THRIP's strategic objectives. It is worth recalling the mission of THRIP is to "improve the competitiveness of South African industry by supporting research and technology development activities and enhancing the quality and quantity of appropriately skilled people" (Annual Report, 2001/2002:4, 2003:4). The fact that industry partners invest in THRIP projects indicates the relevance and importance of these projects.

To achieve THRIP's mission a number of strategic objectives are pursued through collaborative applied research projects. Taking a macro or national perspective, THRIP expects applied research projects it co-funds with industry to yield benefits and impacts in a number of areas, including but not limited to human capital development, commercial products and opportunities, social gains, technology transfer and other benefits that broadly improve the lives of South Africans and put the economy in a better shape. In this research then, it is only proper to use as appropriate indicators of success the extent to which projects have yielded intended benefits and impacts that approximate to THRIP's strategic objectives in terms of stimulation or promoting, among others things:

- income generation;
- job creation;
- registration of patents
- skills development or improvement;
- knowledge and/or technology transfer;
- provision of essential services (for example, better health/medical care);

- development of globally competitive (commercial) products;
- national economic competitiveness through innovation, technology development;
- spin-offs;
- journal publications; and
- improving the number of female and black students training in SET to meet industry needs.

To return to issue of the meaning of 'success' raised in section 4.2, success will be determined by the degree to which projects' objectives and outcomes co-terminate with the strategic objectives of THRIP.

4.4 Defusing criticisms levelled against the goal-attainment model of evaluation

Recalling criticisms made against the goal-attainment model of evaluation and given that this research is grounded in the goal-attainment model or objectives-oriented approach to evaluation, it is necessary to reiterate a few points at the data analysis stage.

The design of the questionnaires took into account some of the main criticisms levelled against the goal-attainment approach in order to address, strengthen and, thus, fine-tune and make it more appropriate to handle the main questions the research seeks to answer.

To recap, firstly, it is argued that the goal-attainment model does not regard implementation as a problem (Vedung, 1997:47). The issue of implementation is addressed by the inclusion of items 4 and 5 in the questionnaire for project leaders. Project implementation being critically important, these items seek to establish if any problems did occur and to ascertain how serious they were.

Secondly, it is said the goal-attainment model over-focuses on goals/objectives, and evaluators' attention is taken away from other important aspects such as finding out why programmes have succeeded or failed, determining whether there are other positive or negative side-effects or even questioning how appropriate were the goals. Sherrill (1984:27) highlights the little attention paid to unintended effects or outcomes in evaluation and makes it clear both wanted and unwanted are bound to occur. According to the author, "unintended outcomes that are unwanted are especially important" given that they unexpectedly and adversely affect people. This is taken into consideration in the data collection process.

Items 13 and 14 in the project leaders' questionnaire, and item 9 (a) and (b) in the sponsors' questionnaire, address positive and negative side-effects. Item 15 in the project leaders' questionnaire focuses on another aspect of side effects, namely contrary impacts. Items 19 and 13 in the project leaders' and sponsors' questionnaires, respectively, were included to ascertain the reasons for projects' failure or inconclusiveness.

The focus of the research is on achievement of projects' objectives which, by definition, are specific, measurable, achievable, relevant, and time-based. The fact of objectives being narrow, precise, tangible, concrete and can be validated makes them more appropriate as yardsticks than goals that might be broad, general, intangible, abstract and not capable of being validated. Consequently, items 10 and 11 in the project leaders' questionnaire focus on objectives (rather than goals) and motivations for achieving them. Similarly, items 5 and 6 in the sponsors' questionnaire focus on objectives.

4.5 Analysis and discussion of data from project leaders

4.5.1 Project status

It was important from the outset to have a clear idea as to where each project stood in its unique life cycle. As such, the exact status of each project was established in terms of whether it had been completed, was still ongoing or had been abandoned. Of the 52 project leaders* who responded to the questionnaire, 29 of them (56%), reported that their projects were completed at the time of the investigation while 23 (44%), indicated their projects were ongoing. Of the two remaining respondents, one did not give information on project status, while another reported the project was abandoned. The pie-chart that follows reflects the situation just described.

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*A total 44 project leaders responded to the questionnaire. Some, however, had undertaken two or more projects that constituted the sample of 52. For the sake of simplicity, then, the number of project leaders is maintained at 52 to establish a one-to-one link between the projects and the project leaders.

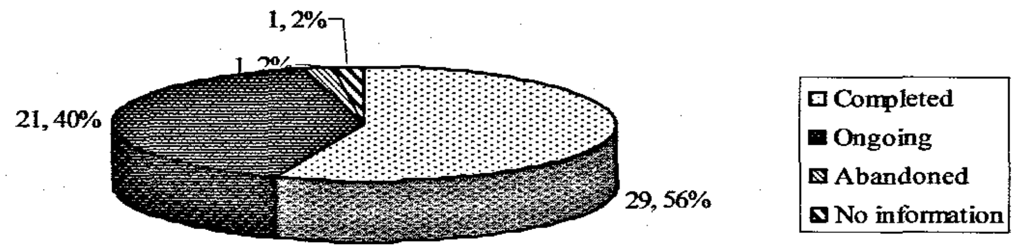

Figure 4.1: Project status - completed, ongoing, abandoned, no information

4.5.2 Implementation problems

Ascertaining whether or not projects faced implementation problems was essential in order to counter a criticism made against the goal-attainment model of evaluation: that the model's focus on results presupposes that proper implementation is a foregone conclusion (see section 3.1.5.2).

It is clear the model focuses on the consequences of implementation rather than the processes involved. It is also true that without proper implementation a project may not stand a good chance of succeeding in achieving its objectives, and making an impact.

The rationale behind the goal-attainment model or the objectives-oriented approach to evaluation is that projects are implemented to accomplish clearly defined objectives. Since the model takes achievement of objectives as primary, it stands to reason that projects should be evaluated in terms of the extent to which the results they have achieved are in line with their predetermined objectives. If projects' objectives were accomplished, the next step is to unreservedly attribute impact(s), if any, on stakeholders and other relevant parties occasioned by the accomplishment of objectives to the projects.

As a first step, however, logic dictates that without proper implementation, the chances of projects achieving their objectives is likely to be seriously hampered, and it might be futile trying to assess the extent to which objectives were achieved.

Determining whether or not implementation problems occurred and how serious they were was a signal that proper implementation is not taken for granted in this research study and to underline the importance of proper implementation in the assessment of project performance. Another reason was to establish the validity of a fundamental assumption that projects which experienced implementation problems, *ceteris paribus*, were more at risk of failure than those that did not.

As to whether implementation problems had been experienced on projects, analysis of the data indicates that 44 respondents (85%), reported that their projects did not experience any while eight (15%), reported having experienced implementation problems. The pie-chart that follows conveys this information:

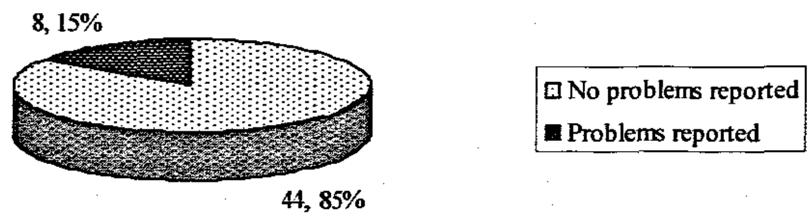

Figure 4.2: Projects with and without implementation problems

4.5.3 Seriousness of implementation problems

Project leaders were required to list major implementation problems, if any, they encountered on their respective projects and to rate how serious these problems were on a scale of 1 to 5, where 1 = not serious: 2 = moderate; 3 = serious; 4 = very serious; and 5 = critical/severe.

In all, seven implementation problems were reported by 11 respondents, about 21% of the total number of respondents, for their projects. Three respondents rated the problems they experienced as 'critical'; one as 'very serious', five as 'serious'; and one as 'moderate'. The last respondent did not specify the seriousness of the problem experienced. One respondent reported experiencing two different problems, which were rated as 'serious' and 'moderate', respectively. Specific problems experienced are shown in Table 5.1.

It is important to note four respondents did not initially report experiencing any implementation problems on their respective projects. However, asked about the severity of implementation problems experienced under item 5, two respondents indicated specific problems and rated them as 'critical/severe', and 'serious'. Given the seriousness of the problems mentioned, it is surprising, but unclear, why the respondents did not initially acknowledge experiencing problems.

Significantly, of the 11 projects reported to have had implementation problems, 10 (all with implementation problems ranging from unrated, through moderate to critical/severe, and including three of the four projects for which implementation problems had not initially been acknowledged) were reportedly successful.

The eleventh project was said to have been inconclusive, because of funding having been terminated by the sponsor as a result of a change in research priorities and also the fact that a 10-year follow-up period is required before a definite indication of its success or otherwise can be determined.

Two important points can be made about implementation problems experienced on projects. The first relates to the nature of the problems. It is significant to note that four of the projects reportedly faced implementation problems in the form of delay that had been rated as 'serious', namely: late release of funds and late authorisation to start work leading to late completion. Theft of components, negotiation with foreign research supplier owing to depreciation of rand and extension of scope of work by the industry partner, all presumably unforeseen and uncontrollable, would most certainly also have resulted in delayed project implementation and completion. Secondly, the fact that THRIP itself, rather than industry partners, is implicated in releasing funds late is of a matter of concern. This issue is raised in section 4.5.23.2 (b), page 123, in a discussion of project leaders' comments.

4.5.4 Relationship between implementation problems and projects' success

In linking projects' success or failure to implementation problems they had faced, the data suggest that of the 44 projects reported not to have experienced implementation problems, three of them, representing approximately 7%, were inconclusive while 41, 93%, were successful.

On the contrary, 10 of the 11 projects for which specific implementation problems were cited, 91%, had been successful and one (representing 9%) was inconclusive. This supports the assumption raised in section 4.5.2 that projects that experience initial implementation problems have a higher chance of failure than those that do not. Although the data do not suggest projects that experience implementation problems invariably fail, it does indicate such projects are slightly more at risk. Thus, the assumption that projects experiencing implementation problems, *ceteris paribus*, are more at risk of failure than those that do not, has substance.

4.5.5 Primary beneficiaries

The projects forming the sample for this research were implemented to achieve specifically-defined objectives with the expectation that they would generate benefits for a range of beneficiaries or stakeholders. In the context of the research, there are two broad categories of beneficiaries of THRIP/industry-funded projects, namely: primary (or main) and secondary beneficiaries.

Primary beneficiaries fall into three groups: industry partners (also called sponsors); other entities in the same industry, sector or similar line of operations (called 'related industry') and other beneficiaries, called 'other(s'), that do not belong to either the first or second group. Item 6 in the questionnaire was aimed at identifying specific primary beneficiaries.

The first group of primary beneficiaries are industry partners or sponsors who, together with THRIP, bear the cost of financing the projects. Sponsors are automatic first-line primary beneficiaries because they stand to reap certain benefits (technology transfer, for example) from financing these projects, otherwise they would have no incentive to fund them. They are essentially investors who see opportunities and collaborate with THRIP in funding these projects with a reasonable expectation of seeing a return on investment. The identification of industry partners as primary beneficiaries is vital for triangulation purposes as it gives legitimacy to the collection of relevant data from industry partners' contact persons as key informants. However, as explained in section 3.2.8, response from this category of respondents was poor.

'Related industry' is the second group of primary beneficiaries. It refers to entities (organisations) in the same industry as corporate sponsors (industry partners) or with parallel operations to those of industry partners. Such entities stand to benefit from the diffusion of new knowledge, new technologies and processes realised from the implementation and success of THRIP projects.

As new knowledge is disseminated through technology transfer and skilled people are trained, 'related industry' benefits by acquiring the technologies and/or skills at practically no, or very little, cost to themselves.

A third group of primary beneficiaries, 'other(s)', includes entities such as government departments, non-governmental organisations and settled communities of people who may directly or indirectly benefit in one way or another from the implementation and success of THRIP projects.

Project leaders were asked to indicate the specific primary beneficiary groups of their respective projects. All 52 indicated 'sponsor' as their first primary beneficiary. Fourteen respondents, about 27% of the sample, also indicated 'sponsor' and 'related industry' as primary beneficiaries and seven, about 13.5%, mentioned all three: 'sponsor', 'related industry' and 'other(s)' as primary beneficiaries. This information is found in Table 5.2.

4.5.6 Secondary beneficiaries

Secondary beneficiaries are entities second to profit directly or indirectly from the implementation and eventual success of THRIP projects. Such beneficiaries may be remotely connected to or have little direct relationship or dealings with the industry partner or sponsor. Twenty-six of the 52 project leaders (50%) mentioned various entities as secondary beneficiaries of their projects. Appendix F (pages 250-255) shows secondary beneficiaries mentioned by project leaders alongside industry partners' contact persons.

4.5.7 Problems projects were implemented to address

Each of the 52 projects in the sample was launched in the light of a specific problem(s) or situation(s) for which a solution(s) needed to be found. Thus, there were motivating factors for implementing these projects. Qualitative content analysis disclosed a number of themes in respondents' data that indicated these underlying motivations.

In general, respondents cited multiple, rather than single, motivations for implementing their projects. This explains the lack of one-to-one correspondence between the number of projects and the number of motivations cited. In other words, given that each project was implemented to address a number of problems or situations, the motivations given exceeded the 52 projects in the sample.

Analysis indicated the projects were designed and implemented to address or solve problems or situations in four domains: commercial/economic, human resource development/intellectual, social and technological. Commercial/economic and technological motivations were the overriding considerations for implementing most of the projects. However, it has to be borne in mind that the four domains of motivations for implementing these projects are not mutually exclusive and that most projects were implemented for multiple considerations, rather than one. There were 19 commercial/economic motivations for the implementing 27 projects and 18 technological considerations for the implementation of 28 projects. Human resource development/ntellectual motivations were also important, nine motivations accounting for the implementation of 23 projects. Social considerations played a minor role in project implementation, accounting for only three projects.

4.5.7.1 Commercial/economic problems

Commercial/economic motivations accounted for the implementation of 27 projects. Nineteen specific reasons were advanced in this domain as motivations for implementing projects. Seven projects had been implemented to improve efficiency in electricity distribution; five to develop new equipment/products or improve on existing ones; three to establish competitiveness of steel, reduce corrosion, and to understand cement; two to develop cryo-preservation protocols for seeds/control plant disease; and 15 for various other reasons. These are detailed in Table 5.3.

4.5.7.2 Human resource development/intellectual problems

Eleven human resource development/intellectual motivations were cited for the implementation of 23 projects. Eight had been implemented to fill knowledge gap in diagnosis/treatment of human diseases/develop drugs/vaccines, and five to build human resources, skills, capacity.

Three were implemented to develop an understanding of a (complex) process and eight for other motivations within this domain. Table 5.4 gives the relevant details.

4.5.7.3 Technological problems

Technological motivations accounted for most of the projects implemented. Twenty-eight were implemented for 18 specific technological considerations. Eight were implemented to improve communication/surveillance; four to study/solve an environmental problem; three to improve mine safety and provide efficient transport and ventilation.

Two projects were motivated by the need to improve vehicle engine performance and/or enhance safety and another two to develop space technology. Other projects were implemented for various motivations. Details of technological motivations are provided in Table 5.5.

4.5.7.4 Social problems

Social motivations, specifically health or medically-related considerations, accounted for the implementation of three projects. These motivations were: the development of an immunogen relevant to South Africa for inclusion in a vaccine; finding a biomarker to predict outcome of treatment in tuberculosis patients; and developing a market to enable pharmaceutical firms invest in new tuberculosis drug development. The motivations and relevant projects are detailed in Table 5.6.

4.5.8 Differences projects made in addressing the problems or situations that prompted their implementation

Impact is the effect a project has made or the value it has yielded to beneficiaries and/or stakeholders after having been implemented and attaining its objectives. In the context of this research study, impact is the difference a project makes in solving a problem(s) prompting its implementation. The term 'impact' suggests a clear, identifiable, measurable and direct relationship" (Commonwealth of Australia, 2000:10). However, this is not always the case.

Since assessment of impact is at the core of this research, it is important to emphasise it is one thing for a project to achieve its objectives, but quite another for it to yield short, intermediate or long-term value. In other words, there is no automatic connection between objectives attainment and impact, although the accomplishment of objectives is a pre-condition for impact to be made. However, since the projects' objectives are aspects of THRIP's strategic objectives the connection between attainment of objectives and impact is less problematic to establish.

Most respondents reported their projects yielded value, evident in the positive change in the situations that existed prior to implementation of the projects. Project leaders were required not only to indicate the difference(s) their projects made, but more importantly, to also rate these differences on the following scale: 1 = none, 2 = little, 3 = moderate, 4 = substantial, 5 = groundbreaking.

From the responses it was evident respondents had taken time to outline at length the differences they thought their projects had made. However, many failed to rate their responses on that 1-5 scale. This resulted in a situation where it was impossible to ascertain what difference some project leaders thought their projects had made.

From analysing responses, four categories of differences made were evident: technological, commercial/economic, human resource development/intellectual, and social. The technological domain, with 35 differences, was where most differences were reportedly made. This was followed by the commercial/economic sphere with 17 differences. The social and human resource development/intellectual spheres were reported to have made 13 and nine differences, respectively. Again, it has to be borne in mind that some respondents cited multiple differences.

4.5.8.1 Commercial/economic differences

Respondents reported that 17 specific differences were made by their projects. Two respondents cited three differences each and five mentioned two differences each. The remaining 11 mentioned one each. Eight respondents indicated that their projects improved efficiency.

Five of their responses were rated and three unrated. Three respondents mentioned reliability and cost-effectiveness as the difference their projects made. Two of the responses were rated and one unrated. Two respondents reported that their projects reduced losses. Both responses were rated. Fourteen projects were reported to have made one difference each; three of these differences were unrated.

Twenty respondents rated the 17 commercial/economic differences reported for their projects, with a total score of 80. This gave 4 as the average difference made by these projects. Thus, it can be said that the projects made a substantial difference in the commercial/economic arena.

Of significance is the fact that five groundbreaking differences were reported. These included: maintaining of trading relations with the European Union based on the provision of scientific evidence that dispelled concerns that South African citrus would spread black spot disease; development of a high-powered transmitter for a multiple-use mid-range laser rangefinder; new products developed in the area of high frequency components and systems; and attraction of new investments to develop a bacterial surrogate marker assay.

In addition, reliability and cost-effectiveness were achieved in environmentally sustainable use of waste water.

In addition, substantial differences were reported. These included: improved paint products; cost/loss reduction; improved efficiency; the achievement of reliability and cost effectiveness; realisation of the value of intensive management of plantations; and opportunity for small-scale farmers to a make a living out of rehabilitated land and waste water were the substantial differences projects made. Table 5.7 gives details of the commercial/economic differences projects made in addressing the problems that prompted their implementation.

4.5.8.2 Human resource development/intellectual differences

In all, 23 respondents cited differences their projects made in this arena. Three respondents each cited two differences made by their projects. In all, nine differences were reported. Two were cited by seven and eight respondents, respectively. These were awareness created, knowledge/increased understanding and postgraduates/skills training; capacity development, were cited by seven and eight respondents, respectively. All respondents rated these differences.

Five respondents reported academic contributions in terms of national/international publications, recognition, conference papers, and broad-based multi-and cross-disciplinary research, with three providing ratings. Of the remaining six differences reported, four were rated. The average rating for differences made by projects in the commercial/economic domain was 4.3. It can, therefore, be said that on average, these projects made a substantial difference in this sphere.

The most outstanding difference projects made was in the area of developing human resources, specifically postgraduate training, where the performance of four projects was rated at 5. Other groundbreaking differences were made. These included: awareness creation, increased knowledge and understanding; registration of patents, one with the potential to cure cancer and the other in new optical equipment; and the development of a new international accredited technique for rapid diagnosis of citrus black spot in export consignments.

Substantial differences were also recorded by other projects in awareness creation; increased knowledge and understanding; postgraduate training; and academic contribution: national/ international publications, recognition, conference papers, broad-based multi- and cross-disciplinary research. Details are given in Table 5.8.

4.5.8.3 Social differences

In the social sphere, 13 differences were reported to have been made by eight projects. All the differences, except one that was reported to have been made in the mining & quarrying sector, were social in nature and specifically health-related.

Two projects were reported to have made three differences each and one project made two. The other five differences were reportedly made by the remaining five projects. All the reported differences were rated. The average rating for differences made in this domain was 4.3. Thus, it can be said that the projects made a substantial social difference.

Some groundbreaking differences are worth highlighting. The development of a device that reduces the diagnostic period of tuberculosis in HIV-infected persons from two weeks to three hours by a researcher and his team at University of Pretoria represents a breakthrough with positive implications.

Additionally, the development of an immunogen by a researcher and team at University of Cape Town that has been included in a vaccine for HIV-1 sub-type C, as well as the discovery of a cancer-causing gene, a preparation for gene-based therapy, and the discovery of a cost-effective way of treating polluted mine water, are worth highlighting. Together, the medical breakthroughs are set to revolutionalise the treatment of specific diseases and improve health care delivery in South Africa.

In addition to the groundbreaking social differences just outlined, several substantial differences were made. Research on colorectal cancer was said to have uncovered disease-causing changes in patients' cells. The colorectal cancer research research project also opened up predictive diagnostic opportunities and families studied under the project were ready to be diagnosed. Furthermore, opportunities for diagnosing genetic retinal cancers in families are now possible as a result of applied research studies. Capsule development for surrogate marker assay is under way. Table 5.9 carries the details.

4.5.8.4 Technological differences

Thirty-five differences were reported to have been made by projects in the technological sphere. Although many respondents reported multiple differences in this domain, the largest number of respondents, 17, cited the development of new/improved designs, equipment, facilities, models, processes, procedures, protocols, tools, techniques, and technologies as the difference their projects had made. One respondent cited this difference twice.

Four respondents thought the difference made in this specific area was groundbreaking while eight thought it was substantial; five did not provide ratings.

Of the 27 respondents who reported 35 aspects of technological differences their projects made, two mentioned four differences; seven mentioned three; and six mentioned two. In all, 15 respondents indicated that the difference made by their project was groundbreaking and 15 said it was substantial.

A groundbreaking difference was made in space technology by a project undertaken by academics/researchers based at University of Stellenbosch. They not only established a micro-satellite industry in South Africa, but earned the university and South Africa a place among serious players. The crowning effort was the establishment of a micro-satellite space industry in the country, and the development and launch (in 2003) of a 65kg satellite with close to imagery Spot 2 in collaboration with the National Aeronautics and Space Administration (NASA) in the United States. In doing this, according to the project leader, it has been proved that established space can be reached at a far lower cost than the industry is achieving.

Among other groundbreaking differences reported were: capability of using imaging radar in a variety of applications; development of a radio backbone with protocols and power; development of a sensitive receiver; a high-powered transmitter; development and patenting of new optical components; the characterisation of seed recalcitrance; completion of the characterisation of optical fibre components and their functionality; the solving of harmonics and voltage distortion in electrical networks; the use of information technology in the design process through a mathematical code; and the ability to test electricity transmission lines under different climatic conditions.

Many substantial differences were reported to have been made by projects, including the designing of software tools to design and manage refrigeration and ventilation; the development of a model for tank teaching; and the establishment of scale-up criteria for manufacturing. Others were the development of a robust, light-weight, cheap, in-store direct contact air cooler for use in mining; technological input and development that enabled more effective control of mango black spot disease; the achievement of improved signal processing in the midrange laser range-finder; forefront status in technology regarding speed, distance and reliability achieved in free space laser communication link, among others.

Moderate differences made were reported for four projects. These, together with details on all differences made in the technological sphere, are shown in Table 5.10.

4.5.9 Main objectives of projects and levels to which they were achieved

Since the approach used for impact assessment was the goal-attainment model or (objectives-based evaluation), it was essential to include an item in the questionnaire that sought, firstly, to identify projects' objectives and, secondly, to ascertain and correlate the levels (in percentage terms) of their achievement.

For this reason, project leaders were asked to state the main objectives of their projects in descending order, from most to least important. This signalled that only top-priority objectives were to be stated. Respondents were also required to indicate (in percentage terms) the level to which each objective was achieved, to indicate how successfully or otherwise individual objectives had been accomplished.

For purposes of analysis, the following interpretation was applied to the percentages provided for objectives' achievement:

0% - 19% = little achievement;
20% - 39% = moderate achievement;
40% - 59% = average achievement;
60% - 79% = good achievement;
80% - 89% = substantial achievement;
90% - 100% = full achievement.

Of the 52 respondents, only one failed to provide both objectives and ratings for the project as required.

Projects' objectives were first analysed for dominant themes. Following thematic analysis, they were grouped into the following broad thematic categories: commercial/economic, human resource development/intellectual, social and technological. Ratings given by respondents were captured alongside the relevant objectives in each category.

To arrive at a rating representing the average level of achievement of projects' objectives for each category, all percentage ratings per category were added and divided by the number of rated objectives.

These average percentages were then taken as a measure of how successfully or otherwise projects collectively had been in achieving each category of objectives.

4.5.9.1 Commercial/economic objectives

Twenty-five commercial/economic objectives were stated by 19 respondents for their projects. One respondent cited three different objectives and four cited two objectives each. The other 14 respondents mentioned one each. Of the 25 objectives, nine respondents did not provide achievement ratings for the objectives of their projects. The 16 achievement ratings provided were: nine at 100%, one at 95%, two at 90%, two at 80%, and two at 50%. This gave an average achievement rating of 90%, indicating full achievement of commercial/economic objectives. Relevant details are outlined in Table 5.11.

4.5.9.2 Human resource development/intellectual objectives

Nineteen respondents cited 19 objectives that fall under the ambit of human resource development/ intellectual. One cited three objectives and five mentioned two each, with the other thirteen mentioning one each. Seven objectives focused specifically on skills development/training. Items 1-7 in Table 5.12 relate to skills training objectives. Twelve objectives centred on the purely intellectual/academic. These are shown as items 8-19 in Table 5.12. The predominant objective in former skills/training strand was training of postgraduate students, cited by eight respondents, four of whom provided ratings for their projects' levels of objectives achievement. Three respondents did not supply rating information on this particular objective. One rated the project objectives' achievement at 100%, one at 95%, one at 90%, and one at 70%.

On achievement of the remaining six objectives focused on training, two were rated at 100% achievement and two at 90%. Rating information was not provided on two objectives by the respective project leaders.

Twelve respondents cited objectives that centred on the intellectual, with one citing two objectives. Eight objectives had achievement ratings: three were scored at 100%; one at 90%, three at 80% each and one at 70%. Four respondents did not indicate the level of achievement of their projects' objectives. The average level of achievement for objectives in the human resource development/intellectual domain was 90%. Thus, this cluster of objectives was fully achieved.

4.5.9.3 Social objectives

Social objectives specifically focused on health dominate this category. Eight project leaders provided 12 objectives, with four citing two objectives each. Four indicated a 100% achievement; one was rated at 90%, two at 80% and one at 50%. Four objectives did not have achievement ratings. The average level of achievement of social objectives was 88%. In other words, projects' objectives were substantially achieved. Table 5.13 shows the various social objectives, their respective ratings and the relevant projects.

4.5.9.4 Technological objectives

As with commercial/economic objectives, 25 technological objectives were cited by respondents for their projects. Seventeen were rated for achievement while eight respondents failed to provide achievement ratings. Six of the objectives were rated at 100% achievement and one at 95%, four were were rated at 90%, another four at 80%, one at 70% and one at 50%. The average level of achievement for objectives in this category was 88%. Thus, technological objectives were substantially achieved. Table 5.14 gives detailed information.

4.5.10 Sample of reasons given for ratings of objectives

The inclusion of this item was to give project leaders an opportunity to reflect on reasons for rating the achievement of their projects' objectives the way they did. It was expected that a reason or explanation would be given for the particular rating of each objective. This was to ensure that project leaders had carefully, objectively and critically assessed projects' level of achievement on each stated objective. This would have been done after introspection and reflection that would give validity to the ratings.

Since projects' objectives were thematically categorised, rather than analysed on project-by-project basis, reasons given for ratings of objectives are a sample taken to match some of the objectives earlier discussed. They are an important part of the research as they help to clarify the ratings given for differences made in sections 4.5.8.1 to 4.5.8.4.

Respondents were required to give a maximum of five reasons, each corresponding to one of five (maximum) project objectives they may have indicated under item 10 in the questionnaire. From the responses provided under item 10, it was clear that there was no uniformity in the number of objectives respondents gave.

While some respondents gave five, others provided less. Further, not all the objectives stated were rated to show their levels of achievement.

Of the 52 respondents, three did not give reasons for rating their projects' objectives. One of the three respondents cited three objectives the project aimed to achieve. Another indicated two objectives. However, neither rated the level of achievement for these objectives. A third respondent did not state any objectives and, naturally, provided no reasons for ratings.

Sixteen specific reasons for ratings given by respondents on specific project objectives are given in Table 5.15. These serve to underline how seriously project leaders had thought of the ratings they had given for the achievement of their projects' objectives.

4.5.11 Specific benefits yielded by projects

Crucial to this research is the assessment of benefits that accrued from implementing the projects that make up the sample. The yielding of benefits is, after all, the reason they were designed and implemented since it is inconceivable that project leaders would have invested money without anticipating returns in one form or another. Such anticipated benefits could be at the micro (individual) or macro (institutional and national) levels. Individual academics/researchers could benefit as a result of, for example, publications, conference papers, or registration of patents.

Benefits at the macro-level could accrue to industry partners (sponsors). Also at the macro-level, projects might yield benefits or show the potential to benefit whole industrial sectors or even the country as a whole, in one or more ways.

Thematic analysis of responses identified four categories of benefits: commercial/economic, human resource development/intellectual, social and technological. All 52 project leaders, except one, reported various benefits accruing from their projects.

4.5.11.1 Commercial/economic benefits

Ten respondents reported that their projects yielded various commercial/economic benefits. These included the setting up of two companies; one was reported in the aerospace industry and another in manufacturing to produce power electric converters; both opening up other commercial/economic opportunities. Additionally, consultancy services in corrosion were established by students trained under one of the projects.

Products such as price and service-competitive borehole radar systems, and a density meter were developed. Furthermore, medical and industrial sensors were developed, manufactured and are used in industrial settings. Another benefit was the creation of awareness in higher educational institutions of the savings impact of Demand Side Management. Finally, in the manufacturing and processing sector, probiotic was applied in yoghurt. These benefits and the relevant projects are detailed in Table 5.16.

4.5.11.2 Human resource development/intellectual benefits

From analysis of the data, it is unarguable that THRIP/industry-funded projects are contributing immensely to developing human resources in SET to the benefit of South Africa. Of all the categories of benefits cited, human resource development/intellectual benefits was reported as having the most benefits accruing to projects.

In all, 19 project leaders cited 24 benefits accruing to their projects. Postgraduate training and development of other expertise; registration of patents; consultancies and consortia; research opportunities and expanded breadth of research, especially research involving gold and platinum; and collaborative research and networking were some of the benefits reported. Table 5.17 gives details of this category of benefits.

4.5.11.3 Social benefits

Three respondents reported five benefits in this category, with one citing three and another two mentioning one each. Four of these were health-related: treatment for arthritis; potential treatment for asthma; insight into how TB infection occurs in patient host cells; and improved understanding of the causes of cancer. A fifth benefit was the creation of jobs from a spin-off company, Sunspace Pty (Ltd). These benefits and the projects to which they relate are indicated in Table 5.18.

4.5.11.4 Technological benefits

Six respondents cited technological benefits accruing to their projects. One was development of a rapid diagnostic technique for controlling citrus black spot disease. The others were: application of free space laser communication link technology in other products; development of an ad hoc network technology for farm information systems; availability of technology that can be used to track particles; setting up of a centre for high performance computing at Mowbray under the auspices of the University of Cape Town.

Lastly was development, patenting and implementation of a limestone handling and dosing system. Table 5.19 provides the relevant details.

4.5.12 Positive unintended impacts or spin-offs

Although not all projects generated spin-offs, respondents reported spin-offs in a number of areas. In all, 27 positive unintended impacts or spin-offs were reported: 10 in the human resource development/intellectual sphere, seven in the technological domain, eight in the commercial/economic sphere and two in the social arena. An outline of spin-offs in each area is now provided.

4.5.12.1 Positive commercial/economic impacts

Fifteen respondents reported eight spin-offs in the commercial/economic front. Among other, these included: the development of marketable products/systems; the setting up of a new company, consultancy or facility; exposure to industry and contact with other industries; opening up of new opportunities; fine-tuning of research to meet industry needs; ability to leverage funds; and the creation of awareness in respect of the savings impact of Demand Side Management. Table 5.20 outlines all the relevant details.

4.5.12.2 Positive human resource development/intellectual impacts

In all, 21 respondents cited 10 impacts or spin-offs in the human resource development/intellectual sphere. Specifically, the development of human resource, capacity, technical experience/expertise was reported as a spin-off by nine respondents. Eight cited development of courses, consultancy, national/international research collaboration; three indicated increased breadth of research and new opportunities; and three cited registration of patents. Other spin-offs recorded included: increased understanding/treatment of plant diseases; improved understanding of the causes of cancer; insight into the mechanism of tuberculosis infection; the increasing use of gold and platinum in anti-cancer research; availability of information on the global distribution of citrus black spot disease; and knowledge gained about the sub-optimal nature of some solutions implemented in telecommunications industry. Table 5.21 provides detailed information.

4.5.12.3 Positive technological impacts

Seven respondents cited technological spin-offs, namely: diagnostic technique for tuberculosis in HIV-infected persons; application of free space laser communication link in other products; development of procedures for managing design process through information technology; the application of probiotic in yoghurt; technology for tracking particles developed; the potential of applying neutralisation and sulphate removal technology to treatment of sulphur dioxide-rich gases; and use of life cycle assessment as a primary decision-making tool in environmental impact analysis. The information and the relevant projects are shown in Table 5.22.

4.5.12.4 Positive social impacts

Two respondents reported two direct social spin-offs from their projects: job creation and treatment for arthritis, respectively. The latter coupled with a reported potential treatment for asthma since antigens worked in mice. Job creation, one of the two reported spin-offs, is likely to be reinforced by spin-offs in the commercial/economic, human resource development/intellectual, and technological spheres. For example, the setting up of new companies means people need to be trained and equipped with skills. Better understanding of human diseases and availability of drugs for treatment means better health care, a healthier society and better quality of life. New technologies open up improvements in industrial processes leading to greater efficiency and effectiveness. Details of these spin-offs are reflected in Table 5.23.

4.5.13 Negative unintended impacts

Four categories of negative unintended impacts emerged from analysis of the responses: commercial/economic, human resource development/intellectual, technological, and administrative. These are briefly sketched.

4.5.13.1 Negative commercial/economic impacts

In the commercial/economic arena, two negative impacts were reported. First was the non-implementation of the Universal Telecommunication Access System for the Southern African Development Community because of monopolistic tendencies of satellite operators such as PAN AM SAT. The second was the loss of growers' or farmers' interest in attempts to control mango black spot disease because drought had effectively stopped its recurrence, leading to termination of the project. Table 5.24 gives relevant details.

4.5.13.2 Negative human resource/intellectual impacts

Four impacts were cited by respondents. Three impacts related to students either taking too long to complete their studies, or not completing at all because they had either abandoned their studies or had been poached by the industry partner on the project. The other was the collapse of a research consortium as a result of disputes among collaborators. Table 5.25 shows these impacts and the relevant projects.

4.5.13.3 Negative technological impacts

Four respondents reported negative impacts in the technological sphere. Three impacts were in the mining and quarrying sector, namely: failure of water transformer technology; the unattractiveness of lateral hydraulic transport for deep mining; and blocked pipes caused by stone in limestone from the paper industry. The fourth impact, piracy by Chinese from their South African partners of technology that had been fine-tuned on the engine development project, was in the manufacturing and processing sector. These impacts and the projects they are attributed to are shown in Table 5.26.

4.5.13.4 Negative administrative impacts

Eleven negative impacts of an administrative nature were reported by nine respondents. These impacts included: administrative overloading of project leader, unnecessary paperwork, time demands, split focus of researcher, great effort to get management buy-in, near derailment of project owing to change of industry partners' policy on funding,and reduced funding by industry partner.

Others negative administrative impacts were: uncertainty of funding, long wait for authorisation to start construction, and the negative attitude of THRIP. Details are shown in Table 5.27.

4.5.14 Contrary effects or impacts and levels of seriousness

Project leaders were asked if any effects or impacts contrary to expected impacts had resulted from their projects' implementation. They were then required to rate the seriousness of these impacts on a scale of 1 to 5, where 1 = not serious; 2 = moderately serious; 3 = serious; 4 = very serious; 5 = critical/severe.

Eight respondents indicated that contrary impacts had resulted from their projects. Seven of the impacts were rated to show how serious they had been. One was rated as 'critical'; two were rated 'very serious'; another two as 'serious'; one was moderately serious, and one was reported as not serious. One reported contrary impact was not rated.

The most serious contrary effects were five: liquidation of industry partner, leading to students not completing their studies; termination of project owing to the fact that farmers lost interest as a result of drought stopping the recurrence of mango black spot disease; the discovery of heptospirillum as the main oxidiser in bioleach systems; financial loss incurred by designers and builders of water transformer; and the non-adoption by industry partners of some recommendations made by the project leader and the team. Table 5.28 outlines all the effects linked to their respective levels of seriousness and the relevant projects.

4.5.15 Performance of projects: successful, unsuccessful or inconclusive?

In the context of this research, impact assessment is predicated on projects achieving objectives they had been designed and implemented to accomplish. Since the research is premised on the primacy of objectives' achievement, it was essential to ascertain from project leaders and industry partners' contact person their perceptions of how well or otherwise the projects had fared overall. Analysis of responses indicated that 48 project leaders (92%) rated their projects as successful and four as inconclusive.

Specifically, 38 of the 42 single-sector projects spanning seven standard industrial classification categories were judged by project leaders as successful while four were said to be inconclusive. All projects in SIC 2, SIC 5, and SIC 7 were said to be successful while four out of five projects in SIC 1, and seven out of eight in SIC 3, SIC 4 and SIC 8 were successful. All 10 cross-/multi-sectoral projects were also successful. Four respondents (8%) indicated their projects were inconclusive. This information is shown in Tables 5.29 and 5.30.

Eighteen of the 21 contact persons (about 86%) said the projects they represented were successful, two (about 10%) said theirs were unsuccessful and one indicated the project was inconclusive. This information is presented in Table 5.67.

Linking projects' success/failure to their status discussed in section 4.5.1, it was found that 26 of the 48 successful projects, about 54%, were completed at the time of data collection while 22, representing 46%, were ongoing. Of the four inconclusive projects, three were completed and one was ongoing. Table 5.29 summarises the overall picture of projects' status in relation to their performance.

Various reasons were given for the inconclusiveness of four projects. One was rated inconclusive on the grounds that it had not run its full course. The liquidation of the sponsor of another project in 2001 resulted in the project not being completed.

A third project was said to be technically completed but not implemented at the end-user level. The project leader also pulled out because of heavy involvement elsewhere. Two factors accounted for the inconclusiveness of the fourth project. Firstly, funding was terminated owing to the industry partner's reprioritisation of its research focus. Secondly, mandatory 10 years follow-up studies would still have been required before any definite conclusions could be drawn on the success or otherwise of the project.

Analysed for success and inconclusiveness on sectoral basis with data obtained from project leaders, of 42 single-sector projects, 38 were successful and four inconclusive. To be more specific, four of the five projects in Agriculture, Hunting and Fishing were successful. All six in the Mining and Quarrying sector were successful. Seven of the eight projects Manufacturing and Processing; Electricity, Gas, Water Supply and Usage; and Health, were successful. Both projects in the Construction and Environment sector were also successful, as well as all five in the Transportation, Storage and Communication sector. Finally, all 10 cross-sectoral projects (representing 19% of the total) were successful. This information is depicted in Table 5.30.

4.5.16 Indicators of projects' success

Four clusters of success indicators emerged from analysing the data: commercial/economic, human resources/intellectual, technological, and social. The largest number of projects for which indicators were reported was in the human resource development/intellectual category. This was followed by the commercial/economic, technological and social domains. Seventeen commercial/economic indicators were cited by contact persons; 16 in the human resource development/intellectual domain, and nine in the technological sphere. None was reported in the social arena. This information is presented in Tables 5.68-5.70. A brief characterisation of indicators cited by project leaders in each of the four categories follows.

4.5.16.1 Commercial/economic indicators of success

Thirty indicators of success were reported in this cluster by 27 respondents. Among them were: development, launching and commercialisation of products; increased exports opportunities for South African citrus; establishment of new companies; and use of waste water to treble crop yields of good quality.

Another indicator was: industry partners' satisfaction and confidence in projects reflected in continuation projects and increased investment, to mention a few. A comprehensive list of these indicators is shown in Table 5.31.

4.5.16.2 Human resource development/intellectual indicators of success

Four main indicators were reported in this category by 32 project leaders, with 16 citing two each and three mentioning three indicators each. Two indicators accounted for the majority of respondents, each cited by 24 and 21 respondents, respectively. Twenty-four mentioned human resource (capacity/skills) development while 21 variously mentioned publications; manuscripts; conference papers; courses; continued research and consultancy; contribution to international knowledge of drugs; and the establishment of a Centre of Excellence. Registration of patents was cited by four respondents and two mentioned awards; national and international recognition or impact as an indicator of their projects' success. With only four objectives in the human resource development/intellectual sphere it, nevertheless, had the biggest number of respondents citing indicators among all the clusters. Table 5.32 shows the details.

4.5.16.3 Social indicators of success

This cluster of success indicators relates to direct benefits to society emanating from projects in the health sector. In all, five respondents cited six indicators. These are detailed in Table 5.33.

4.5.16.4 Technological indicators of success

In this area six indicators were mentioned by 11 respondents. Six cited widespread application or use of knowledge, technology, results, tools as an indicator of their projects' success. Five indicators, each mentioned by one respondent, were: development and launch of a micro-satellite; development of cryo-preservation technique; use of natural anti-microbial compounds to preserve fruit juice; improved surveillance; usefulness of forecasts; and better production processes. These indicators and the relevant projects are shown in Table 5.34.

4.5.17 Managerial and other strategies used to achieve success

It was important to establish the managerial strategies respondents used on their respective projects to achieve success, given that one aim of the research is to facilitate the formulation of guidelines, working policies or strategies that could serve as a blue-print for managing applied research projects. Analysis indicated that other than managerial strategies consciously used by respondents on their projects, environmental and personal factors contributed to achieving success.

In all, 44 respondents provided 16 different strategies they employed on their projects. Twenty-nine of them reported using multiple strategies ranging from two to six while 15 mentioned one strategy each. One respondent cited six strategies; another five; four mentioned four; eight cited three; and 14 cited two.

4.5.17.1 Managerial strategies

That managerial strategies were instrumental in projects' success is evident from analysis of the data. Communication, cited by 20 respondents, was the most widely used strategy to achieve success. It was closely followed by teamwork, collaboration, cooperation; and financial managenment and control, each cited by 15 respondents. Good leadership, including planning and motivation was cited by 13 respondents. For respondents whose key objective was human resource/intellectual development, close supervision/involvement with students proved to be a winning strategy. It was cited by 12 respondents. Other strategies that bore fruits for six respondents each were focused, goal-oriented effort, and technical expertise/building of appropriate capacity. Each was cited by six respondents as having played an important role. Nine other strategies were mentioned. Table 5.35 outlines the various managerial strategies respondents used on their projects.

4.5.17.2 Environmental and personal factors

In addition to the consciously-employed managerial strategies outlined above the data indicated that environmental and personal factors played an important role in the success of some projects. Two environmental and three personal factors were cited by 15 respondents. Six mentioned supportive environment, good organisation, and structure as having played an important role. Academic freedom, the other environmental factor, was mentioned by one respondent.

Three personal factors that emerged as important were: Hard work, perseverance, optimism', cited by five respondents; creativity/common sense, mentioned by two; and a scholarly approach, cited by one respondent. These facilitating environmental and personal factors are outlined in Table 5.36.

4.5.18 Reasons for failure or inconclusiveness of projects

Respondents were asked, in the case of projects that were unsuccessful or inconclusive, to mention contributory factors or reasons that might have accounted for these situations. A total of 16 reasons were given. Five of them were from the four project leaders whose projects were inconclusive. Eleven others were advanced by seven respondents whose projects had been successful. Given this, the factors or 'reasons' they gave might be interpreted as concerns or problems they experienced. Since there were no unsuccessful projects no factors were advanced in that respect. All the reasons factors/reasons for projects' inconclusiveness or concerns are outlined in Table 5.37.

4.5.19 Hindsight actions

Asked what they would have done differently in hindsight to improve the chances of their projects' success, nine respondents mentioned 12 ways in which they might have handled their projects differently. One respondent suggested four different actions: improve networking with industry role players; get academics to market themselves and research more effectively to industry; continued direct communication with industry at all levels; and improve academia's communication skills. It is significant that all four actions are communication-related, underlining its importance in management, but more particularly in the management of projects. Three respondents representing projects in the Mining and Quarrying sector suggested reducing the level to which industry needs drive the programme. Another respondent suggested two actions for the projects: firstly, academics should bring additional knowledge to the table; secondly, industry should be given charge of what it is good at doing. Various other actions were suggested by the other four respondents. Details of all suggested actions are in Table 5.38.

4.5.20 Sectoral distribution of projects

Of the 52 projects, 42 were single-sector projects spread among the seven standard industrial classification categories or sectors. The majority of them, 24, were evenly distributed (eight each) among Manufacturing and Processing (SIC 3); Electricity, Gas, Water Supply and Usage (SIC 4); and Health (SIC 8).

Six projects were in the Mining and Quarrying sector (SIC 2); five in Agriculture, Hunting and Fishing (SIC 1), and Transportation, Storage and Communication (SIC 7); and two in Construction and Environment (SIC 5).

Ten projects were cross-/multi-sectoral, distributed as follows: one spanned four sectors: SIC 2, SIC3, SIC 4 and SIC 5. Four projects spanned three sectors each: the first covered SIC 1, SIC 2, and SIC 3; the second covered SIC 1, SIC 3, and SIC 5. The third embraced SIC 2, SIC 3, and SIC 4; the fourth spanned SIC 2, SIC 3, and SIC 5. Five projects covered two sectors each: three spanned SIC 3 and SIC 7; one spanned SIC 1 and SIC 2 while the other covered SIC 3 and SIC 4. Table 5.39 shows the distribution of single and cross-/multi-sectoral projects among the standard industrial classification categories.

4.5.21 Durations of projects

It takes at about three years for project impacts to manifest. Consequently, it was of utmost importance to establish how long projects had run at the start of the investigation. All respondents, except one, provided the required data. Analysis of responses indicated that not a single project was reported to have been running for less than two years at the time the data were collected. This effectively meant that the options 'less than a year' and 'one year' were inapplicable as options. Eight projects were said to have run for two years, 19 for three years, six for four years, and 18 longer than four years. For projects that had run for more than four years, it is important to state more specifically here that two had run for eight years; one for more than seven years; two for seven years; three for six years; and two for five years. Four projects were said to have run for more than four years. In all, 43 projects, approximately 83% of the sample, had run for three years or more, a period in which impacts can reasonably be expected to manifest. Information on project durations is presented in Table 5.40.

4.5.22 Funding levels

In terms of funding, six respondents indicated that their projects were funded for less than R499 99 each; nine reported a funding amount of between R500 000 and R999 999 each; 11 cited funding of between R1 000 000 and R1 999 999; 12 reported funding of between R2 000 000 and R4 999 999. Two respondents reported funding of between R5 000 000 and R7 999 999; and 11 indicated funding of more than R8 million. More specifically, four projects in the last category had been funded to the tune of R11 million, R16 million, R24 million, and R30 million, respectively. No funding information was supplied for one project. Table 5.41 shows the funding levels of all projects in the sample.

4.5.23 Comments by project leaders

This section of the questionnaire was meant to give project leaders an opportunity to express their views on any issues related to their projects. Views expressed tended to centre around four issues: THRIP itself as a facilitator of on applied research, funding, online application and reporting procedure, and perceptions of the relationship between the government (THRIP), private sector (industry partners) and academia (academics and researchers). Tables 5.42 to 5.46 are a more or less word-for-word reproduction of comments made by respondents relating to the four focal issues.

4.5.23.1 THRIP as facilitator of applied research

Not every project leader expressed views on THRIP's role in facilitating applied research. While one may not speculate on the silence of the majority, it should not be taken for satisfaction with the way THRIP does things. Nevertheless, some very positive comments were made. On the whole, these outweighed negative comments. However, it is important that the negative comments not be dismissed as the views of an insignificant minority. THRIP needs to take these comments seriously in order to improve its operations.

(a) Positive comments

Eight positive comments were made. THRIP is seen as a great initiative and an excellent vehicle that, among other things, involves industry in relevant research that is meaningful for developing know-how and developing products with commercial value. It encourages industry to fund research in universities since there is a return on investment for industry. Its role in project success is acknowledged and underlined in statements such as: "without THRIP no achievement would have been possible" and "successful commercialisation of neutralisation and sulphate removal technology is a direct result of THRIP support". It is also seen as offering a rare opportunity for unrated scientists to build a research record. Technical support is said to have improved and THRIP staff were reported to be helpful. Table 5.42 gives detailed positive comments made on what THRIP is doing well.

(b) Negative comments

On the negative side, concern was expressed about THRIP's over-emphasis on projects making political (demographic) and economic contribution instead of focusing on achieving their scientific objectives and doing good science that leads to manufactured products. The need to stabilise things was also a source of concern.

Administrators are thought to lack focus. THRIP is said to have changed its mind three times in four years. This underlines lack of clarity as to what THRIP wants. An apparent mismatch between questions on the application form and THRIP objectives was pointed out. Lastly, it was said that THRIP uses multiple criteria but does not give feedback to academics/researchers on how they can improve. These criticisms are detailed in Table 5.43.

4.5.23.2 Funding

Analysis of comments relating to funding indicated a number of positive comments, but, on the whole, a negative reflection on THRIP's handling of funding matters emerged alongside suggestions, indicating a high degree of dissatisfaction.

(a) Positive comments

On the positive side, 10 respondents made comments acknowledging the role THRIP funding has played: it was essential in getting things done; enabled useful work, especially basic research, to be done; helped in maintaining laboratory equipment; allowed students to be employed, helped financially and trained. This training aspect, it was pointed out, would not have been possible with only industry partner's involvement.

THRIP also helped in obtaining additional funds; and enabled a broadening and extension of a project that had been constrained by scope, time and budget to successful develop manpower and deliver on technology development programme. These comments are listed in Table 5.44.

(b) Negative comments

The positive comments mentioned earlier were, however, accompanied by negative comments. In all, 13 respondents made negative comments. Nine focused on late release of funds. Two respondents lamented instances of THRIP's failure to honour its 100% funding agreement by cutting back and remitting less than the agreed amounts.

One respondent cited difficulty in getting funding from industry although it gains a lot from applied research, while another pointed out the termination of funding by the industry partner owing to the machinations of a rival entity. Table 5.45 outlines negative comments and suggestions.

(c) Suggestions

Three comments were suggestions. Two respondents suggested the involvement of pharmaceutical and biotechnology companies in projects to achieve funding sustainability, rather than the current practice of restricting collaboration to only industry. The third comment reflected dissatisfaction with the fact that academics and researchers do not have the freedom to use approved funds as they see fit and suggested that they be given more freedom. These suggestions are marked with asterisks (*) in Table 5.45.

4.5.23.3 Online application and reporting system

Eight respondents commented on THRIP's online application and reporting system. Although a small number in relation to the total number of respondents, it is significant given that seven of the comments were negative and touched on an important operating procedure. Five respondents were unequivocal about the system being "difficult to work with", "tedious, ... complicated and time-consuming", having "become a monster", "not user-friendly", and "frustrating". One respondent expressed unhappiness with the annual reporting system being "too frequent" while a seventh respondent criticised the constant changing of THRIP's website. The last respondent suggested that since industry gains a lot from these collaborative research projects, it is only proper that applications come from industry partners rather than academics/researchers. Detailed comments and the suggestion (marked with asterisks) are captured in Table 5.46.

4.5.23.4 Perceptions of relationships among THRIP, academics/researchers, and industry partners

That a triple helix system of collaborative applied research has taken root in South Africa is reflected in comments eight respondents made in connection with the working relationships among the three players (government, industry and academia) in THRIP/industry-funded applied research. Unanimously, these respondents highlighted mutually satisfying working relationships among the three collaborating partners, signalled by expressions such as "good relationship"; "close working relationship"; good cooperation"; "collaboration"; triangular relationship worked well", "good triangular relationship"; and "industry and academia very happy". The fact that there was almost positive unanimity in views regarding the working relationships among government, industry and academia is significant as it reflects confidence respondents have in THRIP and industry. Singularly, the ninth respondent recorded a negative comment, namely: unwillingness of industry partners to work with the researcher on the project. Table 5.47 provides details of respondents' perceptions.

"Collaboration" came up on several occasions in the comments made by project leaders and in responses to other items in the questionnaire. The significance of this lies in the acknowledgement that in running these projects mutuality of needs, benefits and responsibilities is at the core and that the proper functioning of the tripartite relationship involving academics/researchers, industry partners and THRIP is crucial for success.

4.6 Analysis of data provided by sponsors' contact persons

4.6.1 Introduction

This questionnaire was administered to sponsors' contact persons and aimed at introducing a degree of triangulation into the research. It was hoped that each of the 52 project leaders' responses received would have been matched by responses from respective contact persons on the relevant projects. This would have ensured a good measure of triangulation. However, owing to several factors explained in section 4.9, the response rate to this questionnaire was rather poor. Only 21 responses were received. As with the questionnaire for project leaders thematic analysis was undertaken to facilitate analysis.

4.6.2 Status of projects

Of the 21 responses received, nine respondents stated that the projects were completed while twelve indicated they were ongoing. Table 5.48 shows the distribution of projects by status.

4.6.3 Primary beneficiaries of projects

All 21 contact persons indicated employers were the main beneficiaries of benefits accruing from the projects they co-funded. Appendix D (pages 240-243) provides details of primary beneficiaries (industry partners) while Appendix E (pages 244-249) gives the names and other details relating to contact persons.

4.6.4 Secondary beneficiaries

Only six of the 21 respondents gave the names of secondary beneficiaries. The beneficiaries were: Miningtek, Peralox Electronics, Network distribution channels in Africa, Landau Colliery (Amcoal) navigation section, C&CI Technical Advisory Committee, and Poynting. The other fifteen respondents either indicated "N/A" or did not supply any information.

With other relevant information, Appendix F (page 257) gives the names of secondary beneficiaries mentioned by respondents.

4.6.5 Main objectives of projects

Many objectives, falling into three clusters or categories (commercial/economic, human resource development/intellectual, and technological) were cited by respondents. Twenty-five objectives were mentioned in the human resource development/intellectual domain, 18 in the commercial/economic, and 17 in the technological.

Respondents were asked to rate the importance of these objectives on a scale of 1 to 5, where 1 = least important, 2 = moderately important, 3 = important, 4 = very important, 5 = crucial. A brief discussion of each cluster of objectives follows in the next section. To arrive at the average level of importance for the objectives given in each category, the ratings for all objectives were added and divided by the number of rated objectives.

4.6.5.1 Commercial/economic objectives

Eighteen commercial/economic objectives were cited by respondents for 14 projects, with three objectives attributed to one project; two each to two projects, and one for each of the remaining eleven. In terms of importance, six respondents rated their projects' objectives as 'crucial'; and three rated them as 'very important'. Two respondents rated them as 'important'; three as 'moderately important'. One respondent rated his project as 'least important'. Three objectives were not rated. The average level of importance for objectives in this domain was 3.67. Details of objectives and their respective ratings are given in Table 5.49.

4.6.5.2 Human resource development/intellectual objectives

This cluster registered the most objectives. In all, 25 objectives were cited for 16 projects. Three objectives each were attributed to three projects; two to each of three projects, with the remaining 10 projects having one objective each. All the objectives, except one, were rated. Seven respondents rated their projects' objectives as 'crucial'; two rated each of two objectives they had cited for their projects as 'very important'. Six other respondents rated their projects' objectives as 'very important'. Four objectives were rated as 'important'; two were rated as 'moderately important'; one as 'least important', one was not rated. The average level of importance for this cluster of objectives was 3.83. Relevant details pertaining to these objectives are provided in Table 5.50.

4.6.5.3 Technological objectives

Seventeen technological objectives were cited for 12 projects, one of which was not rated for level of importance. Of the 16 that were rated, eight were said to be 'crucial' and six 'very important'. One was 'important'; and one 'moderately important'. On average the level of importance for this category of objectives was 4.3. Table 5.51 shows these objectives and their respective ratings.

4.6.6 Motivating factors for achieving projects' main objectives

It was important to find out the motivating factors for the achievement of projects' objectives and how important these factors were. Consequently, respondents were asked to state a motivation corresponding to each objective they had given and to show how important it was by assigning it a number on a scale of descending order, where 5 = most important; 4 = very important; 3 = important; 2 = moderately important; 1= least important.

A number of motivating factors were advanced by respondents. These factors were categorised into three groups: commercial/economic, human resource development/intellectual and technological. Twenty-five motivating factors were advanced for objectives in the commercial/economic sphere; 25 in the human resource development/intellectual domain, and 17 in the technological domain. Each of the three categories of motivating factors is now examined.

4.6.6.1 Motivations for achieving commercial/economic objectives and ratings

Twenty-five motivating factors were advanced by 17 respondents. However, only 10 of the objectives were provided with ratings. Fifteen other respondents did not give any rating information. Five were rated as 'most important'; three as 'very important'; one as 'important' and one as 'moderately important'. Majority of respondents did not give any information on the importance of their projects' objectives. The average rating for the 10 objectives for which ratings were provided was 4.2. This figure is not very meaningful given that it represents the average of less than half of the motivations provided. Details of motivations, ratings and relevant projects are shown in Table 5.52.

4.6.6.2 Motivations for achieving human resource development/intellectual objectives and ratings

Of 25 human resource development/intellectual objectives cited by 18 respondents in 4.6.5.2, 23 had corresponding motivating factors. Two respondents did not provide any motivations. Of the 23 motivating factors, 19 were rated. Six were rated as 'most important', six as 'very important', five as 'important', one as 'moderately important' and one as 'least important'. On average, the level of importance motivating factors in this category was 3.8. Table 5.53 shows the motivating factors, their respective weights and relevant projects.

4.6.6.3 Motivations for achieving technological objectives and ratings

Of the 17 technological objectives cited in section 4.6.5.3, 15 had corresponding motivating factors for their achievement. Twelve of the motivating factors were rated: seven as 'most important'; four as 'very important'; and one as 'moderately important'. The average level of importance for the rated factors was 4.4. Details of motivating factors, their ratings and relevant projects are provided in Table 5.54.

4.6.7 Specific benefits projects yielded

The core of this research study lies in determining the extent to which projects accomplished their objectives and what benefits and impacts, if any, accrued from these projects. Three main categories of benefits emerged from analysing the data: commercial/economic, human resource development/intellectual, and technological. Each cluster of benefits is briefly discussed.

4.6.7.1 Commercial/economic benefits yielded

In this domain, 16 benefits were cited by 11 respondents. Two projects were reported to have yielded three benefits and two others yielded two benefits each. Seven other projects were reported to have yielded one benefit each. Some of the benefits realised included: a reduction in capital and operating costs; potential for cost-effective treatment for polluted water that would meet the needs of the local community.

Others were the development of a commercial technique to control citrus black spot disease and opening of the United States market to Northern Cape farmers; to mention but a few. Details of benefits and relevant projects are outlined in Table 5.55.

4.6.7.2 Human resource development/intellectual benefits yielded

Thirty benefits were reported by 17 respondents for their projects in the human resource development/intellectual arena. Four projects were reported to have yielded three benefits each and five reportedly produced two each with the other eight yielding one each. Among the benefits were the following: registration of three patents; training of previously disadvantaged people, technikon diploma students and postgraduates (master's and doctoral); training of skilled engineers; skills training in high voltage direct current; knowledge or understanding gained or improved in areas such as polymers, reactive processes and reactor technology, refrigeration and ventilation in mining; and publications. Detailed information is provided in Table 5.56.

4.6.7.3 Technological benefits yielded

Concerning technological benefits, five were cited by nine respondents for their projects. Two projects were reported to have yielded three benefits each and three had reportedly produced two each, with the other three yielding one each. Technology transfer; the design, development and subsequent launch of a micro-satellite that established an embryo space industry and gained South Africa international recognition in the space community; and the successful development of a high power limiter that is available from only one manufacturer worldwide and which can now be produced locally are a few of the benefits, among many. Table 6.58 captures details of all technological benefits and the relevant projects.

4.6.8 Intended impacts projects had on beneficiaries

Responses to this item were of particular interest given that the essence of the research study was to assess the impact, if any, projects in the sample had on beneficiaries and/or stakeholders. Three clusters of impacts emerged from the analysis: commercial/economic, human resource development/intellectual, and technological. A brief discussion of each is undertaken in the next section.

4.6.8.1 Commercial/economic impacts on beneficiaries

Sixteen impacts were reported by 11 respondents for their projects. Four impacts were reportedly generated by one project and two impacts each were attributed to two projects. One impact was reported for each of the remaining eight projects.

Notable among this cluster of impacts were: the creation of a spin-off company; savings for client; development of products; increased efficiency and effectiveness; and market intelligence and leadership. Table 5.58 carries all the relevant details.

4.6.8.2 Human resource development/intellectual impacts on beneficiaries

Ten respondents reported 12 impacts for their projects. One project reportedly made two impacts in this domain while the other nine recorded one impact each. Skills development; the turning out of postgraduate students; continued research in bio-lipid chemicals for diagnosis of tuberculosis; and understanding of issues related to specific projects were some of the impacts mentioned. Detailed information is provided in Table 5.59.

4.6.8.3 Technological impacts

In this sphere, four projects were reported to have made impacts. These were: use of components developed on radio frequency and antenna systems in other products; proper functioning of technical aspect of the project; De Beers becoming miner of choice owing to the development of differentiating technology on computer vision for inspection and control project; and increased capacity to design high power amplifiers from high frequency components and systems project. These are detailed in Table 5.60.

4.6.9 Positive and negative unintended effects/impacts

Respondents reported some positive and negative unintended commercial/economic, human resource development/intellectual, and technological impacts that resulted from implementation of their projects. By and large, the positive aspects outweighed the negative. These unintended impacts are outlined in the relevant sections.

4.6.9.1 Positive unintended impacts

Nine respondents cited 12 positive unintended commercial/economic impacts; eight mentioned human resource development/intellectual impacts; and three cited technological impacts. The other sponsors' contact persons did not provide information.

(a) Positive commercial/economic impacts

Twelve impacts were reported by nine respondents. Three impacts were attributed to one project, with nine others reportedly yielding one impact each.

Of note among these impacts were: improved and new products; market leadership; a merry-go-round that simultaneously generated power to charge battery; enhanced image of sponsor; and closeness to customer. All reported impacts and the relevant projects are provided in Table 5.61.

(b) Positive human resource development/intellectual impacts

In this category, eight respondents cited 11 impacts. One respondent cited three impacts to his project. Eight others respondents indicated one impact each. Among others, impacts reported included: skills sharing of knowledge and breakthroughs between South African universities and their counterparts worldwide; broad knowledge of polymers; mentoring and support for Eskom staff; new ideas for further research; and increased understanding of Eskom process and problems. Details are given in Table 5.62.

(c) Positive technological impacts

Three respondents cited technological impacts produced by their projects: the development of electronic converter technology to charge battery; opportunity for further upgrading of components; and the availability of a laboratory for ad hoc investigation. Table 5.63 outlines the relevant details.

4.6.9.2 Negative unintended impacts

Although several negative unintended impacts were cited by respondents, they were fewer in each category than positive impacts reported. Five negative impacts were reported in the commercial/economic domain; one in the human resource development/intellectual arena; and two in the technological sphere. These are detailed in the relevant sections that follow.

(a) Negative commercial/economic impacts

Five negative commercial/economic impacts were reported, namely: Plessey, Grintek and Altech, the sponsors, got no or negligible benefits from the project; the fact that it takes a very long time to commercialise concepts like using bio-lipid chemicals for TB diagnosis; funding seeming to go into a "black hole" on one project; the need for a sustainable disposable solution to be found for disposing brine residue from processing plants; and spillage of wet limestone during transport. Details are provided in Table 5.64.

(b) Negative technological impacts

Two negative unintended technological impacts were cited. One was the practical implementation problems that were experienced with using the technology developed for cement-based materials technology. The second was ineffectiveness of technology transfer because there was a fairly large overhead of university management and project staff collaborating on the project. Table 5.65 provides relevant details.

(c) Negative human resource development/intellectual impacts

The only negative human resource development/intellectual unintended impact cited was the fact that no university or in-house skills had been developed on a project involving high voltage distribution of electricity mainly because the industry partner's (Eskom) staff had provided all the needed expertise.

4.6.10 Contrary impacts and levels of seriousness

While projects may yield specific benefits and impacts, sometimes other impacts may occur that are contrary to what was intended and may even threaten to negate the benefits and positive impacts. This item was meant to determine if any such impacts had occurred on any projects. Respondents were asked to mention any contrary impacts and to rate their seriousness on an ascending scale of 1 to 5, where 1 = not serious; 2 = moderately serious; 3 = serious; 4 = very serious; and 5 = critical/severe.

Analysis indicated that two categories of contrary impacts, involving four projects, were reported. Four were in the commercial/economic domain and one in the technological sphere.

4.6.10.1 Contrary commercial/economic impacts

In this area, three respondents cited four impacts, one citing two for his project. First was the fact that the sponsor could not sustain funding, because the main initial objective of the project was taking too long to achieve. The second contrary impact mentioned was spiralling increase in cost. The first impact was rated as 'critical/severe' while a second was rated as 'serious'. The second respondent cited a shift of focus to complete spin-off products which delayed industrialisation of midrange laser rangefinder as the contrary impact on his project. This impact was not rated. The third respondent cited programme delays on project his project. This was rated as 'serious'.

The average rating for these impacts was 3.7. This effectively means that these impacts were serious enough to negate the benefits and positive impacts these projects had produced. Details are given on Table 5.66

4.6.10.2 Contrary technological impacts

Realisation that the medium for free space optical communication link was much more complex than initially anticipated was the only contrary impact cited in the technological domain, but its level of seriousness was not indicated.

4.6.11 Performance of projects: successful, unsuccessful or inconclusive?

Eighteen projects were judged as 'successful, two as 'unsuccessful', and one as 'inconclusive'. Among the 18 successful was a project for which no prioritised objectives, hence no reasons, had been provided by the researcher. In the light of the fact that impact assessment is premised on projects accomplishing their objectives, the researcher's successful verdict was rejected. The same project, however, is rated as 'successful' by the sponsor's contact person. Given the triangulatory function purpose of data provided by sponsors' contact persons and affirmation by the contact person on the specific project, the researcher's verdict on the project is confirmed. Table 5.67 gives details of projects' performance based on data obtained.

4.6.12 Indicators of projects' success

Indicators were provided for 19 projects in three domains: commercial/economic, human resource development/intellectual, and technological but none for the two inconclusive projects.

4.6.12.1 Commercial/economic indicators

Seventeen commercial/economic indicators were cited by 11 respondents for their projects. One respondent cited three indicators, and four cited two indicators each. Six others mentioned one indicator each. Among the indicators cited were: development of commercially-viable products and components; provision and potential sale of cost-effective water from polluted mine water; and maintenance of European citrus market. Details of indicators and relevant projects are provided in Table 5.68.

4.6.12.2 Human resource development/intellectual indicators

In the human resource development/intellectual domain, 16 indicators were cited for eleven projects: three for one; two each for three; and one each for the remaining seven projects. Among others, indicators mentioned included: registration of patents; postgraduate training; skills development and experience; and publications. Detailed information is provided in Table 5.69.

4.6.12.3 Technological indicators of success

Nine indicators were cited for six respondents' projects, of which one mentioned four for the project. The other five projects accounted for the remaining indicators. Some notable indicators of success in this domain included: the building and launching of a micro-satellite; establishment of an embryonic space industry in South Africa; and international recognition of the country in the space community. Details of these indicators are given in Table 5.70.

4.6.13 Reasons for failure or inconclusiveness of projects

Two respondents indicated their projects were unsuccessful and one indicated inconclusiveness. Contact person for one failed project cited economic reasons, specifically unfavourable market conditions that made it economically unsound to move into the next phase of the project. This was mining of gold at 4km underground. Although this project may have failed to usher in an era of deep mining of gold in South Africa, it did succeed in developing skills, a key focal area of THRIP. In addition, a large body of knowledge resulted from the research.

The failure of the second failed project was attributed to two factors. One was failure to set a time limit within which project objectives were to be achieved. The other was failure to take a decision in time to continue of discontinue the project. Both factors are aspects of poor project management.

Two factors were cited for the inconclusiveness of the other project. One was the lack of sufficient qualified personnel to work on the project. Another was the inability of students to deliver well-documented and well-tested deliverables. Table 5.71 outlines the reasons for projects' failure and/or inconclusiveness.

4.6.14 Sectoral distribution of projects

The distribution of projects, based on responses received from sponsors' contact persons, showed that there were 15 single-sector and six cross-/multi-sectoral projects, briefly outlined as follows:

4.6.14.1 Single-sector projects

SIC 1: Agriculture, Hunting and Fishing: 1 SIC 2: Mining and Quarrying: 3
SIC 3: Manufacturing and Processing: 4 SIC 4: Electricity, Gas, Water Supply and Usage: 3
SIC 5: Construction and Environment: 1 SIC 7: Transport, Storage and Communication: 2
SIC 8: Health: 1

4.6.14.2 Cross-/multi-sectoral projects

SIC 1 and SIC 2: 1 SIC 1, SIC 2 and SIC 5: 1 SIC 2, SIC 3, SIC 4 and SIC 5: 1
SIC 3 and SIC 4: 1 SIC 3 and SIC 7: 2

Table 6.52 gives all relevant details by linking the projects to their standard industrial classification categories.

4.6.15 Funding levels

Funding details were provided by all 21 respondents. Analysis indicated the following:
Less than R499 999: 3 R500 000 - R999 999: 4
R1 000 000 - R1 999 999: 7 R2 000 000 - R4 999 999: 3
R5 000 000 - R7 999 999: 1 More than R8 000 000: 3

Detailed information is shown in Table 5.73.

4.6.16 Contact persons' comments

Sixteen respondents provided comments. On examination it was found that the comments were either positive or negative. Thus, the analysis focused on bringing out these positive and negative aspects. On the whole, more positive than negative comments were made.

This does not, however, imply that the negative comments do not warrant serious attention. On the contrary, it is essential for THRIP to pay serious attention to these criticisms in order to understand and address the issues raised.

4.6.16.1 Positive comments

Twelve positive comments were made by 11 respondents, with one making two comments. Seven comments centred on good collaborative interactions and relationships and their positive effects. One highlighted the role of THRIP in technology transfer; and three touched on success achieved on their projects. One attributed the project's success to having enrolled capable students and good communication (frequent meetings and a reporting system). One dwelt on positive disposition of the industry partner to the project itself. Detailed information is provided in Table 5.74.

As pointed out in section 5.5.23.4, the nature of the tripartite relationship involving academics/researchers, industry partners and THRIP is underlined by collaboration. It is significant that contact persons, like project leaders, have underlined this in their comments both unambiguously and in subtle ways.

4.6.16.2 Negative comments

Seven comments were made by six respondents, of which two were made by one respondent. One respondent severely criticised THRIP as an entity, referring to it as only bureaucratic but also that it likes to get "water out of stone". Further, the respondent sees lack of realism in THRIP's insistence on the involvement of previously disadvantaged people and universities. Another respondent indicated that "THRIP is very much at arm's length" and that administrative requirements, process and benefits are not clear from the DTI. A third respondent echoed the "arm's length" comment by adding it was the researcher who did most of the negotiations and communication and that decisions could have been taken quicker if sponsor was closer to THRIP outcomes".

A fourth respondent highlighted the complex structure of THRIP funding and difficulty in understanding how it works. Other comments reflected issues such as difficulties, owing to distance, industry partner's contact person had in attending meetings with researcher; and poor results produced by students. The last comment indicated initial problems experienced by the industry partner: lack of proper planning, knowledge-based assistance and office space. Table 5.75 provides the relevant details.

4.6.17 Summary

This penultimate chapter has analysed the findings of the research study based on responses to the key research questions framed as items included in a questionnaire administered to project leaders. Where appropriate, information is drawn from sponsors' contact persons to highlight similarities or differences in perspectives between them and project leaders. In most cases, reference is made to appendices, figures or tables containing information distilled from analysing project leaders' and contact persons' responses to their respective questionnaire, to support the finding(s).

Chapter 5, the final one, summarises the findings, revisits the aims of the study and indicates their accomplishment, draws conclusions based on the research findings, makes recommendations, outlines limitations of the study and examines implications for further research.

CHAPTER 5: FINDINGS, CONCLUSIONS, RECOMMENDATIONS

5.1 Introduction

In Chapter 4 primary data obtained from questionnaires administered to two sets of respondents, project leaders and industry partners' contact persons, were analysed. In this final chapter, findings of the research are outlined. First is a general summary followed by a detailed one where each item of the questionnaire for project leaders, which embodies the research questions, is stated and finding(s) given alongside it. Since the questionnaire for industry partners' contact persons served a triangulatory purpose, findings from analysis of this questionnaire are put alongside those of the main questionnaire, in cases where both project leaders and contact persons were asked to provide data on the same issue. In this way, points of similarities and differences in their responses are illuminated.

To make the detailed summary easy to follow, where appropriate appendices, figures and/or tables are referred to immediately after the research questions. In all such cases, the appendices, figures or tables given before the semi-colon refer to information provided by project leaders. This is also the case where there is only an appendix, a figure or table. All appendices, figures or tables appearing after the semi-colon refer to information provided by contact persons. In cases where there is no information relating to contact persons on an issue, this is indicated at the end of the summary of finding(s) for project leaders.

Eight aims of the research outlined in section 1.8 are restated, each followed by a short discussion. Where appropariate references are made to tables that the illuminate the discussion. Specific conclusions are drawn based on the key research findings, followed by a general conclusion and recommendations. Limitations of the study are briefly outlined and implications for further research indicated.

5.2 General summary of findings

Two sets of questionnaires were administered. The first, consisting of 24 items, to project leaders and the second of 16 items to sponsors' contact persons. Both respondents were key informants and were expected to provide relevant information from their perspectives. The summary that follows reflects main findings from analysis of the questionnaires.

A number of findings emerged from analysing the main questionnaire, that of project leaders. Firstly, slightly more than half (56%) of the projects were completed at the time and 44% were ongoing.

Secondly, majority of projects (85%) were implemented according to plan and, although implementation problems were experienced by some projects (21%), an overwhelming majority (93%) were successful. Thirdly, industry partners, related industry and other(s) were cited as three classes of primary beneficiaries, but only industry partners were mentioned by all respondents. Half of the respondents also mentioned other entities as secondary beneficiaries.

Further, consistently, commercial/economic, human resource development/intellectual, technological, and social themes emerged in terms of problems research projects were implemented to address, their major objectives, differences and impacts made, intended and unintended benefits yielded, positive and negative intended and unintended impacts made, contrary effects/impacts that occurred, and indicators of success reported. Significantly, cited commercial/economic and human resource development/intellectual objectives were fully achieved while technological and social objectives were achieved substantially.

In connection with managerial strategies used communication; teamwork; and financial management; good leadership, planning, motivation; and close supervision/involvement with students emerged as the five most prominent strategies instrumental in achieving projects' success. Others were focused, goal-oriented effort and technical expertise/building of appropriate capacity. Non-use of managerial strategies, and particularly poor project management, accounted for some projects' inconclusiveness and failure. Environmental and personal factors also played a role in achieving success.

Five reasons were offered to explain projects' inconclusiveness and a number of hindsight actions suggested by respondents of both successful and inconclusive projects that would have enhanced chances of success. Regarding sectoral distribution, there were 42 single-sector and 10 cross-/multi-sectoral projects, spanning seven standard industrial classification categories or sectors.

In terms of duration, forty-three (83%) of respondents indicated their projects had been running for three years or more and eight (15%) said theirs had been running for two at the start of the research. Information was not provided for one project.

Finally, regarding funding, majority of projects (36) were funded between R1 million and more than R8 million while 15 received funding of between less than R499 999 and up to R999 999. The funding amount for one project was not provided.

Findings from analysis of contact persons' questionnaire indicated, among other things, the following: nine projects were completed and 12 were ongoing; sponsors were the main beneficiaries; and there were a few secondary beneficiaries. Objectives cited fell into three clusters: commercial/economic, human resource development/intellectual, and technological.

On average, objectives in the technological cluster were rated at 4.3 or 'very important', while those in the commercial/economic and human resource development/intellectual clusters were averagely rated at 3.67 and 3.83, respectively, or 'important'.

Many motivating factors, falling into technological, commercial/economic, and human resource development/intellectual were advanced for implementing the projects. A variety of specific benefits were yielded in the commercial/economic, human resource development/intellectual and technological domains. Similarly, intended impacts, positive and negative unintended effects/impacts, as well as contrary impacts, were reported in these spheres.

An overwhelming majority of projects, 18, representing 86%, were judged as 'successful', two as 'unsuccessful', one as 'inconclusive' and indicators of projects' success were provided in the commercial/economic, technological and human resource development/intellectual domains. Factors implicated in projects' failure and inconclusivess were cited: unfavourable market conditions and poor project time management, and lack of sufficient qualified personnel and inability of students to deliver well-tested deliverables, respectively.

Fifteen projects were single-sector and six were cross-/multi-sectoral. Two-thirds of the projects (14) were funded between R1 000 000 and more than R8 000 000.

Many positive comments were made, highlighting different aspects. There were, nevertheless, some negative comments that THRIP needs to pay attention to.

5.3 Detailed summary of findings

In this section, an item-by-item summary of findings is provided. Given that the questionnaire for project leaders embodied the key research questions, the summary takes each of the 24 items in turn but also gives findings relating to sponsors' contact persons, where the two sets of respondents were asked their perspectives on the same issue.

Item 1

Project ID: *Short title:*

Information sought under this item was solely for the purpose of facilitating data collection. All 52 project leaders provided these essential details for their projects. All 21 sponsors' contact persons also supplied the relevant information. This served to establish a direct link between project leaders and the relevant contact persons for their projects. Details of project ID's, their short titles, names of project leaders and their affiliations, as well as their contact details are provided in Appendix D (pages 240-243).

Item 2

Was the project completed, ongoing or abandoned? (Figure 5.1 and Table 5.48)

At the start of the study in 2004, 26 projects, about 56% of the total number of projects investigated, were completed while 22 (42%) were ongoing. One project was reported to have been abandoned and no information was provided on the status of another. On the part of contact persons, nine of them (or 43% of those who responded to the questionnaire) reported that the projects they represented were completed, while 12 (57%) indicated that their projects were ongoing.

On the whole, there was a high degree of agreement between data provided by sponsors' contact persons and that of project leaders, except in one instance where the project leader indicated that the project was completed whereas the contact person said that it was ongoing.

Concerning ongoing projects in particular, data provided by the project leaders and contact persons were in concordance on seven projects. On five ongoing projects, the relevant project leaders indicated that the projects were completed whereas contact persons said they were ongoing. Why and how the difference in opinion came about is unknown.

Item 3

Name(s), telephone number(s) and email address(es) of industry partner's/partners' contact person(s). (Appendix E)

This information, like that required under research questions 1 and 7, was solely to facilitate contact with sponsors' contact persons to collect data. All project leaders provided the names of industry partners; in some cases with names, telephone numbers and/or e-mail addresses of relevant contact persons for the projects.

For reasons of confidentiality, however, some project leaders did not supply the names, telephone numbers and/or e-mail addresses of contact persons. Some provided outdated contact details while others had forgotten who the contact persons were or could not locate the relevant contact details. This item was not included in the questionnaire for contact persons.

Item 4

Was the project implemented according to plan? (Figure 5.2)

Forty-four project leaders (85% of the sample) reported that their projects were implemented according to plan while eight (15%) indicated that they experienced implementation problems on their projects. Contact persons were not asked to provide data on this issue.

Item 5

If your response to 4 is "No", mention the major implementation problems and rate them in descending order of seriousness (where 5 = critical/severe, 4 = very serious, 3 = serious, 2 = moderate, 1 = not serious). (Table 5.1)

Eleven project leaders (21% of the sample) reported seven implementation problems. All the implementation problems, except one, were rated in terms of how serious they were. Three of them were rated as 'critical'; one as 'very serious', five as 'serious', and one as 'moderate'. Despite experiencing implementation problems, 10 respondents indicated that their projects were successful. The eleventh said the project was inconclusive. In terms of the seriousness of implementation problems experienced, the average rating for the 10 rated projects was 3.6. This item was not included in the questionnaire for contact persons.

Item 6

Who is/was/were primary beneficiary/beneficiaries? (Table 5.2)

All 52 project leaders (100%) cited their sponsors as primary beneficiaries; 14 (27%) cited both sponsor and related industry; seven (13.5%) mentioned sponsor, related industry and other(s).

For contact persons, all 21 indicated their organisations were the sole primary beneficiaries of the projects. This established 100% concordance with data provided by project leaders.

Item 7

Indicate, if any, who the secondary beneficiary is/beneficiaries are/were and the name(s) and telephone number(s) and email address(es) of contact persons. (Appendix F)

Twenty-six project leaders (50% of the sample) mentioned various secondary beneficiaries; the other half did not provide any information. For contact persons, five (24% of the sample) provided names of secondary beneficiaries.

Item 8

Explain briefly what the existing problem(s) was/were that you set out to solve by undertaking your project. (Tables 5.3-5.6)

It was found the projects were launched to address a multitude of problems in four domains. Majority of projects (28) were launched to address 18 technological problems. Nineteen commercial/economic problems were instrumental in the launching of 25 projects. Eleven human resource development/intellectual problems accounted for the launching of 22 projects, and three social problems played a role in the launching of three projects. This item was not included in the questionnaire for contact persons.

Item 9

Briefly explain what difference your research has made in solving the problem(s) that necessitated your project(s) and rate your responses in descending order of importance (where 5 = groundbreaking, 4 = substantial, 3 = moderate, 2 = little, 1 = none). (Tables 5.7-5.10)

Differences or impacts made were in four spheres. Most (35) were reported in the technological domain by 28 respondents. Fifteen respondents (54%) reported that the difference their research made was 'groundbreaking' while 13 indicated it was 'substantial'. It is important to note that while some of these differences were intermediate (or of an immediate nature), it will take some time for the final impacts to show.

The commercial/economic sphere came second with 17 differences reported by 20 respondents. Six respondents (30%) said the difference made by their research was 'groundbreaking', eight (40%) said it was 'substantial' and six (30%) rated the difference made as 'moderate'.

In the human resource development/intellectual sphere, nine differences were cited by 21 respondents for 21 projects. However, five respondents cited two differences. Eight respondents (38%) indicated that the difference was 'groundbreaking', another eight (38%) said it was 'substantial' and two (10%) rated it as 'moderate'. Four respondents (14%) did not indicate any rating.

Thirteen social differences were cited by seven respondents. However, two respondents gave three differences each made by their projects and one gave two differences. Five differences were rated as 'groundbreaking'; seven as 'substantial' and one as 'moderate'.

Fifty-two responses were provided by 28 respondents, citing 35 technological differences their projects made. Two respondents (7%) mentioned four differences each; six (21%) cited three each; and seven (25%) mentioned two each. Six (21%) of the remaining 13 respondents cited a particular difference made by their projects while the other seven (25%) mentioned various differences. Eighteen responses (34%) labelled the difference as 'groundbreaking', 15 (29%) indicated it was 'substantial', four (8%) showed it was 'moderate', and one (2%) labelled it 'little'. Fourteen (27%) responses did not rate the difference.

Item 10

Briefly state the main objectives of your project in descending order of importance (where 5 = most important, 4 = very important, 3 = important, 2 = moderately important, 1 = least important) and score the level to which each objective was achieved in percentage terms. (Tables 5.11-5.14 and Tables 5.50-5.52)

Commercial/economic and technological objectives were the dominant ones cited by project leaders, each mentioning 25. Twenty respondents cited commercial/economic objectives. Of the 16 rated for achievement, nine were at 100%, one at 95%, two at 90%, two at 80% and two at 50%. Thus, 64% of commercial/conomic objectives were fully (90%) achieved.

Twenty-four respondents cited technological objectives. The levels of achievement for the seventeen that had achievement ratings were: six at 100%, one at 95%, four at 90%, four at 80%, one at 70%, and one at 50%. The average achievement level for technological objectives was 88%. In short, there was substantial achievement of technological objectives.

Two strands of objectives in the human resource development/intellectual domain were cited. One strand, consisting of seven specific objectives, was cited by 14 respondents. It focused on human resource development or training.

Of eight respondents who provided ratings for objectives achievement under this strand, three were rated at 100%; one at 95%; three at 90%; and one at 70%. The other strand of objectives, consisting of 12, focused on the intellectual. Eight had achievement ratings: three were rated at 100%; one at 90%; three at 80%; and one at 70%. The average level of achievement for the 16 rated objectives was 90. These objectives were, thus, fully achieved.

Twelve objectives were mentioned in the social cluster by eight respondents. Of eight objectives rated for achievement, four were at 100% achievement; one at 90%; two at 80% and one at 50%. These objectives were substantially (88%) achieved.

For contact persons, human resource development/intellectual objectives were predominant. Twenty-five were cited for 16 projects of which 24 were rated. Seven objectives were rated as 'crucial', 10 as 'very important', four as 'important', two as 'moderately important', and one as 'least important'. One objective was not rated. The average level of importance for the 24 rated objectives in this domain was 3.8.

Eighteen commercial/economic objectives were cited for 14 projects. Fifteen of them were rated. Six respondents rated their projects' objectives as 'crucial', three as 'very important', two as 'important', three as 'moderately important', and one as 'least important'. The average level of importance for the 15 rated objectives was 3.7.

The technological realm registered 17 objectives from 12 respondents. Sixteen were rated. Eight were rated as 'crucial', six 'very important', and one each were rated 'important' and 'least important', respectively. The average level of importance for the 16 rated objectives was 4.3.

It is important to note that the objectives provided by contact persons were not rated for levels of achievement. It also needs to be borne in mind that in spite of the fact that these objectives were rated from most important to least important, they were the top priorities for each project; as such, it was important to achieve all.

Item 11

Give reasons for the ratings given under item 10. (Table 5.15)

A sample of reasons given by project leaders for ratings under research question 10 is presented in Table 6.15. This indicated that respondents did not nonchalantly ascribe reasons for the ratings they provided regarding the level to which their projects' main objectives were achieved.

On the contrary, the ratings given were backed by well-thought out rationale that lends credibility to all ratings reflected in sections 4.5.8.1 - 4.5.8.4. Contact persons were not required to rate the levels to which the objectives of projects their companies co-funded were achieved.

Item 12

What specific benefits has the project yielded? (Tables 5.16-5.19 and Tables 5.56-5.58)

Numerous benefits accrued from implementing the projects. Fifty-one respondents reported various benefits that fell into four categories. Twenty-four benefits were cited in the human resource development/intellectual sphere by 19 respondents; nine in the commercial/economic domain cited by 10 respondents; six and five in the technological and social arenas, respectively.

With contact persons, three categories of benefits were reported. Most were in the human resource development/intellectual arena, where 30 benefits were reported by 17 respondents. The commercial/economic domain registered 16 benefits from 11 respondents while the technological field had 15 benefits reported by nine respondents.

Item 13

What are were some of the positive unintended impacts/spin-offs of the project? (Tables 5.20-5.23 and Tables 5.62-5.64)

Positive unintended impacts or spin-offs totalling 31 were reported in the commercial/economic, human resource development/intellectual, technological and social spheres by project leaders. Ten spin-offs were reported by 24 respondents in the human resource development/intellectual domain; nine in the commercial/economic sphere for 10 projects; seven in the technological arena for seven projects; and two in the social realm.

Three categories of positive unintended impacts were cited by contact persons. Nine cited 12 impacts (spin-offs) in the commercial/economic realm; eight cited 11 human resource development/intellectual impacts/spin-offs; and three reported technological impacts/spin-offs.

Item 14

What are/were some of the negative unintended impacts of the project? (Tables 5.24-5.27 and Tables 5.65-5.66)

Three categories of negative unintended impacts were cited by project leaders. Eleven negative administrative impacts were mentioned by nine respondents. The human resource development/intellectual and technological domains each recorded four negative impacts while two negative impacts were reported in the commercial/economic sphere.

On the part of contact persons, five negative unintended impacts were cited in the commercial/economic sphere; two were reported in the technological sphere and one in the human resource development/intellectual field.

Item 15

Did any effects/impacts occur that were contrary to the expected impact(s)? If so, list them in descending order of seriousness (where 5 = critical/severe, 4 = very serious, 3 = serious, 2 = moderately serious, 1 = not serious). (Table 5.28 and Table 5.67)

Eight contrary impacts were reported by project leaders. Seven were rated for their levels of seriousness. One was rated 'critical/severe', two were said to be 'very serious', and two 'serious'. One was moderately serious', and onother 'not serious'. Three contact persons cited four contrary commercial/economic impacts. In terms of seriousness, one was rated 'critical/severe', and two as 'serious'. The fourth was not rated. The average level of seriousness for these impacts was 3.7. In the technological sphere, one contrary impact was reported.

Item 16

How would you rate the project? (Table 5.29-5.30 and Table 5.68)

In terms of categories, 42 of the 52 projects were single-sector, spread across seven standard industrial classification categories while 10 were cross-/multi-sectoral. Thirty-eight of the single-sector projects (90%) were judged as successful: four out of five projects in SIC 1; all six in SIC 2; seven out of the eight in both SIC 3 and SIC 4; both projects in SIC 5; all five in SIC 7; and seven out of eight in SIC 8. Four projects (10%) were said to be inconclusive, one each from SIC 1; SIC 3; SIC 4; and SIC 8. All 10 cross-/multi-sectoral projects were successful. In all, then, 48 projects, representing 92% of the sample, were rated as 'successful' and four were said to have been inconclusive.

For contact persons, 18 of the 21 projects (86%) were said to be successful; two inconclusive and one unsuccessful.

Correlating data on projects' success provided by project leaders (see section 4.5.15) and contact persons (see section 4.6.11), differences in perspectives surfaced. Two projects that were said to be successful by project leaders were judged as unsuccessful by contact persons. A third project said to have been successful by the relevant project leader was judged as inconclusive by the contact person. Conversely, one project was said to have been successful by the contact person but judged as inconclusive by the project leader.

Perhaps these discrepancies go to the root of possible differences in the definition of 'success' raised and problematised in section 5.2. This might be a classic case where the academics'/researchers' and sponsors' interest are asymmetrical and where different criteria of success were applied.

Item 17

If you consider the project successful, what are/were the indicators of success?
(Tables 5.31-5.34 and Tables 5.69-5.71)

Four categories of success indicators were reported by project leaders: 30 in the commercial/economic domain reported by 23 respondents; six indicators in the technological arena by 11 respondents; six in the social sphere by four respondents; and four in the human resource development/intellectual domain by 33 respondents.

Contact persons reported three domains of indicators of success. Seventeen commercial/ economic indicators were cited by 11 respondents; 16 human resource development/ intellectual indicators were mentioned for 11 projects; and nine technological indicators were cited for six projects.

Item 18

What managerial strategies were used to achieve success? (Tables 5.35-5.36)

Projects leaders mentioned two sets of factors (managerial and environmental/personal) that were instrumental in their projects' success. In the managerial category, 16 different strategies were mentioned by 44 respondents. In terms of prominence, communication came first, being cited by 20 respondents. Teamwork, collaboration, cooperation and financial management came in second, each mentioned by 15 respondents. Good leadership was third in prominence, cited by 13 respondents.

In fourth place was close supervision/involvement of students, which was mentioned by 12 respondents. Focused, goal-oriented effort and technical expertise/building of appropriate capacity were each cited by six respondents, taking the fifth place.

Fifteen respondents cited environmental factors as having facilitated their projects' success. In order of prominence these factors were: supportive environment/good organisation, structure: six respondents; hard work, perseverance, optimism: five respondents; and creativity/common sense: two respondents. Others were: academic freedom and scholarly approach, cited by one respondent each. This question was not included in the questionnaire for contact persons.

Six respondents (14%) cited 'supportive environment/good organisation and structure and five (11%) mentioned 'hard work, perseverance, optimism'. This information is reflected in Tables 5.36.

Item 19

If projects were unsuccessful or inconclusive, what did not go well? (Table 5.37 and Table 5.72)

No unsuccessful projects were reported. Eleven project leaders gave 16 reasons why their projects were inconclusive. Five of the reasons came from four respondents. Another 11 reasons were provided by seven respondents whose projects had been successful.

Two contact persons indicated their projects were unsuccessful and one indicated the project was inconclusive. Market conditions and poor project management accounted for the failure of one project while a lack of sufficiently qualified people and non-delivery of well-documented and well-tested key deliverables led to the inconclusiveness of the other.

Item 20

What would you do differently to ensure success? (Table 5.38)

Nine project leaders provided 12 actions they would have taken in hindsight to ensure their projects' success. Three thought reducing the level to which industry needs drive the programme might have helped. One of the three also thought rigorous scrutiny of actual, as opposed to reported progress, would have ensured success.

All but one of the 52 project leaders provided the relevant data to this question. Of these, 43 (83%) indicated that their projects had been running for three years or more at the start of the investigation. Specifically, eight projects had been running for two years; 19 for three years; six for four years; and 18 for more than four years. Eight respondents (15%) stated that their projects had been running for two years. No project had run for less than one year or one up to a year at the time this research undertaken. Contact persons were not asked to provide data on this issue.

Item 23

What was the total amount of funding (in Rand) for the duration of the project? (Table 5.41 and Table 5.74)

Fifty-one project leaders supplied the relevant data on funding. Six of these respondents stated that their projects had been funded for less than R499 999. Nine respondents indicated between R499 999 and R999 999, 11 between R1 000 000 and R 1 999 999, 12 between R2 000 000 and R4 999 999, two between R5 000 000 and R7 000 000, and 11 for more than R8 000 000.

Comparing this information to information obtained from responses provided by sponsor's contact persons (see section 5.6.15), some discrepancies became apparent. Only eight contact persons (38%) were in agreement with project leaders about funding levels of the projects their organisations had co-funded. Four of the remaining 13 respondents quoted figures that were higher than those given by project leaders. No plausible explanation can be given for this. The other nine respondents gave funding figures lower than those provided by project leaders. A possible explanation could be that contact persons stated only the amounts their organisations had contributed to the relevant projects, ignoring the THRIP contribution.

Item 24

Make comments, if any. (Tables 5.42-5.47 and Tables 5.75-5.76)

Project leaders made comments that related to four aspects: THRIP as an entity, funding, the online application and reporting system, and perceptions of working relationships among the DTI, industry partners and academics/researchers.

Eight positive comments were made about THRIP as an entity. They related to its role in facilitating applied research. On the other hand, four negative comments were made. On funding, 10 positive comments and three suggestions were made.

The positive comments were, however, overshadowed by 13 criticisms. The online application and reporting system received seven criticisms and a suggestion. Respondents' perceptions of the relationship among the triad of players in South African applied research (academics/researchers, THRIP and industry partners) was overwhelmingly positive.

Eight out of nine respondents characterised the relationship in positive terms. The comments indicated satisfaction and optimism regarding the strengthening of collaborative efforts. The last comment, however, highlighted the fact that more still needs to be done.

In all, 15 contact persons made 19 comments. Twelve positive comments were made by 11 respondents. These centred on attitude of respondent, collaboration, role of THRIP, and acknowledgement of success achieved; six respondents made seven negative comments.

In the comments section as well as in responses to other items in the questionnaire, project leaders and contact persons kept referring to "collaboration". This is significant in that both view the relationship as symbiotic, where mutual needs and benefits are shared, rather than parasitic where one party gains at the expense of the other. This is consistent with findings on the industry's perspective of the nature of the relationship highlighted by the HSRC study (2003:26).

5.4 Revisiting aims of the research

As indicated in section 1.8, this research was undertaken with eight broad aims. All were achieved. Firstly, the research was aimed at establishing projects' objectives and the extent to which they were accomplished.

Analysis of data collected from project leaders uncovered four broad categories of objectives, namely: commercial/economic, technological, human resource development/intellectual, and social. This does not, however, imply that every project had objectives in each category.

On projects' achievement of their objectives, the commercial/economic and technological clusters of objectives, the two dominant ones, were fully achieved (90%), followed by human resource development/intellectual and social objectives, each of which was substantially achieved (88%). The relevant information is presented in Tables 5.11-5.14.

For sponsors, human resource development/intellectual clusters of objectives were primary, closely followed by commercial/economic and technological clusters, in that order. Sponsors' contact persons were not asked to provide their perspectives on the extent to which projecrts' objectives were achieved. No social objectives were reported. Tables 5.49-5.51 depict the details.

The second aim was to establish how successful projects were from the perspectives of project leaders, on the one hand, and industry partners' (or sponsors') contact persons, on the other. Forty-eight (92%) of the 52 projects were successful. Thirty-eight of the 42 single-sector projects spanning seven standard industrial classification categories were judged by project leaders as 'successful', while four were said to be 'inconclusive'. Tables 5.29 and 5.30 and section 5.5.15 have the relevant details.

Eighteen of the 21 contact persons (86%) said the projects they represented were successful, two (10%) indicated theirs were unsuccessful, and one indicated the project was inconclusive. This information is captured in Table 5.67.

Thirdly, the research aimed at outlining key indicators of projects' success. In this respect, project leaders cited 30 key indicators of success in the commercial/economic domain, six each in the social and technological spheres, and four in the human resource development/intellectual arena. With only four objectives in the human resource development /intellectual sphere it, nevertheless, had the biggest number of respondents citing indicators among all the clusters. Tables 5.31-5.34 carry the relevant information.

Seventeen commercial/economic indicators were cited by contact persons; 16 in the human resource development/intellectual domain, and nine in the technological sphere. None was reported in the social arena. This information is presented in Tables 5.68-5.70.

The fourth aim was to assess specific ways in which industry partners or sponsors benefited from implementation of the projects. Analysis of data has established that the projects yielded many benefits for industry partners. Most benefits were in the human resource development/intellectual domain.

Commercial/economic and technological benefits came second for both project leaders and sponsors as well. Social benefits were reported as accruing from the projects by only project leaders. Tables 5.16-5.19; and 5.55-5.57 present all the details.

Sectoral analysis of projects' success in achieving their objectives was the fifth aim of the research. This analysis, involving four clusters of objectives, follows:

In the commercial/economic domain, five objectives were cited by four respondents for their SIC 1 projects. Three were rated for achievement. The average achievement level was 83%. In SIC 2, four objectives were cited by four respondents. All were rated, the average achievement level being 91%. Four objectives were cited for projects in SIC 3; only one was rated (at 100%). Seven objectives were cited for four SIC 4 projects. Five had achievement ratings. The average achievement was 98%. No objectives were cited for projects in SIC 5 and SIC 7. Only one objective was cited for SIC 8 and rated at 80%.

In all, 64% of objectives cited were rated. Projects in three single-sector categories (SIC 2, SIC 3 and SIC 4) achieved their objectives fully while two sectors (SIC 1 and SIC 8) achieved theirs substantially.

Four objectives were cited for two cross-/multi-sectoral projects, with two of them rated. The average rating for them was 75%. In all, 16 of the 25 objectives (64%) cited for projects were rated. Overall, this cluster of objectives for both single- and cross-/multi-sectoral projects registered an average of 88%. Table 5.76 depicts this information.

In the arena of human resource development/intellectual objectives three objectives, all rated, were attributed to one (SIC 1) project, with an average achievement of 82%. The objective for the only SIC 2 project was rated at 100%.

Three objectives were cited for three SIC 3 projects. None was rated. Five objectives were cited for four SIC 4 objectives; four were rated. The average level of achievement was 98%. Three objectives were cited for two projects in SIC 5. Only one was rated (at 90%). In SIC 7, three objectives were mentioned, with two rated, giving an average of 85%. SIC 8 recorded three objectives; two rated with an average of 85%. In general, projects in four single-sector project categories (SIC 2, SIC 4, SIC 5 and SIC 8) were fully achieved their objectives while projects in two sectors (SIC 1 and SIC 7) achieved their objectives substantially.

Seven objectives were attributed to six cross-/multi-sectoral projects, of which four were rated. The average rating for them was 88%, a substantially achievement. Overall, the average level of achievement for all objectives cited in the human resource development/intellectual category was 90%. All the relevant information is shown in Table 5.77.

All the 12 objectives cited in the social arena by eight respondents were for projects in SIC 8. Eight (67% of the objectives cited) were rated. The average level of achievement was 88%, thus a substantial level of achievement. The relevant information is captured in Table 5.78.

Finally, in the technological sphere, two objectives were cited for SIC 1 projects; neither was rated for level of achievement. Three were attributed to projects in SIC 2 and all were rated; the average level of achievement was 88%. In SIC 3, four objectives were cited but three were rated. The average rating was 87%. Three objectives, all rated for achievement, were mentioned for projects in SIC 4, giving an average achievement rating of 90%. Of the two objectives attributed to the two projects in SIC 5, one was rated (70%). SIC 7 had three objectives credited to it, with two rated at 100% each. No objectives were cited for projects in SIC 8.

No technological objectives were reported for projects in SIC 8. Cross-/multi-sectoral projects accounted for eight objectives. With five rated, the average achievement level was 90%. Projects in three sectors (SIC 4, SIC 7 and the the cross-/multi-sectional) achieved their objectives fully while the objectives of projects in SIC 2 and SIC 3 were substantially achieved. Sixty-eight percent (17 out of 25) of objectives cited in this domain were rated. Overall, the average level of achievement of objectives for the six sectors was 88%. Table 5.79 reflects this information.

To comment on sectoral achievement of projects' objectives, suffice it to say that not all project leaders provided objectives for their projects. Further, in cases where objectives were cited, not all were given an achievement rating. With the data provided analysed, it is clear that the four clusters of projects' objectives were substantially achieved.

The research also aimed at establishing factors/conditions common to successful projects (that is, finding critical factors that underpin their success) and to determine factors/conditions common to or implicated in not-so-successful projects.

For successful projects, a common set of critical success factors was clearly discernible. Communication was cited by 20 project leaders (45%); teamwork (collaborative/cooperation) and financial management were each mentioned by 15 respondents (34%); good leadership, planning, motivation was cited by 13 respondents (30%); close supervision/involvement with students by 12 (27%); focused (goal-oriented effort); and technical expertise were each mentioned by six respondents (14%).

Quite apart from managerial strategies that were employed to ensure projects' success, environmental and personal factors also played a role. Six respondents (14%) cited "supportive environment/good organisation and structure" and five (11%) mentioned 'hard work, perseverance, optimism', two cited "crativity"/"common sense", and one "scholarly approach". This information is reflected in Tables 5.35-5.36.

For the not-so-successful projects, the four inconclusive ones, none of the project leaders mentioned employing any managerial or other strategy on the project. Reasons cited for inconclusiveness were: "lack of effective communication with the industry"; and 'industry could not understand the importance and impact of our work" for one project; "not finally implemented in the field" for another; "premature termination of funding due to change in research priority of Cancer Association" for the third project; and "students became involved in the company's fight for survival, detracting from their intended research activities", for the fourth project. It can be said that the non-use of communication as at time-tested managerial strategy as well as funding difficulties accounted for the inconclusiveness of the four projects. Table 5.37 captures reasons for cited by the relevant project leaders for their projects' inconclusiveness.

Two contact persons indicated that their projects were unsuccessful; one said the project was inconclusive. The reason given for the failure of one project was: "Gold price on world market made it uneconomical to do deep mining". Failure of the second project was attributed to "lack of sufficiently qualified personnel to work on project", and "failure of students to deliver well-documented, well-tested subsystems".

For the inconclusive project, two factors/reasons were given: "failure to set time limit within which objectives were to be achieved" and "failure to decide in good time to continue or discontinue the project".

It is clear from the reasons given that uncontrollable factors (price of gold on the world market) as well as controllable ones (lack of skilled people and poor project time management skills) accounted for failure or inconclusiveness of some projects. Reasons for projects' failure and inconclusiveness given by contact persons are presented in Table 5.72.
The seventh aim was to suggest, in the light of the research findings, measures (conditions, guidelines, policies, strategies) for achieving, maintaining and improving projects' success across sectors. This aspect constitutes recommendations and is undertaken in section 6.6.

The final aim was to draw comparisons between successful and not-so-successful projects within and across sectors, in the light of the findings. In terms of this, findings for the 42 single-sector projects were as follows: 80% success in SIC 1 (four out of five projects); 100% in SIC 2 (all six); 89% in SIC 3 (seven out of eight); 88% in SIC 4 (seven out of eight); 100% in SIC 5 (both projects). There was 100% achievement in SIC 7 (all five projects) and 88% in SIC 8 (seven out of eight). In addition, the 10 cross-/multi-sectoral projects were all successful (100%). All this information is shown provided in Table 5.30.

What differentiated successful from inconclusive/unsuccessful projects across sectors was that managerial strategies were employed by project leaders of successful projects while there was no indication any strategy was used by project leaders of inconclusive/unsuccessful projects.

In sum, because sectoral representativity was not a primary concern in drawing the sampling frame, no generalisations can be made regarding failure/success rate of projects' across sectors. It is, however, important to indicate that a high rate of success was achieved among projects in each sector. Three sectors (SIC 2, SIC 5 and SIC 7) achieved 100% success; another three (SIC 3, SIC 4 and SIC 8) achieved 88%, and one (SIC 1) achieved 80%.

5.5 Conclusions drawn

Given the findings of the research summarised in section 5.2 and a revisit of research aims in section 5.3, a number of conclusions may be drawn.

5.5.1 Majority of projects did not experience problems during implementation

An overwhelming majority of projects did not experience implementation problems. This is evident in the fact that 44 project leaders (85%) indicated that they did not experience any implementation problems. However, eight (15%) did. Of the projects, that did not experience implementation problems, three (7%) were inconclusive.

Furthermore, in spite of a number of serious implementation problems reported on some projects, problems that were serious enough to have derailed the relevant projects, 10 of the 11 projects (91%) for which such problems were nevertheless reported as successful. This number includes projects for which implementation problems were not initially reported.
The lesson to be learnt from the link between implementation problems and project success/failure is that although experiencing implementation problems on a project is not a sure sign that it will fail, such problems are warning bells to be heeded.

Implementation problems, in all likelihood, will lead to failure without proper corrective measures. If implementation problems arise project leaders need to take charge and confront them directly and decisively. Complacency might spell doom for project leaders who do not anticipate impending problems.

5.5.2 Projects were implemented to address various problems in a four main areas

The 52 projects were implemented to address problems in four domains: commercial/economic, technological, human resource development/intellectual, and social, in that order of prominence. The motivations for implementing these projects are detailed in Tables 5.6-5.6.

5.5.3 Projects' main objectives were substantially achieved but project leaders and contact persons seemed to focus on achieving different objectives

Four categories of objectives emerged from the analysis. In all, including single sector and cross-/multi-sectoral projects, 25 commercial/economic objetives were cited. Sixteen (64%) of them were rated for achievement with an average of 83%. The technological cluster of objectives also had 25 objectives for single and cross-/multi-sectoral projects. With 17 (68%) rated, the average achievement was 90%.

In the human resource development/intellectual sphere, 19 objectives were cited (some more than once) for single and cross-/multi-sectoral projects. Sixteen (84%) of the objectives were rated. The average level of achievement was 90%. Finally, 12 social objectives were mentioned for single-sector projects, with eight (67%) rated. The average achievement for this cluster was 88%.

Although not all the objectives cited were rated, more than two-thirds were rated in each category. In one category (human resource development/intellectual) objectives were fully achieved; in the other three there was substantial achievement. Tables 5.76-5.79 give full details.

Differences in focus or priority showed in the main objectives of projects cited by project leaders and those given by contact persons. Commercial/economic and technological objectives were the dominant ones cited by project leaders, followed by human resource development/intellectual, and social objectives, in that order. In terms of achievement, commercial/economic objectives were fully achieved while objectives in the other three clusters were substantially achieved.

Contact persons focused on three categories of objectives. Human resource development/intellectual objectives were predominant, followed by commercial/economic and technological objectives.

5.5.4 Implementation of projects yielded mostly human resource benefits for industry partners and other stakeholders

Industry partners were not the sole beneficiaries of benefits that accrued from the projects. 'Related industry' and 'other(s)' also benefited. Apart from these main beneficiaries other stakeholders benefited: project leaders (academics/researchers), the public, and South Africa at large benefited.

The projects studied in this research yielded numerous benefits. Four categories of benefits accrued to main from implementing the projects. The most benefits were realised in the human resource development/intellectual sphere. The commercial/economic domain recorded nine, while the technological and social domains recorded six and five benefits, respectively. Most benefits reported by contact persons were in also in the human resource development/intellectual realm, followed by commercial/economic domain, and technological spheres only. This is conveyed in Tables 5.16-5.19.

Specifically, many academic/researchers benefited from conducting THRIP/industry-funded applied research projects in terms of journal publications, conference papers, the building of local and international networks and status, and registration of patents, to mention a few.

Some of the ways in which industry partners and the country benefited was through knowledge and/or technology transfer, income generated from developing new or improved globally competitive commercial products, exploitation of (new) markets, and skills development or improvement.

5.5.5 Some positive unintended impacts (spin-offs), negative unintended impacts and contrary impacts also materialised

Other than direct and expected benefits, unintended impacts or spin-offs were realised from implementing the projects. Ten spin-offs were reported in the human resource development/intellectual realm by twenty-one respondents, eight in the commercial/economic sphere by fifteen respondents, seven and three in the technological and social arenas, respectively. These are reflected in Tables 5.20-5.23. Only the first three categories of unintended impacts were reported by contact persons.

The majority of negative unintended impacts were administrative. Eleven were cited. Four each were reported in the human resource development/intellectual and technological arenas while two were eported in the commercial/economic domain. Tables 6.24-6.27 carry the relevant details. With respect to contrary impacts, seven of varying levels of severity were cited. Details are eflected in Table 5.28.

5.5.6 Projects made many differences in changing the situations that existed before they were implemented

Projects made many differences or impacts in four domains: technological, commercial/economic, human resource development/intellectual, and social. These varied in degrees of importance, ranging from moderate, substantial to groundbreaking, and contributed significantly to solving the problems they were implemented to address.

The greatest number of differences made, 35, was in the technological sphere, reported by 27 respondents (the largest number for any category). Fifteen groundbreaking differences were reported and the 15 respondents reported substantial differences their projects made. Seventeen commercial/economic differences were reported by 20 respondents, of which five were groundbreaking. In addition, eight substantial differences were cited. In the human reource development/intellectual domain nine differences were cited in multiples by 23 respondents, nine rating the differences their projects made as 'groundbreaking'. Eight respondents cited substantial differences made. Socially, 13 differences, five of which were groundbreaking, were reported by eight respondents. Seven were substantial. In all, then, the projects made many differences in addressing the problems/situations that prompted their implementation. Tables 5.7-5.10 capture all the details.

5.5.7 Although some impacts were immediate, many will manifest only in the medium-to long-term

Most impacts from projects were reported by both project leaders and contact persons in the human resource development/intellectual sphere. Project leaders reported having turned out masters and doctoral students as a direct result of having implemented their research projects. Most of these skilled personnel are highly sought after globally. The training of graduates on THRIP/industry-funded projects immediately served to reduce scarce but much-needed skills shortage in SET, thereby creating the opportunity for small, medium and micro enterprises to be better equipped in producing new and improved products that can compete in the local and international market demands.

In the commercial/economic sphere improved efficiency and reliability, reduced costs and losses, new techniques of energy management and improved electricity distribution, development of new products, the development of probiotic for use in yoghurt, improvement in animal genetics and nutrition were some of the immediate impacts projects made.

Of immediate impact on the South African economy was the removal of citrus black spot disease threat to the European Union. This was facilitated by the development of a new internationally-accredited technique for rapid diagnosis of citrus black spot disease in export consignments. This had an immediate impact in providing a competitive edge for a perishable product in international markets.

Technologically, the impact of launching a 65kg micro-satellite with close to imagery Spot 2 has been immediate in putting South Africa among globally serious space players. Similarly, the establishment of the world's first (and possibly so far only) non-passive treatment plants for neutralisation and sulphate removal using limestone as the only source of alkali has had a double immediate impact. First, it gained the researcher instant international recognition and, secondly, it solved one of the intractable prolems in the mining sector, namely: cost effective treatment of acid water.

The impact of the development and optimisation of cryo-preservation protocols and characterisation of seed recalcitrance and its relevance for food security will be realised only in the long-term when the technology is fully appreciated and utilised.

Finally, immediate impacts were realised in the social arena through some SIC 8 projects while others hold promise for medium to long-term impacts. The rapid (three-hour) diagnosis of TB in HIV-infected persons made possible from a technological breakthrough of one project makes the difference between life and death for millions of South Africans.

Similarly, the discovery of a treatment for arthritis is immediate welcome news for people living with this debilitating condition. In the medium to long-term, the development and inclusion of an immunogen in a vaccine for HIV-1 sub-type C holds promise for HIV-infected persons.

While intermediate impacts are clearly visible now, it must be borne in mind that long-term (or final) human resource/intellectual development, commercial/economic, technological, and social impacts of implementing these projects will only be realised years down the line.

5.5.8 Majority of projects were judged as 'successful' and backed up with indicators

That the projects studied were largely successful is beyond dispute. Overall, 92% of the 52 projects were successful and 8% inconclusive. All projects in SIC 2, SIC 5, and SIC 7 were successful but one each in SIC 1, SIC 3, SIC 4, and SIC 8 were inconclusive. All ten cross/multi-sectoral projects were also successful. However, differences in perspectives surfaced, with contact persons indicating that 86% of the 21 projects they represented were successful, two inconclusive and one unsuccessful, contradicting a successful verdict by project leaders on two projects. This might be attributed to project leaders and contact persons applying different criteria in defining 'success', a possibility hinted at in section 4.2.

Indicators of success were cited in the commercial/economic, technological, social, and human resource development/intellectual, in that order of prominence, by project leaders. Contact persons cited indicators in three domains: commercial/economic, human resource development/intellectual, and technological.

5.5.9 Use of managerial strategies were instrumental in achieving success but environmental and personal factors also played a role

Managerial strategies were instrumental in achieving success. The main strategies used were communication, collaborative effort or teamwork, good leadership, financial management, close supervision/involvement with students, focused or goal-oriented effort, and technical expertise. Supportive environment (good organisation/structure) and personal characteristics of some project leaders, however, were also critical success factors.

5.5.10 Uncontrollable factors, but also poor project management skills, acccounted for some projects' failure and inconclusiveness of some projects

Three main factors accounted for failure of projects. The first was unfavourable market conditions. Another was failure to set a time limit within which objectives were to be achieved. Thirdly, was failure to decide in good time to continue or discontinue project. The latter factors are aspects of poor project time management. Inconclusiveness was attributed to seven factors: two related to improper communication, two to financial/funding problems, and one to non-implementation of technology developed. Another was attributed to failure of students to deliver standard subsystems and the last to lack of qualified personnel on the projects.

5.5.11 Project leaders and contact persons saw themselves as collaborators

Although the study was not primarily concerned with how project leaders and contact persons see the relationship among the three parties (academics/researchers, industry partners and THRIP), "collaboration" featured prominently in comments and other responses. From these, it is evident that project leaders and contact persons saw themselves as collaborators involved in mutually beneficial projects with THRIP. This ownership of projects is an essential indication that the triple helix has taken root in applied research in South Africa.

5.6 General conclusion

It is clear from this research that THRIP/industry-funded applied research projects have produced many benefits and made impacts at the individual, institutional and national levels and will continue to do so in the foreseeable future. Applied research does not only benefit academics/researchers who conduct them, but also industry partners who invest in them, the wider public, and the South African economy.

The research shows that the benefits and impacts yielded by the projects are in line with THRIP's strategic mission and that overwhelmingly human capital development, that is human resource and intellectual development, has been the major benefit with resulting impacts. The South African workforce has been gaining invaluable scarce SET expertise over the years. Numerous students and company employees have been trained under the wings of THRIP/industry-funded applied research projects at universities.

The impact of human resource development in SET scarce skills has been immediate but will be more deeply felt over the years as small, micro and medium enterprises fill their ranks with appropriately-skilled employees. The economy is becoming more globally competitive with the turning out of world-class scientists, engineers and technologists in different specialist areas. Research has also resulted in the development and registration of patents, publication of papers in local and international journals, and conference presentations.

Technology development and transfer hold many promises for countries. These include the stimulation of economic growth, improvement of the quality of life and making better use of national R&D assets to promote economic competitiveness in the world marketplace. South Africa has gained in this respect from THRIP/industry-funded applied research projects.

South Africa's image is internationally well-established in the space community because of technological breakthroughs in the industry that have resulted in the launching of SunSAT micro-satellite by the National Aeronautics and Space Administration in 2003.

Implementation at mine sites of non-passive treatment neutralisation and sulphate removal plants that use limestone as the only source of alkali was a world first in cost-effective waste-water (50% cost reduction) treatment that not only earned the researcher international recognition, but also firmly put the country at the forefront of using technology to solve pressing environmental problems.

That some of the projects studied yielded benefits in the commercial/economic domain can be seen in the development and marketing of new and improved products locally and internationally. Among these products are a density meter, borehole radar syatems, and medical and industrial sensors.

Commercialisation of micro-satellite technology by some University of Stellenbosch students resulted in the setting up of Sunspace (Pty) Ltd as a spin-off company from the SunSAT micro-satellite research project. The micro-satellites have found market with NASA (USA), in Australia, Germany and Korea, where they are deployed in space to monitor the weather, track refugees and forest fires. It is also reported that Sunspace is bringing in foreign exchange, has created employment and succeeded in bringing back some of South Africa's top scientists. Another spin-off company has been set up by some students who graduated under a project to manufacture and sell power electric converters Du Plessis (See THRIP:n.d.).

Socially, the lives of millions of ordinary South Africans will be changed in significant ways as a result of research that has produced breakthroughs in medical technologies and techniques. For example, a device developed in a THRIP project is now being manufactured and marketed, capable of diagnosing tuberculosis in HIV-positive patients in three hours. Prior to this, the earliest time the other method took to produce any results at all, which might not be all that conclusive, was two weeks. In addition, arthritis sufferers can now heave a sigh of relief with the development of a drug for treatment. Further, the potential for cancer treatment and the inclusion of an immunogen in a vaccine for HIV-1 sub-type C hold great promise for cancer and HIV-infectd persons, respectively.

As a final point, it has to be acknowledged that while many intermediate impacts have occurred, it will take some years for the cumulative final impacts of all these projects to show.

It is recommended that THRIP take a good, long, and hard look at the online application and reporting system with a view to simplifying operational procedures involved.

This will take the administrative burden off project leaders and ensure faster submission of funding applications and easier reporting of progress, thereby saving valuable time for crucial project work.

5.7.3 Provide unambiguous guidelines and give feedback

Concern has been raised in comments by some project leaders about the absence of clear indications of what benefits THRIP and the DTI expect from projects, lack of feedback mechanisms and seeming non-alignment of questions on the application form with THRIP's objectives. Given that THRIP has certain expectations of projects, it is imperative to have these stated in clear, unambiguous terms that are properly communicated to project leaders. Similarly, there is a need for regular feedback to be provided on improvements that could be made.

5.7.4 Encourage use of project management principles by project leaders

It is important for project leaders, the people responsible for accomplishing project objectives, to know the fundamentals of project management in the light of the fact that aspects of poor project management (poor time management, poor communication, and lack of sufficiently qualified expertise) were implicated in the inconclusiveness of two projects.

Projects may look simple but they are complex to manage successfully because they involve balancing three key elements, namely scope, time, and cost. These constitute the "triple constraint" that needs careful balancing against each other and against other aspects to achieve success. A change in any one of the three has a ripple effect.

To compound things, projects operate in highly uncertain environments. While a stock of "best practices" applicable to managing applied research projects specifically may not readily be available, a good knowledge of generic project management will go a long way to improving the chances of success.

5.8 Limitations of research

Time, financial and other constraints did not allow for a more comprehensive research that would have involved following up more on contact persons to have a better response rate. In addition, it was intended that a third questionnaire be administered to secondary beneficiaries and members of the public or sections of society that benefited from the implementation of the projects in order to obtain a holistic picture of the projects' benefits and impacts.

While the projects have undoubtedly yielded many benefits and impacts, it is not known at what total cost these have been achieved. A link between total costs and benefits and impacts through cost-benefit/cost-effectiveness analysis might be useful. It might show whether some of the successes were "pyrrhic victories", where costs out-weighed benefits and impacts and, therefore, offered no real value for money. Future research with this focus will be beneficial.

While the research covers projects in the major standard industrial classification categories or sectors, the sampling technique did not focus on representativity. As such projects in the sample were not representative of their respective sectors. This means that no generalisations can be made from the research findings.

At best, as far as the current research is concerned, the performance of these projects is an indication of the many and varied benefits and impacts that THRIP/industry-funded applied research projects are capable of yielding, but not guaranteed to yield.

5.9 Implications for further research

A holistic assessment of projects' impact needs to consider the collective views of all stakeholders and beneficiaries. This research involved a relatively small number of academics/researchers, numbering 44, some of whom undertook two or more projects (hence 52 projects and 52 project leaders). They were affiliated to seven South African universities, one technikon, and three divisions of the CSIR. A small number of sponsors were also involved. This limited number, coupled with the non-inclusion of views of the public/civil society, the ultimate beneficiary of all applied research, constitutes the major limitation of this research.

As they stand, the research findings represent an important, but incomplete view of how THRIP/industry-funded applied research projects impact on a wide range of stakeholders. A complete picture of impact will begin to emerge only when the input of many more sponsors, secondary beneficiaries and identified communities that have benefited from specific projects have been sought and considered alongside those of project leaders over a longer period of time. Thus, there is need for further research in this direction.

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Table 2.1: Commonalities among classification of evaluation types

2.3.1 American Evaluation Association	2.3.2 Rossi and Freeman	2.3.3 Posavac and Carey	2.3.4 Kusek and Rist	2.3.5 Trochim	Researcher's nomenclature
2.3.1.1 Front-end Analysis 2.3.1.2 Evaluability assessment 2.3.1.3 Formative evaluation **2.3.1.4** Impact *evaluation* 2.3.1.5 Programme monitoring 2.3.1.6 Meta- evaluation	2.3.2.1 Analysis related to conceptualisation and design of interventions 2.3.2.2 Programme monitoring studies **2.3.2.3** *Programme* outcome or impact assessment	2.3.3.1 Evaluation of need 2.3.3.2 Evaluation of process **2.3.3.3** Evaluaton of outcome 2.3.3.4 Evaluation *of efficiency*	2.3.4.1 Performance logic chain evaluation 2.3.4.2 Pre- implementation assessment 2.3.4.3 Process implementation *evaluation* **2.3.4.4** Rapid appraisal 2.3.4.5 Case study 2.3.4.6 Impact eval.	2.3.5.1 Formative evaluation a. Needs assessment b. Evaluability assessment c. Structured conceptualisation d. Implementation evaluation *e. Process* evaluation **2.3.5.2** Summative evaluation	Evaluation for planning and execution (Planning/ execution studies) **Evaluation for effects (Effects Studies)**
			2.3.4.7 Meta- evaluation	a. Outcome evaluation b. Impact evaluation c. Cost- effectiveness evaluation d. Secondary evaluation e. Meta-analysis	

Note: **Bold numbering** indicates start of aspects relating to Evaluation for effects

Table 2.2: Compendium of evaluation approaches

House's taxonomy	Posavac/Carey's overview of models
2.4.1.1 Systems Analysis	2.4.2.1 Traditional
2.4.1.2 Behavioural Objectives	2.4.2.2 Social Science research
2.4.1.3 Decision-making	2.4.2.3 Industrial Inspection
2.4.1.4 Goal-free	2.4.2.4 Black Box
2.4.1.5 Art Criticism	2.4.2.5 Objectives-based
2.4.1.6 Professional Review	2.4.2.6 Goal-Free
2.4.1.7 Quasi-Legal	2.4.2.7 Fiscal
2.4.1.8 Case Study	2.4.2.8 Accountability
	2.4.2.9 Expert Opinion
	2.4.2.10 Naturalistic
	2.4.2.11 Improvement-based

Table 2.3: Types of evaluation according to timing and role

Source	Before implementation	During implementation	After implementation
American Eval. Society	2.3.1.1, 2.3.1.2	2.3.1.3	2.3.1.4, 2.3.1.5
Rossi & Freeeman	2.3.2.1	2.3.2.2	2.3.2.3
Posavac & Carey	2.3.3.1	2.3.3.2	2.3.3.3, 2.3.3.4
Kusek & Rist	2.3.4.1, 2.3.4.2	2.3.4.3, 2.3.4.4	2.3.4.5, 2.3.4.6, 2.3.4.7
Trochim	2.3.5.1 (a-c)	2.3.5.1 (d-e)	2.4.5.2 (a-e)
	F O R M A T I V E		S U M M A T I V E

Table 4.1: Standard industrial classification categories of projects

Major divisions or sectors	Standard industrial classification category
Agriculture, Hunting and Fishing	1
Mining and Quarrying	2
Manufacturing *and Processing*	3
Electricity, Gas, Water Supply/*Usage*	4
Construction and *Environment*	5
Transportation, Storage and Communication	7
(Health)	8

Note: *Italics* indicate adjustment to category

Table 4.2: Distribution of academics/researchers and projects

Provinces and institutions	Number and percentage of academics/researchers		Number of projects	Pecentage
Gauteng	15	34%	21	37%
University of Pretoria	7		9	
University of the Witwatersrand	3		3	
Rand Afrikaans University	1		1	
Pretoria Technikon	1		3	
CSIR (Miningtek)	1		3	
CSIR (Coaltech)	1		1	
CSIR (Environmentek)	1		1	
KwaZulu Natal	8	18%	9	17%
University of Durban Westville	3		4	
University of Natal, Durban	5		5	
Western Cape	21	48%	22	46%
University of Cape Town	9		10	
University of Stellenbosch	12		12	
Total	44		52	

Table 4.3: Distribution of single-sector projects by size of funding

SIC	Less than R499 999	R499 999 to R999 999	R1 million to R1 999 999	R2 million to R4 999 999	R5 million to R7 999 999	More than R8m
1		1598 1715	1756 2426	1815		
2			1691	1569	820	755 816 1394
3	1377 1630 1759	1655	1582 1749	2458		698
4	2965	1811 2218	1716	1643 2295	2465	2675
5		2684		2366		
7	2508 2083			2007 2605		1865
8	1314		1690 1748	1299 1628		1456 1802

Note: Funding amount for one project (1805) in the Health sector was not provided

1 = Agriculture, Fishing, and Hunting

2 = Mining and Quarrying

3 = Manufacturing and Processing

4 = Gas, Water Supply and Usage

5 = Construction and Environment

7 = Transport, Storage, and Communication

8 = Health

Table 4.4: Distribution of cross-/multi-sectoral projects by size of funding

Sector	Funding size	Projects
SIC 1, SIC 2 & SIC 3	R1 000 000 - R1 999 999	2217
SIC 1 & SIC 3	R1 000 000 - R1 999 999	2392
SIC 2, SIC 3 & SIC 4	More than R8 000 000	1651
SIC 2, SIC 3 & SIC 5	R2 000 000 - R4 999 999	1496
SIC 2, SIC 3, SIC 4 & SIC 5	More than R8 000 000	1610/1609
SIC 3 & SIC 4	R2 000 000 - R4 999 999	1696
SIC 3 & SIC 7	R499 999 - R999 999	2825
SIC 3 & SIC 7	R1 000 000 - R1 999 999	1824
SIC 3 & SIC 7	More than R8 000 000	1817
SIC 1, SIC 3 & SIC 5	R1 000 000 - R1 999 999	1822

Table 5.1: Implementation problems experienced on projects linked to success/failure

Problem	Rating	Project ID	Outcome
1. Late transfer or release of money	3, 3, 3	1628, 1756, 1865	Successful
2. Late authorisation to start led to late completion of work.	3	2295	Successful
3. Theft of components	5	1394	Successful
4. Negotiation were held with foreign research supplier due to rand depreciation.	4	755	Successful
5. Scope of work or task details were extended by industry partner.	2 unrated	2218 820	Successful Successful
6. A student was employed who failed to complete work/studies.	3, 5	2218, 1377	Successful
7. Project is not yet completed (and a 10-year follow-up is needed).	5	1314	Inconclusive

Table 5.2: Primary beneficiary groups identified by project leaders

Beneficiary group(s)	Respondents	Percentage
1. Sponsor	52	100
2. Sponsor and related industry	14	27
3. Sponsor, related industry and others	7	13,5

Table 5.3: Commercial/economic problems projects were implemented to address

Problem	Project ID
1. To provide scientific evidence to ensure continued trade	2426
2. To improve efficiency in electricity distribution	2218, 1716, 1811, 2675, 2295, 2965
3. To develop new equipment/products and improve on existing ones	698, 1815, 1691, 1759, 2825
4. To find better ways to export perishable products	
5. To develop cryo-preservation protocols for seeds and/or control plant disease	1815, 1598
6. To establish competitiveness of steel, reduce corrosion, understand cement	2366, 1696, 2684
7. To control animal diseases and improve animal genetics	1815
8. To reduce the impact of mango black spot disease	1598
9. To ensure sustainability of wood production in South Africa	1756
10. To develop specialised optical fibre	1817
11. To find an alternative to nisi, the only purified commercially-used antimicrobial peptide used in food preservation	2302
12. Efficient conversion and control of electrical energy	2675
13. The need to improve the life of transmission lines caused by fatigue and breakage	2295
14. The need for a low-cost, sensitive laser diode that can operate at a good distance without signal processing problems	2217
15. To develop a cost-effective local; product capable of covering a distance 1 to 4 km at a good speed and protocols	1824
16. The need for an ad hoc telecommunication network with input-output at nodes powered by solar cells that is cost-effective and with a total system integration	1822
17. Neutralisation of acid water in a cost-effective way	1610/1609
18. Investigating the economics and feasibility of establishing a Universal Telecom Access system for SADC region using a hybrid of satellite and terrestrial links	2083
19. To find a safe, cost-effective means of transporting men on shifts to their working places	820

Table 5.4: Human resource development/intellectual problems projects were implemented to address

Problem	Project ID
1. To fill knowledge gap in diagnosis and/or treatment of human diseases; to develop drugs	1802, 1299, 1314, 1628, 1690, 1748, 1805, 1456
2. To build human resources, skills, capacity	1655, 1582, 2825, 1643, 2458
3. To develop an understanding of a (complex) problem	1569, 1655, 1749
4. To develop and register a patent	2392
5. To develop a one-stop methodology for universities doing industrial projects	1651
6. To develop capacity and new knowledge in Energy Management/Demand Side Management	2465
7. Need for a consulting service in software engineering	2815
8. The need to have foreknowledge of geological structures	755
9. Research on basic characterisation and understanding of cement-based construction materials	2684
10. Building a South African micro-satellite as part of graduate training of M Sc and Ph D students	2007
11. The need to establish a centre of knowledge and capability in high frequency components and systems to train engineers with right skills and knowledge and support them and local companies with continuous research into developments in this fast changing field	2458

Table 5.5: Technological problems projects were implemented to address

Problem	Project ID
1. To develop space technology	1865, 2007
2. To find ways of preserving fruit juice	2302
3. To improve vehicle engine performance and/or enhance safety	1582, 1759
4. To apply radar technology to various problems	1496
5. To improve communication or surveillance	1691, 1817, 2217, 1822, 1824, 2083, 2508, 2605
6. To improve mine safety and provide efficient transport and ventilation	755, 816, 820
7. To study and/or solve an environmental problem	1377, 1756, 1394, 1610/1609
8. To establish a methodology for doing industrial projects	1651
9. To solve harmonics and voltage distortion in supply networks due to classical diode rectifiers	1716
10. To supply electricity to areas where other possibilities are not possible	1811
11. Movement of laboratories	1749
12. To develop a methodology for crashworthiness assessment and virtual prototyping of automotive components made from advanced composite materials	1759
13. To raise the bar on imaging by launching a 10 mega-pixel camera/push-button in micro-satellite	1865
14. The need to identify, evaluate and develop technologies and systems that will enable cost-effective ultra-deep mining to take place in acceptable environmental conditions	816
15. To find a way of dealing with stress corrosion cracking in ferritic stainless steel	1696
16. To study ways of providing multiple services in wireless for the generation of cellular systems	2605
17. Capacity building in High Voltage Direct Current (HVDC) technology	1643
18. To design curves for patch antennas	2508

Table 5.6: Social problems projects were undertaken to address

Problem	Project ID
1. To develop an immunogen relevant to South Africa for inclusion in a vaccine	1628
2. To find a biomarker to predict outcome of treatment in tuberculosis (TB) patients	1456
3. To develop a marker to enable pharmaceutical forms invest in new TB drug development	1805

Table 5.7: Commercial/economic differences projects made

Difference	Rating	Project ID
1. Ensured continued trade with the European Union	5	2426
2. Improved paint products on the market	4	698
3. Developed a high-powered transmitter	5	2217
4. Availability of a modular software package for advanced control that can be utilised by smaller companies: a niche market opportunity	not rated	1630
5. Developed new products	5	2458
6. Reduced costs/loss	3 4	820 2965
7. Improved efficiency	4 not rated 4 not rated not rated 3 4 5	1811 1691 1582 2465 1822 2218 2217 2965
8. Economic opportunity created for small-scale farmers	3	1394
9. Reliability and cost-effectiveness achieved	4 5 not rated	1822 1394 1610/1609
10. Feasibility and viability of UTAS established	not rated	2083
11. Attracting new investments	5	1456
12. Improved animal genetics and nutrition	3	1815
13. Relative value of intensive management established	4	1756
14. An opportunity was afforded to small-scale farmers to make a living out of rehabilitated land and waste water.	4	1394
15. Enabled industry partners to make proper engineering decisions that had huge capital and running cost implications	3	820
16. The research was the first that resulted in full-scale application in a cost-effective way.	not rated	1610/1609
17. Energy management	3	2465

Table 5.8: Human resource development/intellectual differences projects made

Difference	Rating	Project ID
1. Awareness created, knowledge/understanding increased	4	1377
	4	1569
	5	1749
	4	2465
	5	1643
	not rated	2508
	4	1651
2. Human resource development: postgraduates/skills training; capacity development	2	2366
	4	1691
	4	1655
	5	2295
	5	1643
	3	2465
	5	1582
	5	2007
3. A provisional patent in the application of Natural Anti-Microbial Peptide Bacteriocins as natural preservation and sanitation agents was filed.	not rated	2392
4. Patents with potential cancer treatment	5	1299
5. *Internationally recognised patents were registered*	*not rated*	1610/1609
6. A new international accredited technique (PCR) for rapid diagnosis of citrus black spot in export consignments was developed.	5	2426
7. Developed and patented new optical equipment	5	1817
8. Academic contribution: national/international publications, recognition, conference papers, broad-based multi- and cross-disciplinary research	4	1651
	4	1456
	not rated	1299
	4	2684
	not rated	1610/1609
9. Provided evidence to address EU concerns about citrus black spot risk	3	1756

Table 5.9: Social differences projects made

Difference	Rating	Project ID
1. TB diagnosis in HIV-infected persons can now be done in 3 hours, instead of two weeks.	5	1802
2. An immunogen was developed and is currently included in a vaccine.	5	1628
3. Few disease-causing changes were found	4	1690
4. Results have been returned to families for diagnosis	4	1690
5. Discovery of cancer-causing gene	5	1748
6. Preparation for gene-based therapy	5	1748
7. Data and sample banks were developed.	4	1805
8. Retinal diseases diagnostic opportunities	4	1748
9. Predictive opportunities for colorectal cancers in families	4	1690
10. Environmental problem solved	4	1756
11. A cheap way to treat contaminated mine water was found.	5	1394
12. Progress has been made in developing a vaccine.	3	1628
13. Capsule development for surrogate marker assay	4	1456

Table 5.10: Technological differences projects made

Difference	Rating	Project ID
1. Development of new/improved design, models, equipment, facilities, processes, procedures, tools, protocols, techniques and technologies	5 5 4 4 not rated *not rated* not rated not rated not rated	1696, 2684, 2605, 2295, 2426, 1759, 1655, 1496, 1582, 755, *816, 1811* 2295, 1569 1610/1609, 1630, 2366,
2. A 65 kg satellite with close to imagery Spot 2 was launched; space technology was developed.	5	1865, 2007
3. The research proved that established space could be reached at a far *lower cost than industry was achieving.*	5	1865
4. Application of research, skills, and technology	3 2 5	2825 1811 2217
5. Characterisation of seed recalcitrance	5	1715
6. Developed and optimised and cryo-preservation protocols	not rated	1715
7. Combating seed-associated micro-organisms	not rated	1715
8. The only *non-passive treatment plants in the world for neutralisation and* sulphate removal were established.	*not rated*	*1610/1609*
9. Technological input and development was provided to more effectively control mango black spot disease.	4	1598
10. Developed a robust, light-weight, cheap, in-store direct contact air cooler	4	816
11. Developed and patented new optical components	5	1817
12. Developed a high-powered transmitter	5	2217
13. Developed a sensitive receiver	5	2217
14. Achieved improved signal processing	4	2217
15. At the forefront regarding speed, distance and reliability	4	1824
16. Developed radio backbone with protocols and power	5	1822
17. Capability of using imaging radar in a variety of applications	5	1582
18. *Applied newer engine* control technology to old engine	3	2083
19. It was shown that Universal Telecommunication Access System (UTAS) is feasible and viable as an option for Southern African Development Community (SADC).	not rated	2083
20. Characterisation of optical fibre components completed and working	5	1817
21. Designed software tools to design and manage refrigeration and ventilation	4	816

22. Harmonics and voltage distortion in networks were solved	5	1716
23. Identified heat treatment procedure to avoid sensitisation and SCC of ferritic stainless steels	5	1696
24. Mine sites where neutralisation and sulphate removal were implemented are the only non-passive treatment plants in the world using limestone as the only source of alkali.	not rated	1610/1609
25. Identified mechanisms of failure of adhesion in coatings and remedial actions	4	1696
26. Upgrade old engines to meet new emission standards	3	1582
27. Membrane and solar distillation plants for sterilisation desalination	3	698
28. Established scale-up criteria	4	1655
29. Information technology in design process: mathematical code developed	4	755
30. Codification: development of South African loading code	4	2366
31. Developed process-controlled laboratory reactors	4	1655
32. Developed a model for tank leaching	4	1569
33. A density meter to monitor and control limestone slurry density at a specific level was developed.	not rated	1610/1609
34. Ability to test under different condition because of temperature control	5	2295
35. A Borehole Radar System has been developed from concept, prototype to commercialisation that has been routinely used on deep gold and platinum mines.	4	755

22. Harmonics and voltage distortion in networks were solved	5	1716
23. Identified heat treatment procedure to avoid sensitisation and SCC of ferritic stainless steels	5	1696
24. Mine sites where neutralisation and sulphate removal were implemented are the only non-passive treatment plants in the world using limestone as the only source of alkali.	not rated	1610/1609
25. Identified mechanisms of failure of adhesion in coatings and remedial actions	4	1696
26. Upgrade old engines to meet new emission standards	3	1582
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29. Information technology in design process: mathematical code developed	4	755
30. Codification: development of South African loading code	4	2366
31. Developed process-controlled laboratory reactors	4	1655
32. Developed a model for tank leaching	4	1569
33. A density meter to monitor and control limestone slurry density at a specific level was developed.	not rated	1610/1609
34. Ability to test under different condition because of temperature control	5	2295
35. A Borehole Radar System has been developed from concept, prototype to commercialisation that has been routinely used on deep gold and platinum mines.	4	755

Table 5.11: Main commercial/economic objectives

Objective	Rating	Project ID
1. To improve return in investment	100	2218
2. To improve engine power and efficiency	not rated	1582
3. To maximise energy distribution generation on losses	not rated	2465
4. To control mango black spot disease in new orchards	not rated	1598
5. To optimise cryo-preservation protocols for general use	50	1715
6. To assess impact of distribution generation on losses	100	1715
7. To do risk assessment study to prove that citrus black spot disease cannot be introduced into the European Union and should not considered a phytosanitary risk	100	2426
8. To treat contaminated mine water cost effectively	100	1394
9. To develop high quality diets and feed additives for monogastric animals for both domestic and potential export markets which can compete with current expensive, imported, high quality products	not rated	1815
10. To develop an affordable model predictive control package	not rated	1630
11. To neutralise mine acid water using limestone	100	1610/1609
12. To design a low-cost, high-speed, reliable product capable of covering a good distance	50	2217
13. To develop high-efficiency, high-power factor, non-polluting three-phase active rectifier	90	1716
14. To assess the impact of distribution generation on voltage profile	100	2965
15. To assess the impact of distribution generation on losses	100	2965
16. Competitive edge improvement	not rated	2458
17. To attract new investments	80	1456
18. Creation of small, medium and micro enterprises	100	698
19. To determine economic viability of distribution generation	100	2965
20. To develop a reliable and cost-effective product	not rated	1822
21. To afford small-scale farmers the opportunity to make a living out of rehabilitated land and waste water	80	1394
22. To identify technologies that will ensure rapid and safe transport of men and transport of material and rock between surface and working place	95	820
23. To identify, evaluate and develop technologies and systems that will enable cost-effective ultra deep mining to take place in acceptable environmental conditions	90	816
24. To improve power consumption	not rated	1822
25. Energy Management and Energy efficiency	not rated	2465

Table 5.12: Main human resource development/intellectual objectives

Objective	Rating	Project ID
1.To develop manpower	100	2605
2. To develop high level human resources	90	2366
3. To develop human resources	not rated	1655
4. Training of specialists	100	1643
5. Training of professional staff	90	1696
6. To increase pool of high level human resource skills in cement/concrete materials	not rated	2684
7. To train postgraduate students (M Sc, Ph D); graduate training in Engineering	100 95 90 70 not rated	2295 1756 1299 1865 2218 1817 2007 2458
8. To foster international ties	80	1817
9. Publication of knowledge	70	1756
10. To understand problems affecting performance of existing HVDC systems	100	1643
11. To understand catalysis deactivation	not rated	1749
12. To understand metallurgical and corrosion principles	80	1696
13. To solve industrial problems through multi- disciplinary teams	not rated	1651
14. Networking of national and international scientists	80	1756
15. To develop a strong and sustainable research network among local tertiary education institutions	not rated	2684
16. To gain knowledge of Demand Side Management	not rated	2465
17. To patent application of identified and isolated bacteriocins/AMPs to juice preservation	100	2392
18. To improve understanding of network operation	90	2218
19. To establish a centre of expertise in bioleaching research	100	1569

Note: objectives 1-8 represent the human resource development or training strand, while 9-19 reflect the intellectual strand of objectives

Table 5.12: Main human resource development/intellectual objectives

Objective	Rating	Project ID
1.To develop manpower	100	2605
2. To develop high level human resources	90	2366
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9. Publication of knowledge	70	1756
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11. To understand catalysis deactivation	not rated	1749
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Objective	Rating	Project ID
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3. To develop human resources	not rated	1655
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5. Training of professional staff	90	1696
6. To increase pool of high level human resource skills in cement/concrete materials	not rated	2684
7. To train postgraduate students (M Sc, Ph D); graduate training in Engineering	100 95 90 70 not rated	2295 1756 1299 1865 2218 1817 2007 2458
8. To foster international ties	80	1817
9. Publication of knowledge	70	1756
10. To understand problems affecting performance of existing HVDC systems	100	1643
11. To understand catalysis deactivation	not rated	1749
12. To understand metallurgical and corrosion principles	80	1696
13. To solve industrial problems through multi- disciplinary teams	not rated	1651
14. Networking of national and international scientists	80	1756
15. To develop a strong and sustainable research network among local tertiary education institutions	not rated	2684
16. To gain knowledge of Demand Side Management	not rated	2465
17. To patent application of identified and isolated bacteriocins/AMPs to juice preservation	100	2392
18. To improve understanding of network operation	90	2218
19. To establish a centre of expertise in bioleaching research	100	1569

Note: objectives 1-8 represent the human resource development or training strand, while 9-19 reflect the intellectual strand of objectives

Table 5.13: Main social objectives

Objective	Rating	Project ID
1. To discover cancer-causing genes	90	1748
2. To identify compounds for cancer treatment	100	1299
3. To identify causes of cancer	not rated	1314
4. Early diagnosis of cancer	not rated	1314
5. To develop reliable and fast diagnosis of TB in HIV-infected persons	100	1802
6. To give patients information in respect of genetic data	80	1690
7. To afford prediction and diagnosis based on genetic knowledge	80	1690
8. To identify a South African isolate HIV-1 subtype C for inclusion in a vaccine	not rated	1628
9. To characterise immune responses to HIV-1 subtype C infection	100	1628
10. To find a biomarker that will predict outcome of treatment in TB patients	50	1456
11. To find a surrogate marker that will predict response to TB treatment	not rated	1805
12. To recruit and enrol smear-positive TB positive patients	100	1805

Table 5.14: Main technological objectives

Objective	Rating	Project ID
1. To obtain accurate visualisation of geological structures	80	755
2. To identify technologies for rapid and safe transport of men, machines and rocks	95	820
3. To identify, evaluate and develop technologies/systems for cost-effective ultra-deep mining	90	816
4. To develop a converter	90	2675
5. To establish University of Stellenbosch as a player in micro-satellite technology	100	1865
6. To develop a high-efficiency, high-power, non-polluting three-phase active rectifier	90	1716
7. To develop a high-powered transmitter	not rated	2217
8. To develop a low-speed generator	90	1811
9. To develop radio backbone with protocols and power	not rated	1822
10. To design a low-cost, high-speed, reliable product	not rated	1824
11. Technological advancement	not rated	2458
12. To develop software to design and cost a UTAS for SADC	100	2083
13. To develop new technology	not rated	2007
14. To develop new technology in crashworthiness modelling	100	1759
15. To produce "products" in the form of usable improvements	not rated	2684
16. To improve/develop radar technique	100	1496
17. To develop an affordable model predictive control package	80	1630
18. To apply software engineering technology in the real world	50	2825
19. To incorporate technology n design process	70	2366
20. To determine juice spoilage organisms and select bacteriocin for AMP production in juice	100	2392
21. To upgrade old engines to meet new emissions standards	80	1582
22. To neutralise mine acid water using limestone	100	1610/1609
23. To identify specific genetic markers using DNA technology	not rated	1815
24. To optimise production process	80	1696
25. To add intelligence to surveillance	not rated	1815

Table 5.15: Specific reasons for rating achievement levels of objectives

Objective	Rating	Reason	Project ID
1. To develop reliable and fast diagnosis of TB in HIV-infected persons	100	A device for quick and reliable diagnosis of TB has been developed.	1802
2. To develop software to design and cost a UTAS for SADC	100	This objective was fully achieved	2083
3. To apply software engineering technology in the real world	50	Suggestions were not followed by industry partners.	2825
4. To develop converter technology	90	Converter technology is equal to the state- of-the-art in the world.	2675
5. To establish University of Stellenbosch as a player in micro-satellite technology	100	A micro-satellite was designed, developed and launched by NASA.	1865
6. To treat contaminated mine water cost-effectively	100	A cost-effective way of treating waste water was found.	1394
7. To identify a South African is Isolate HIV-1 subtype C for inclusion in a vaccine	100	Implemented inclusion of vaccine in clinical trials	1628
8. To find a biomarker to predict outcome of treatment of TB patients	50	No definite biomarker found yet	1628
9. To optimise cryo-preservation protocols for general use	50	Many species must be evaluated before this can be achieved.	1715
10. To develop high efficiency, high power factor, non-polluting three-phase active rectifier	90	The problems were solved.	1716
11. To obtain accurate visualisation *of geological structures*	80	Knowledge and technology were developed.	755
12. To identify technologies for rapid and safe transport of men, machines and rocks	95	The objective was achieved, but manufacturers of equipment and mining companies failed to provide capital for major developments.	820
13. To develop a low-speed generator	90	The technology was implemented.	1811
14. To improve/develop radar technology	100	Capability of using imaging radar in various applications has been fully achieved.	1496
15. To incorporate technology in design process	70	Developed the mathematical basis for managing the design process	2366
16. To upgrade old engines to meet new emission standards	80	Relatively advanced technology was applied, but it is not the most advanced.	1582

Table 5.16: Commercial/economic benefits

Benefit	Project ID
1. Higher educational institutions are now aware of savings impact of Demand Side Management.	2465
2. A company, Sunspace (Pty) Ltd, has been set up	1865, 2007
3. Deeper understanding of complexity of disease and a more holistic approach to disease control	1598
4. A company was started by some graduates who had completed under the project to manufacture power electric converters.	2675
5. Students founded corrosion consultancies	1696
6. Price and service-competitive borehole radar systems	755
7. Medical and industrial sensors developed	1817
8. A density meter was designed and manufactured to be marketed internationally.	1610/1609
9. Probiotic has been iappled in yoghurt.	2392

Table 5.17: Human resource/intellectual benefits

Benefit	Project ID
1. A SAPPI employee started and completed a Ph D on a similar topic; two are others are starting Ph D and M Sc, respectively.	1377
2. Increased breadth of research and increased opportunities	1628
3. Additional areas of interest and new research opportunities by related industries	1756
4. Technical expertise in opto-electronics and equipment was developed.	1824
5. Capability was developed in large scale computing.	1496
6. Expertise was developed in failure analysis.	1696
7. Experience and expertise generated has led to involvement in research for future HVDC projects.	1643
8. Three patents were registered	1817
9. Patents accepted internationally	1610/1609
10. Training of staff and students	2217
11. Students were trained in product design.	1824
12. A group of people were trained in how to work in a multi-disciplinary team.	1822
13. Scientific outcomes in terms of a far greater understanding of the impacts of manipulations involved	1715
14. The project started with 3 or 4 scientists, now it is a national consortium of about 20.	1299
15. Developed courses for industry	2605
16. Research collaboration with mechanical and civil engineers has resulted.	1817
17. Link to a large number of overseas research works	1496
18. Cooperation with overseas universities	1655
19. National and international research cooperation	1759
20. Gold and platinum are now being used to do more anti-cancer research.	1299
21. A community worker studied for a degree in Pharmacy; another is studying Computer Science.	1805
22. Polymer Institute has become very popular for students.	698
23. Funding has created a critical mass for research.	1805
24. A lot of extra research and consultancy has resulted.	816

Table 5.18: Social benefits

Benefit	Project ID
1. Finding of human papiloma virus in tumours has increased/improved understanding of the causes of cancer.	1314
2. Treatment of arthritis	1802
3. Potential asthma treatment as antigens used worked in mice	1802
4. Many new jobs created in Sunspace (Pty) Ltd	2007
5. Insight into mechanism of TB infection in patient host cells	1802

Table 5.19: Technological benefits

Benefit	Project ID
1. Rapid diagnostic technique	2426
2. Technology used in other products	1824
3. Ad hoc network technology has caught the interest of other companies.	1822
4. Technology for tracking particles was developed	1691
5. A centre for high performance computing has been established in line with government plan.	1496
6. Limestone handling and dosing systems were developed, patented and implemented.	1610/1609

Table 5.20: Commercial/economic spin-offs

Spin-off	Project ID
1. Developed marketable product/system	1610/1609, 1817, 755
2. Created awareness of savings impact of Demand Side Management	2465
3. Set up new company, consultancy or facility	1865, 2007, 2675, 1496, 2217
4. New opportunities	1456
5. Exposure to industry/contact with other industries	1655, 1630
6. Interaction with industry partners led to adjustment in research focus to meet industry needs.	2825
7. Ad hoc network has caught interest of other companies.	1822
8. Leverage of funds	1756

Table 5.21: Human resource development/intellectual spin-offs

Spin-off	Project ID
1. Human resource, capacity, technical experience/expertise developed	698, 1824, 1696, 1643, 2217, 1822, 1805, 1377, 1715
2. *Gold and platinum are now being used in doing more anti-cancer research.*	1299
3. Increased understanding/treatment of plant diseases	1598, 2426
4. Registration of patents	1817, 2366, 1610/1609
5. Developed courses, consultancy, national/international research collaboration	1817, 196, 1299, 1655, 1759, 816, 1696, 2605
6. Increased breadth of research and new opportunities	1628, 1756, 1805
7. Global distribution of citrus black spot disease is available through Global Positioning System Climax study.	2426
8. *The finding of human papiloma virus in tumours has increased/improved* understanding of causes of cancer.	1314
9. Insight into the mechanism of TB infection in patient host cells	1822
10. Knowledge that some solutions implemented in telecommunications systems are sub-optimal	755

Table 5.22: Technological spin-offs

Spin-off	Project ID
1. Application of technology in other products	1824
2. Procedures for managing design process through information technology	2366
3. Rapid diagnostic technique	2426
4. Application of probiotic in yoghurt	2392
5. *There is a realisation that neutralisation and sulphate removal technology can also* be applied to treatment of sulphur dioxide rich gases.	*1610/1609*
6. Technology for tracking particles	1691
7. SAPPI uses LCA as a primary decision-making tool for environmental impact analysis.	1377

Table 5.23: Social spin-offs

Spin-off	Project ID
1. Job creation	2007
2. Treatyment for arthritis	1802
3. Potential treatment for asthma	1802

Table 5.24: Negative unintended commercial/economic impacts

Impact	Project ID
1. Opportunities identified by the project to open up telecommunication for rural development could not be implemented owing to monopolistic tendencies of satellite operators such as PAN AM SAT.	2083
2. Growers' lost interest in the project because of drought that stopped the effect of mango black spot disease, leading to termination of project.	1598

Table 5.25: Negative unintended human resource/intellectual impacts

Impact	Project ID
1. Some students leave before their Ph D has been awarded.	698
2. Disputes with research collaborators led to disintegration of consortium in 2000.	755
3. The student was "poached" by another company.	1377
4. Students took longer to complete their studies because they combined studies with working on the project.	1865

Table 5.26: Negative unintended technological impacts

Impact	Project ID
1. Failure of water transformer technology	816
2. Chinese engineers gained expertise from South African partners, resulting in technological piracy.	1582
3. Lateral hydraulic transport was shown to be an unattractive solution.	820
4. Stones in limestone from paper industry because of blocked pipes	1610/1609

Table 5.27: Negative unintended administrative impacts

Impact	Project ID
1. A change of industry partner's policy nearly derailed the project.	1802
2. Administrative overload on project leader	1815, 1756, 2465
3. Researcher has split focus and does not benefit.	2675
4. Time consuming	1655
5. Unnecessary paperwork	2675
6. Negative attitude of THRIP	1651
7. THRIP's very bad and difficult online system	1815
8. Industry partners take a long time to authorise construction of demonstration plants.	1610/1609
9. Reduced funding from CANSA affected quality of testing as reagents are imported.	1299
10. Uncertainty of funding	2675
11. Trying to get management buy-in	2465

Table 5.28: Contrary effects/impacts

Effect/impact	Rating	Project ID
1. Big financial loss for designers and builders of water transformer	3	816
2. Microprocessor did not perform to required standard	1	1822
3. The project was terminated owing to loss of interest by farmers because drought stopped the disease from recurring.	4	1598
4. Liquidation of industry partner; students had less time to complete studies	5	1630
5. Return on investment was less than expected.	not rated	1756
6. Closer working relationship with industry partner failed to materialise so pressure mounted on RAU researchers to formulate projects.	2	1817
7. Heptospirillum ferroxidants was identified as iron oxidiser in bioleach systems.	4	1569
8. Not all recommendation were adopted.	3	2218

Table 5.29: Project status versus performance

Performance/status	Completed	Ongoing
Successful	26	22
Inconclusive	3	1

Table 5.30: Sectoral distribution of single-sector and cross/multi-sectoral projects linked to their performance

Single sector	Successful projects
SIC 1: Agriculture, Hunting & Fishing	1815, 1715, 2426, 1756
SIC 2: Mining & Quarrying	1569, 1691, 755, 820, 816, 1394
SIC 3: Manufacturing & Processing	698, 1377, 1582, 1655, 1749, 1759, 2458
SIC 4: Electricity, Gas, Water Supply & Usage	2218, 1716, 2465, 2675, 2295, 1643, 2965
SIC 5: Construction & Environment	2366, 2684
SIC 7: Transportation, Storage & Communication	1865, 2508, 2083, 2605, 2007
SIC 8: Health	1802, 1456, 1299, 1628, 1690, 1748, 1805
	Inconclusive projects
	SIC 1: 1598, SIC 3: 1630, SIC 4: 1811, SIC 8: 1314
Cross-sectoral projects	Successful projects
SIC 1 & SIC 2	2217
SIC 1 & SIC 3	2392
SIC 1, SIC 3 & SIC 5	1822
SIC 2, SIC 3 & SIC 4	1651
SIC 2, SIC 3 & SIC 5	1496
SIC 2, SIC 3, SC 4 & SIC 5	1610/1609
SIC 3 & SIC 4	1696
SIC 3 & SIC 7	1817, 1824 , 2825

Table 5.31: Commercial/economic indicators of success

Indicator	Project ID
1. Increased export of citrus to European Union	2426
2. Continued interest/satisfaction of sponsor	1696, 1749
3. New investments were attracted.	1456
4. Contractual funding/ongoing funding by industry partners	1456
5. Use of waste water trebled crop yields of good quality.	1394
6. Increased capacity	1628
7. Commercialisation and industrial profits	698
8. Current negotiations with USA for market access	2426
9. Construction of a full-scale plant amounting to R105 million	1610/1609
10. Repeated award of contract to Volkswagen South Africa	1582
11. Companies are still in business owing to component from our research.	2825
12. We were able to take the research all the way to final components products that are currently in the market.	1824
13. A company is making profit	1824
14. A new company in satellite engineering created	2007
15. Working software programmes	2083
16. Support by industry partner for continuation project	2366
17. Continued funding from industry partners	2684
18. Project has spawned a similar project with specific goals	1496
19. Processes and products are in use by industry	1655
20. The product	2508
21. A new (continuation) project was started	1655
22. System is being industrialised / commercialised	1822
23. Improved economics of industry partner	1815
24. Plant germplasm was retrieved from cryo-storage and ultimately planted out in the field.	1715
25. The ability for long-term conservation of germplasm species hitherto considered unstorable	1715
26. The product is ready for industrialisation and the market.	2217
27. Products were developed, successfully tested and introduced into industry partner's product line.	2458
28. Continued interest by sponsors	1696
29. Leverage for other funding	1805
30. Successful product launch and production	1582

Table 5.32: Human resource/intellectual indicators of success

Indicator	*Project ID*
1. Human resource (capacity/skills) development	1299, 1569, 1756, 1817, 1456, 2605, 2007, 698, 1628, 1865, 1824, 1805, 1643, 2965, 2825, 1822, 2083, 2366, 1582, 1815, 1496, 1456, 1759, 2675
2. Publications, manuscripts, conference papers, courses, continued research and consultancy, contribution to international knowledge of new drugs, Centre of Excellence established	1299, 1691, 1569, 1628, 1690, 1756, 1748, 2366,1805,2605, 1643, 2965,1817, 1749, 2675, 2083, 1759, 1865, 816, 820, 1456
3. Patents registered	1299, 1628, 1817, 1456
4. Awards, national/international recognition/impact	1655, 2684

Table 5.33: Social indicators of success

Indicator	Project ID
1. Preparation of treatment trial	1748
2. Reagents made	1628
3. Number of patients tested/screened, results returned	1690
4. Successful return of results to patients	1748
5. Commercialisation of TB diagnosis device	1802
6. *Number of positive and negative tests for affected families*	1690

Table 5.34: Indicators of technological success

Indicator	Project ID
1. *Development and launch of micro-satellite*	1865
2. Widespread application/use of knowledge, technology, results, tools	1815, 2675, 1759, 2684, 755, 820
3. Preservation of fruit juice with natural anti-microbial compounds	2392
4. Improved surveillance	1691
5. Forecasts made were shown to be useful	2218
6. Better production processes	1696

Table 5.35: Managerial strategies used to achieve success

Strategy	Project ID
1. Communication (consultations, feedback, meetings, reports, seminars)	698, 755, 816, 820, 1569, 2426, 1628, 1655, 1749, 1756, 2366, 2392, 2825, 2295, 2217, 1824, 1822, 2458, 1696, 1610/1609
2. Doing industrially relevant projects	1696
3. Teamwork: collaboration/cooperation	698, 755, 816, 820, 1802, 1569, 1628, 1643, 1749, 1759, 1817, 1610/1609, 1805, 1749, 1299
4. Financial management	698, 755, 816, 820, 1815, 1377, 1716, 1756, 1865, 2083, 1456, 1299, 1610/1609, 1805, 1643
5. Close supervision/involvement with students	698, 2218, 1582, 1655, 1691, 1696, 1715, 2083, 2366, 2605, 2965, 2684
6. Good leadership, planning, motivation	1377, 2426, 1643, 1655, 1690, 1716, 1817, 2458, 2684, 1299, 1456, 1805, 1394
7. Focused (goal-oriented effort)	698, 1690, 1748, 1716, 1756, 1610/1609
8. Technical expertise/building of appropriate capacity	2675, 2217, 1824, 1822, 2426, 1610/1609
9. Identification of key industry leaders as sponsors, champions of new technology and key suppliers	1610/1609
10. Trust and credibility	1815, 1377
11. *Experience in managing research/project management*	1756, 2508
12. Introduction of ISO 17025 quality laboratory management system	2426
13. Well-defined contracts/broadly-defined scope of work to capitalise on research opportunity	1496, 1582
14. Being abreast with international developments	2675
15. Sensitivity and responsiveness to industry needs to ensure continued support	755, 816, 820
16. From begging to threatening	2465

Table 5.36: Environmental and personal factors facilitating success

Factor	Project ID
1. Supportive environment/good organisation, structure	1299, 1715, 2416, 1643, 1295, 1456
2. Hard work, perseverance, optimism	1377, 1802, 1815, 1569, 1628
3. Creativity/common sense	1817, 2458
4. Academic freedom	1456
5. Scholarly approach	1569

Table 5.37: Why projects were inconclusive

Factor/reason	Project ID
1. Two mergers of industry partner caused termination of research support.	1802*
2. Lack of effective communication with industry	1598!
3. The technology was not finally implemented at end-user level.	1811!
4. The experiment was too large to be managed by researchers.	1756*
5. One task ran seriously overtime due to poor project management.	816*
6. "Strategic patenting"	1802*
7. The industry partner did not understand importance and impact of work.	1598!
8. The project was seen differently by academic institution and industry partner.	2825*
9. Poaching of project staff by industry partner	2825*
10. Twenty-six per cent of project money was lost as VAT (14%) is levied and University of Stellenbosch also took 12%.	2825*
11. THRIP administration is terrible: late payments	2825*
12. Students were detracted from research activities by industry partner's fight for survival.	1630!
13. Funding was terminated so the project was not completed owing to CANSA's change in research priorities.	1314!
14. Some technical developments did not result in commercialisation.	820*
15. Compaction of certain areas such that water did not drain and crops did not grow	1394*
16. A serious downturn in optical communications industry prevented implementation.	1818*

Key: * = successful projects (issues are treated as concerns not reasons for inconclusiveness)
! = inconclusive

Table 5.38: Actions project leaders would have taken in hindsight

Action	Project ID
1. Sign agreement to penalise industry partner for students not completing studies	1377
2. Improve networking with industry role players	1598
3. Identify and contact potential users	1811
4. Academics to bring additional knowledge to the table	1756
5. Give industry chance to do what it is good at	1756
6. Reduce level to which industry needs drive programme	755, 820, 816
7. Try not to take responsibility for everything	2465
8. Involve a larger sponsor less likely to run into financial problems	1630
9. Tighter scrutiny of real (not reported) progress	816
10. Academics should market themselves/research more effectively to industry.	1598
11. Continued direct communication with industry at all levels	1598
12. Improve academia's communication skills	1598

Table 5.39: Sectoral distribution of projects

Sector	Project ID
SIC 1: Agriculture, Hunting & Fishing	1815, 1715, 1598, 2426, 1756
SIC 2: Mining & Quarrying	1569, 1691, 755, 820, 816, 1394
SIC 3: Manufacturing & Processing	698, 1377, 1582, 1630, 1655, 1749, 1759, 2458
SIC 4: Electricity, Gas, Water Supply & Usage	2218, 1716, 1811, 2465, 2675, 2295, 1643, 2965
SIC 5: Construction & Environment	2366, 2684
SIC 7: Transportation, Storage & Communication	1865, 2508, 2083, 2605, 2007
SIC 8: Health	1802, 1456, 1299, 1314, 1628, 1690, 1748, 1805
SIC 1, SIC 2 & SIC 3	2217
SIC 1 & SIC 3	2392
SIC 1, SIC 3 & SIC 5	1822
SIC 2, SIC 3 & SIC 4	1651
SIC 2, SIC 3 & SIC 5	1496
SIC 2, SIC 3, SIC 4 & SIC 5	1610/1609
SIC 3 & SIC 4	1696
SIC 3 & SIC 7	1817, 1824, 2825

Table 5.40: Durations of projects

Duration	Project ID
Less than 1 year	not applicable
1 year	not applicable
2 years	1377, 1630, 2083, 2218, 2007, 2392, 2508, 2965
3 years	1314, 1582, 1598, 1628, 1651, 1655, 1690, 1691, 1716, 1748, 1759, 1811, 1815, 2217, 2295, 2366, 2465, 2458, 2825
4 years	755, 816, 820, 1643, 1756, 2605
Longer than 4 years	698, 1802, 1496, 1299, 1715, 1569, 1749, 1817, 1865, 2675, 1824, 1610/ 1609, 1394, 1456, 1696, 1822, 2426, 2684
Not supplied	1805

Table 5.41: Projects' funding levels

Funding amount	Project ID
Less than R499 999	1377, 1630, 1759, 2508, 2083, 2965
R499 999 – R999 999	2218, 1715, 1314, 1598, 1655, 1811, 2392, 2825, 2684
R1 000 000 – R1 999 999	1691, 1582, 2426, 1690, 1748, 1716, 1749, 1756, 2217, 1824, 1822
R2 000 000 – R4 999 999	1299, 1815, 1496, 1569, 1628, 2366, 2295, 1696, 2605, 2007, 1643, 458
R5 000 000 – R7 999 999	820, 2465
More than R8 000 000	698, 1802, 1651, 1817, 1865, 2675, 1610/1609, 755, 816, 1394, 1456
Not supplied	1805

Table 5.42: Positive comments on THRIP

Comment	Project ID
1. An excellent vehicle to involve industry and do relevant research meaningful for developing know-how and products with commercial value	1651
2. Staff are very helpful.	2825
3. Encourages industry to fund research in universities because industry knows it will get more for Its investment	2605
4. Offers unrated scientists chance to build research record	2465
5. Without THRIP no achievement would have been possible.	698
6. A great initiative	1805
7. Technical support has improved	1643
8. Successful commercialisation of neutralisation and sulphate removal technology was a direct result of THRIP support.	1610/1609

Table 5.43: Negative comment on THRIP

Comment	Project ID
1. Administrators need to stabilise things. THRIP changed its mind three times in four years. Focus should be on promoting good science leading to manufactured products through integrated projects.	1756
2. Uses multi-criteria but does not give feedback on how one can improve	2465
3. It is unclear what THRIP wants to achieve. Questions on application do not align with its objectives.	2465
4. Too much emphasis is put on political (demographic) and economic contributions rather than scientific objectives. There is no emphasis on good science.	1815

Table 5.44: Positive comments on funding

Comment	Project ID
1. THRIP funding was essential in getting things done.	1496
2. Enabled useful work to be done, specially basic research	2218
3. Allows students to be trained. Impossible if only industry partner is involved	1749
4. Enabled students to be employed and financially aided	1715
5. Laid foundation for more funding	1628
6. Additional funds help substantially to get industry funds.	2366
7. Made more things possible	1691
8. Proved very useful in enabling laboratory equipment to be maintained and to pursue fundamental work necessary to develop required expertise	1569
9. Enabled a narrowly-defined, time and budget constrained project to be broadened and extended in time to serve as basis for successful manpower and technology development programme	1582
10. The system has been very successful.	1643

Table 5.45: Negative comments and suggestions on funding

Comment	Project ID
1. Delay in approval and late release of funds	1655
2. Before 2003 funds were late in coming and university had to step in	1816
3. Fairly late payment is frustrating and impacts negatively on cash flow	2366
4. Funding comes very late	2392
5. Funds are received late and sponsor's money gets work done	1805
6. Delay in paying slows down programme	1802
7. Funding is administration intensive	2508
8. *Funding should be linked to organisations and foundations in pharmaceutical and biotechnology, not restricted to industry only	1805
9. *CANSA is not the right type of organisation. Pharmaceutical and biotechnology companies should be involved.	1314
10. Financial and time constraints hampered implementation	2675
11. Industry benefits a lot but it is difficult to get industrial funding	2675
12. Interference by Telkom led Siemens to stop funding	1865
13. Unpredictability of funds made forward planning difficult	1628
14. THRIP's recent cutbacks make it very difficult to budget in advance	2458
15. *Researchers should be given more freedom to use funds as necessary	1456
16. THRIP can improve on meeting the 100% obligation rather than 58% the former has been approved	698

Key: * denotes suggestion

Table 5.46: Comments about THRIP's online application and reporting system

Comment	Project ID
1. Online system is difficult to work with	1815
2. It is tedious applying for funds and producing research reports	2392
3. Applying for funds is tedious. Paperwork is complicated and time consuming. With too many regulations the system has become a "monster".	2675
4. Online system is not user-friendly. A system where the researcher completes forms and sends to be loaded on the system by THRIP staff is preferable.	1655
5. Online application is frustration	1805
6. The website keeps changing	2825
7. Annual applications and reports are too frequent	1456
8. *Applications should come from industry partner, not researchers	2465

Key: * denotes suggestion

Table 5.47: Project leaders' perceptions of working relationship among the DTI, industry partners and researchers

Comment	Project ID
1. A joint venture within industry is envisaged with the mining sector expected to provide capital	1299
2. Good relationship with industry established and we now have Department of Environmental Affairs and Tourism project on demonstration cleaner production in the pulp and paper industry	1377
3. There was good cooperation among THRIP, researcher and industry partner	1759
4. Government, industry, researcher triangular relationship worked very well	1496
5. There was good triangular relationship: small medium and micro enterprises provide good support	2295
6. Collaboration among researcher, industry and government is working well but more is needed between industry and university to disseminate research findings	2217
7. Close working relationship with industry has contributed to project success	1643
8. Industry partners unwilling to work with researcher	1314
9. Industry and academia very happy to and keen to have one single entity through which they dealt with University of the Witwatersrand but THRIP unhappy with supporting such a project	1651

Note: Tables 6.48-6.76 relate to information from analysis of questionnaire for sponsors' contact persons

Table 5.48: Status of projects

Completed	Ongoing
755, 1817, 2508, 1582, 1824, 1610/1609, 1811, 2007, 1655	1643, 1394, 1696, 1822, 2217, 1802, 1691, 2965, 698, 2684, 2426, 2458

Table 5.49: Commercial/economic objectives

Objective	Rating	Project ID
1. To develop a commercial scale plant from test plan	4	1610/1609
2. To create alternate product range from existing products	not rated	1824
3. To develop a software product in a niche area	2	2508
4. To establish a marketable product	not rated	1811
5. To develop an integrated farm information system	5	1822
6. To identify and develop related products	3	2217
7. To develop a Game Counting Module	4	1822
8. To develop prototypes for potential products	5	2458
9. To effect operating cost savings for client	1	1610/1609
10. To gain competitiveness in the marketplace	3	698
11. To create industrial spin-off opportunities	2	2007
12. To conduct durability research	5	2684
13. To commercialise using bio-lipid chemicals for TB diagnosis	5	1802
14. Long-term water management within the Witbank Coalfield	5	1394
15. Improved utilisation of a scarce resource	4	1394
16. To create environmentally-friendly alternative products	not rated	1824
17. To extend the life of gold mining	5	755
18. To utilise waste product as a usable commodity	2	1610/1609

Table 5.50: Human resource development/intellectual objectives

Objective	Rating	Project ID
1. To develop skills in High Voltage Direct Current	3	1643
2. To develop research capacity	5	1643
3. To gain a body of knowledge in optical fibre and optical fibre systems	4	1817
4. To acquire knowledge, capacity, know-how, technology	5	755
5. Training M Sc and Ph D students	4	1817
6. To develop manpower	5	1582
7. To develop manpower for potential De Beers recruitment candidates	2	1691
8. To gain expertise in technology related to the product	not rated	1811
9. To build core knowledge base within the company	5	2217
10. To train concrete specialists	4	2684
11. To develop skills	5	2965
12. To understand products	4	698
13. To develop skills in polymers	5	698
14. To develop human capital in space science and engineering	4	2007
15. To train and develop students	2	2217
16. To train manpower in microwave technology	3	2458
17. To develop experience in software development process cycle	4	2508
18. To develop and maintain computer vision and pattern competency base and Centre of Excellence at University of Cape Town with access to De Beers Group	4	1691
19. To conduct blue-sky research in diamond and mineral detection and characterisation	3	1691
20. To consult in the discipline of High Voltage Direct Current	1	1643
21. To provide support to Eskom research programme	3	1696
22. To facilitate academic publications from South African universities	4	1802
23. To take out patents; enhance intellectual property	4	1802
24. To show that black spot disease is unlikely to establish in Mediterranean climate	5	2426
25. To research and develop a range of laser diode rangefinder products	4	2217

Table 5.51: Technological objectives

Objective	Rating	Project ID
1. To develop technology for engine development	5	1582
2. To prove a novel technology	5	1811
3. To retain a technology base in space engineering	4	2007
4. To develop new technology for potential future use	5	2458
5. To develop technology (equipment and methods)	5	2965
6. To develop prototypes for potential products	5	2458
7. To investigate and master technology not yet used by the company	5	2458
8. To develop a pilot reactor	5	1655
9. To develop a Radio Frequency Network for fences	4	1822
10. To develop processes and procedures	4	1582
11. To provide technology demonstrators	2	1582
12. To develop scale-up procedures	4	1655
13. To improve identification techniques for citrus black spot	5	2426
14. To develop assessment techniques for coating	4	1696
15. To create building blocks usable in communication products	not rated	1824
16. To develop a High Voltage Direct Current laboratory	4	1643
17. To establish South Africa as a player in space industry	3	2007

Table 5.52: Motivations and ratings for achieving main commercial/economic objectives

Motivation	Rating	Project ID
1. None	not rated	1610/609
2. Commercially driven	not rated	1824
3. To fill a gap in a specialist area and the gap in the software tool market	not rated	2508
4. To get a commercially viable product	not rated	1811
5. Commercially driven	not rated	1822
6. Potential for other related products as required by the market	not rated	2217
7. Need identified with game farmers for less complicated game counting method	not rated	1822
8. Ensuring the future supply of microwave specialists	4	2458
9. None	none	1610/1609
10. Understanding of existing products	3	698
11. Durability	not rated	2684
12. None	none	2007
13. To find an authentic and validated method to diagnose tuberculosis with accurate sensitivity and selectivity	not rated	1802
14. Improved coal resources utilisation	not rated	1394
15. Removal of long term cost liability	4	1394
16. An existing area of interest	not rated	1824
17. To ensure continuous profitable operations	4	755
18. None	none	1610/1609
19. To convince the European Union that there is no threat to the citrus industry in from citrus black spot disease so that our exports are unhindered	5	2426
20. To establish a niche market for such plants	5	1610/1609
21. The need to increase business effectiveness/efficiency	5	2965
22. Cost effective way of investigating new technology	5	2458
23. To provide demonstration of local capabilities and experience in order to win more contracts with higher levels of local responsibility	2	1582
24. To determine what areas in the country are free from citrus black spot disease in order to export to the more lucrative USA market	5	2426
25. Commercially-driven	not rated	2007

Table 5.53: Motivations and ratings for achieving main intellectual objectives

Motivation	Rating	Project ID
1. The need to replace ageing skills in High Voltage Direct Current	1	1643
2. To do local research in High Voltage Direct Current	3	1643
3. Since ATC is in optical fibre industry it is important for a body of knowledge to be developed in optical technologies as the company will eventually gain from this	5	1817
4. To develop the capacity of knowledgeable managers	4	755
5. Training in advanced Mathematics and Physics for M Sc and Ph D students To enable them design and build systems to develop the industry	4	1817
6. Experienced and knowledgeable manpower is not readily available in South Africa for the scale of anticipated projects	5	1582
7. None	none	1691
8. To keep developing new technology and fine tuning existing ones	not rated	1811
9. Market/product opportunity at that moment	not rated	2217
10. Skills	3	2684
11. The need to increase business efficiency	5	2965
12. Skills	4	698
13. Knowledge	5	698
14. None	not rated	2007
15. Training of students in general as required by THRIP	not rated	2217
16. Transferring know-how to the company	4	2458
17. To get experience in tackling software development projects	4	2508
18. To develop/co-opt new ideas/technologies through innovation at university made possible through support of blue sky research which would be difficult to motivate on a purely De Beers budget	3	1691
19. To create a resource pool in the field to sustain De Beers capability in this area going forward	3	1691
20. To write research papers	2	1643
21. Expertise the research team has is recognised throughout Eskom TESP programme	5	1697
22. To promote the need for enhanced intellectual property	3	1802
23. To provide a mechanism to promote academic research in South Africa and convert such research to commercial products/projects	4	1802
24. To convince European Union authorities that there is no threat to the citrus industry in Spain from citrus black spot infested citrus so that our exports are unhindered	5	2426
25. Core skills development as required by company	not rated	2217

Table 5.54: Motivations and ratings for achieving main technological objectives

Motivation	Rating	Project ID
1. Technologies for developing modern engines are not directly available in South Africa to industry partners, making in-house development necessary.	5	1582
2. To establish a niche market for such plants	5	1610/1609
3. None	none	2007
4. The need to increase business effectiveness	5	2965
5. Cost effective way of investigating new technology	5	2458
6. Ensuring a future supply of microwave specialists	4	2458
7. Getting access to academic specialists, especially in a field where we are not expert, and getting them interested in our field	4	2458
8. To enable us to have pilot facility to scale up to production scale	5	1655
9. To establish a new technical capability that we did not have	not rated	1822
10. Detailed processes, procedures and experiences are not readily available to engineering teams of industry partners.	4	1582
11. Provide demonstration of local capabilities and experience in order to win more contracts with higher levels of local responsibility	2	1582
12. Procedures at pilot scale enable less risk at production scale	4	1655
13. To determine what areas in the country are free from citrus black spot disease in order to export to the more lucrative USA market	5	2426
14. Project leader and team have produced good and usable results to Eskom's benefit.	not rated	1696
15. Commercially driven	not rated	1824
16. Strategic inputs to regional High Voltage Direct Current schemes	5	1643
17. None	none	2007

Table 5.55: Commercial/economic benefits yielded

Benefit	Project ID
1. Potential cost effective treatment for polluted water	1394
2. Source of water for the local community which has a shortage	1394
3. Developed a commercial technique for reliable identification of citrus black spot disease	2426
4. A successful product (computer vision system for accurately and repeatedly sizing individual diamonds at a relatively high throughput) was developed.	1691
5. A commercially-viable product was developed.	1824
6. Market intelligence	1817
7. Some areas in Northern Cape can now export citrus to USA.	2426
8. Capital and operating were costs reduced.	2965
9. Release of additional coal resources for mining	1394
10. Reduced risk on scale up	1655
11. Contributed to electrification planning and management	2965
12. Higher profile in optical community	1817
13. Exposure to international clients/users of advanced technologies	1582
14. Related products old into market	2217
15. Market leadership in optical fibre	1817
16. Contributed to product life cycle on High Voltage Direct Current lines	1643

Table 5.56: Human resource development/intellectual benefits yielded

Benefit	Project ID
1. Experience in low speed (permanent magnet) alternator	1811
2. New expertise for Radio Frequency Networks	1822
3. Core knowledge base developed	2217
4. Three patents registered	1802
5. All stages in software development cycle were learnt.	2508
6. Previously disadvantaged people were trained.	698
7. Monographs published	2426
8. Creation of some skills in High Voltage Direct Current	1643
9. Expertise was developed.	755
10. A staff member obtained M Sc Engineering degree.	2508
11. Assisted in training a large number of graduates and Technikon diploma students	1582
12. Student training	2007
13. Better understanding of processes	1655
14. Knowledge in polymers	698
14. Promotion/acquisition of academic qualifications	1812
16. Radio Frequency Network knowledge was gained.	1822
17. New knowledge in refrigeration and ventilation	755
18. Group of highly skilled engineers and scientists trained	2007
19. Expose of young researchers to overseas conferences	1643
20. Reduced shortage of skilled people	698
21. Skills training	2426
22. M Sc and Ph D's produced	2426
23. Postgraduate lectures in High Voltage Direct Current	164
24. A pool of expertise in computer vision/pattern recognition fields was created.	1691
25. Awareness of space and satellite applications was kindled.	2007
26. The technical director wasinvited to sit on technical forums.	1817
27. Better understanding of physical factors (i.e rheology)	1655
28. Information transfer	2684
29. Valuable insight into design of tracking algorithms for target recognition where multiple radar sensors track the same object was gained.	2458
30. The company has gained high standing with students who are potential future employees.	2458

Table 5.57: Technological benefits yielded

Benefit	Project ID
1. Technology transfer enhanced knowledge of light-based technology.	1824
2. An embryo space industry as established.	2007
3. Developed technologies that have supported/aided other De Beers R&D projects	1691
4. Practical electrochemical assessment technique for coating developed	1696
5. The satellite was built and successfully launched.	2007
6. Opportunity to use and evaluate more advanced technologies	1582
7. Access to other technologies via THRIP	1610/1609
8. Establishment and maintenance of a computer vision Centre of Excellence at University of Cape Town	1691
9. Successful development of a high power limiter currently available from only one manufacturer in the world and that can now be locally produced	2458
10. Processes, procedures and experience were developed to accomplish specific tasks.	1582
11. Construction of follow up plants for other clients opened doors to new developments.	1610/1609
12. Laboratory infrastructure was developed to support design of high power microwave solid state power amplifiers.	2458
13. South Africa gained considerable international recognition in the space community.	2007
14. Infrastructure established	2217
15. Development of high power combiner for direct use in next generation of one of our radars nearing completion	2458

Table 5.59: Intended human resource development/intellectual impacts

Impact	Project ID
1. Understanding of issues related to different loading characteristics	2965
2. Improved knowledge of South African practitioners	2684
3. Knowledge	698
4. Enhanced knowledge	1696
5. Knowledge enhancement	1824
6. University of Pretoria continues research in bio-lipid chemicals for TB diagnosis	1802
7. Process understanding	1655
8. Creation of consultancy skills and reputation	1643
9. Radio Frequency Network knowledge	1822
10. Students with higher academic qualifications were produced.	1802
11. Skills	
12. University of Stellenbosch is recognised as the centre for space satellite engineering in South Africa.	2007

Table 5.60: Intended technological impacts

Impact	Project ID
1. Components developed are used in other products	2508
2. Technical aspect worked well	1811
3. Differentiating technology contributed to De Beers being miner of choice	1691
4. Increased capability to design high power amplifiers	2458

Table 5.61: Positive unintended commercial/economic impacts

Impact	Project ID
1. Developed and sold related products	2217
2. Closeness to customer	1817
3. Cost-effective source of water	1394
4. Management system created that us used in other products	1824
5. Improved properties of emulsions	1655
6. Enhanced image of sponsor	1817
7. Market leadership	1817
8. Some building blocks/designs used in other products	1824
9. Produced merry-go-round for children to play and simultaneously generate power to charge battery	1811
10. General appreciation by company management of the benefits of THRIP initiative	2458
11. Construction of new plant to enable closure of Tailings Dam	1610/1609
12. Enthusiasm for High Voltage Direct Current	1643

Table 5.62: Positive unintended human resource development/intellectual impacts

Impact	Project ID
1. Mentoring and support for Eskom staff	1696
2. Link with Optical Fibre Institute	1817
3. Broad knowledge of polymers	698
4. Staff member completed a M Sc in Engineering degree	2508
5. Core competency developed	2217
6. Academic relationship with other universities doing similar work; South African universities are sharing knowledge and breakthroughs with universities worldwide.	1802
7. New ideas for further research	1696
8. Increased understanding of Eskom's process and problems	1696
9. Five years of research has benefited other areas of mining (Coaltech, Futuremine, Platmine)	1811
10. Developed improved working relationship between industry partners	1582
11. Exposure of staff to mechanical drive with high speed step up ratio	1811

Table 5.63: Positive unintended technological impacts

Impact	Project ID
1. Electronic converter technology technology to charge battery developed	1811
2. Opportunity for further upgrading of components	2508
3. Laboratory available for ad hoc investigation	1643

Table 5.64: Negative unintended commercial/economic impacts

Impact	Project ID
1. Sponsoring companies (Plessey, Gintek, Altech) receive no or negligible benefits from the project	2007
2. It takes a long time to commercialise such concepts	1802
3. "Brine" residue from processing plants require a sustainable disposal solution	1394
4. Spillage of wet limestone during transport	1610/1609
5. Funding seems to go into a "black hole"	1802

Table 5.65: Negative unintended technological impacts

Impact	Project ID
1. Practical implementation problems with use of developed technology	2684
2. Technology transfer was not effective because of a fairly large overhead of university management and project staff collaboration on the project.	1691

Table 5.66: Contrary commercial/economic impacts

Impact	Project ID	Rating
1. A shift of focus to complete spin-off products delayed industrialisation of midrange laser rangefinder.	2217	not rated
2. The sponsor could not sustain funding as the project's main initial objective was taking too long to achieve.	1802	5
3. Programme delays	2965	3
4. Spiralling increase in cost	1802	3

Table 5.67: Projects' performance

Successful	Unsuccessful	Inconclusive
1643, 1817, 1394, 1696, 1582, 1824, 1610 / 1609, 1811, 2217, 2007, 1691, 2965, 1655, 698, 2684, 2426, 2458, 2508	755, 1802	1822

Table 5.68: Commercial/economic indicators of success

Indicator	Project ID
1. Commercially viable product	1824
2. Developed products met all expectations	1582
3. Developed significant software sold worldwide	2508
4. Considerable operational expenses savings realised for client	1610/1609
5. Successful product development meeting a real need	1691
6. Cost effective solution to polluted mine water	1394
7. Successful commercialisation of products	698
8. Components created are used in other products	2508
9. Laser diode rangefinder products were developed and marketed.	2217
10. Interest of municipality in purchasing the treated water	1394
11. Related products were developed	2217
12. Follow up queries, which extended scope of project	1696
13. Five follow up plants constructed for same and new clients	1610/1609
14. Political pressure from European Union on citrus black spot infection threat was reduced.	2426
15. Customer satisfaction	2458
16. Good relationship between industry and academics running the THRIP programme	2458
17. Fulfilled expectations	2458

Table 5.69: Human resource development/intellectual indicators of success

Indicator	Project ID
1. Registration of patents	1817
2. Core knowledge developed in company	2217
3. Postgraduate students trained	698
4. Improved understanding of how to make durable concrete	2684
5. Exposure of staff to mechanical drive technology	1811
6. Development of skills	755
7. Trained students joined Eskom	2965
8. Improved understanding of process	1655
9. Huge increase in knowledge of light free space optical transmission medium	1824
10. Experience in low speed (permanent magnet) alternator	1811
11. Publications in international journals	1817
12. Students trained	2217
13. A group of highly skilled engineers and scientists was trained on the project.	2007
14. Awareness of space and satellite applications was kindled in South Africa.	2007
15. Level of research done	1817
16. Positive experience for the student	2458

Table 5.70: Technological indicators of success

Indicator	Project ID
1. Satellite built and successfully launched	2007
2. An embryo space industry was established.	2007
3. Development of identification technique	2426
4. Prediction of scale up factors	1655
5. Use of advanced technologies were proved to be advantageous to the process.	1582
6. Solutions to engineering problems	1643
7. South Africa gained considerable international recognition in the space community.	2007
8. Direct implementation of research results	1696
9. Infrastructure established	2007

Table 5.71: Reasons for failure or inconclusiveness of projects

Reason	Project ID
5. Gold price on world market made it uneconomical to do deep mining.	755
2. Lack of sufficiently qualified personnel to work on project.	1822
3. Failure of students to deliver well-documented, well-tested subsystems.	1822
4. Failure to set time limit within which objectives were to be achieved.	1802
5. Failure to decide in good to continue or discontinue the project.	1802

Table 5.72: Distribution of projects by sectors

Category: single-sector	Project ID
SIC 1: Agriculture, Hunting & Fishing	2426
SIC 2: Mining and Quarrying	755, 1394, 1691
SIC 3: Manufacturing & Processing	698, 1582, 1655, 2458
SIC 4: Electricity, Gas, Water Supply & Usage	1643, 1811, 2965
SIC 5: Construction & Environment	2684
SIC 7: Transport, Storage & Communication	2007, 2508
SIC 8: Health	1802
Category: cross-/multi-sectoral	Project ID
SIC 1 & SIC 2	2217
SIC 1, SIC 3 & SIC 5	1822
SIC 2, SIC 3, SIC 4 & SIC 5	1610/1609
SIC 3 & SIC 4	1696
SIC 3 & SIC 7	1817, 1824

Table 5.73: Funding levels

Amount	Project ID
Less than R499 999	1655, 1822, 2508
R499 999 - R999 999	1610/1609, 1643, 1811, 2217
R1 000 000 - R1 999 999	698, 1691, 1696, 1817, 1824, 2965, 2458
R2 000 000 - R4 999 999	1394 (industry only), 2684, 2426
R5 000 000 - R7 999 999	1582
Above R8 000 000	755, 2007, 1802

Table 5.74: Positive comments by industry partner's contact persons

Comment	Contact person
1. On the whole, a successful project but there is room for improvement. (S)	1643
2. Success of project can be attributed to enrolling capable M Sc and Ph D students, holding regular meetings, having a normal system of reporting by researcher to industry partner and the expertise of the researcher. (S)	1394
3. Collaborative research has worked successfully for five years and is considered an ideal model. Success of project (and all Coaltech) owes to the fact that it is industry driven and managed. All work is collaborative and shared for the benefit of the industry. Current threats to project are: potential reduction in THRIP funding and restructuring in funding and organisational goals of the Council for Scientific and Industrial Research. (C)	1394
4. The benefits of a long term relationship supported by THRIP has given the opportunity to have research input in a number of projects as the research needs of Eskom evolved. This, combined with Eskom TESP programme, has benefited Eskom considerably over the years. Streamlining of THRIP process is a positive step in making the system easier to use and manage. We will continue using process as it provides good return on investment to Eskom. (C)	1696
5. THRIP has cemented existing relationship between researchers and industry partners. (C)	2508
6. THRIP is and excellent vehicle to invest in industry and effect technology transfer. (R)	1610/1609
7. We are happy to be involved with the researcher and THRIP. (C)	1811
8. Most of the core objectives have been achieved. Midrange laser rangefinder is still in process and financial benefits for the core development has not been realised. (S)	2217
9. We are very positive about the THRIP project. (A)	2458
10. Balance between size of THRIP project, university collaborators and industry partner's team is crucial to success of the project. (C)	1691
11. Interaction with university is critical. Development of students involved in industry work is very useful as they can contribute to the benefit of the industry. They are also better educated in the problems and challenges facing industry. (C)	2965
12. Related (spin off) products have been marketed and sold with direct financial benefits to the company. Collaboration with lecturers, students, experts and industry has been established. (C)	2217

Key: A: attitude C: collaboration R: role S: success

Table 5.75: Negative comments by industry partners' contact persons

Comment	Contact person
1. THRIP is bureaucratic; it likes to get "water out of stone", lacks realism in insisting on involvement of previously disadvantaged people and universities.	755
2. THRIP is very much at arm's length. Administrative requirements, process and benefits are not very clear from Department of Trade and industry.	2508
3. There were initial problems: properly structured planning, knowledge-based assistance, office space. Cost recovery and product creation are the driving forces so the research must succeed for investment to be realised.	1824
4. The structure of THRIP funding and money is very complex. I still do not understand how it works.	1610/1609
5. Distance from F'SATIE made it cumbersome attending meetings.	1822
6. Students did not produce good results.	1822
7. Sponsor was kept at an "arm's length" as researcher did most negotiations/ communication with THRIP. Decisions could have been taken quicker if sponsor was closer to THRIP outcomes.	1802

Table 5.76: Sectoral achievement of commercial/economic objectives

Sector	No of objectives cited	No of objectives rated	Av achievement (%)
SIC 1	5	3	83
SIC 2	4	4	91
SIC 3	4	1	100
SIC 4	7	5	98
SIC 5	0	0	0
SIC 7	0	0	0
SIC 8	1	1	80
Cross-/multi-sectoral	4	2	75
All sectors	25	16	88

APPENDICES

Appendix A: Questionnaire for project leaders

Your response to this questionnaire is invaluable for a project entitled "Assessing the impact of applied research on communities".

Please, read each question/statement and indicate your response with "X" in the appropriate box where options are given. In all other cases, give your response in brief, clear sentences. Use the plain section of the last sheet if space provided is inadequate. ***All information given will be treated with strict confidence.***

Thank you for your time

Maurice Oscar Dassah
Doctoral candidate: Faculty of Management, Cape Technikon

These questions relate to the THRIP/industry-sponsored research project(s) that you started in the recent past.

1. a. Project **ID**: b. Short **title**:

2. Is the project completed, ongoing or abandoned? **Mark with an X**

   Completed ☐ Ongoing ☐ Abandoned ☐

3. Name(s), telephone number(s) and email address(es) of industry partner's/partners' contact person(s):
   ....
   ....
   ....
   ....
   ....

4. Was the project implemented according to plan? **Mark with an X**

   Yes ☐ No ☐

5. If your response to 4 is **"No"**, mention the major implementation problems and rate them **in descending order of seriousness** (where 5 = critica/severe 4 = very serious 3 = serious 2 = moderate 1 = not serious)

   Problem Rating
   i. ....
   ii. ....
   iii. ....
   iv. ....
   v. ....

6. Who is/ was/were the **primary beneficiary/beneficiaries? Mark with an X**

   Sponsor ☐ Related industry ☐ Other(s) specify): ☐

7. Indicate, if any, who the **secondary beneficiary** is **beneficiaries** are/were and the name(s), telephone number(s) and email address(es) of contact person(s):
   i. ....
   ii. ....
   iii. ....
   iv. ....
   v. ....

8. Explain briefly what the existing **problem(s)** was/were that **you set out to solve** by conducting your research project:
   i. ....
   ii. ....
   iii. ....
   iv. ....
   v. ....

9. Briefly explain what **difference your research has made** in solving the problem(s) that necessitated your project(s) **and** rate your responses from **in descending order of importance** (where 5 = groundbreaking 4 = substantial 3 = moderate 2 = little 1 = none):

   Response Rating
   i. ....
   ii. ....
   iii. ....
   iv. ....
   v. ....

10. Briefly state the **main objectives** of your project **in descending order of importance** (where 5 = most important 4 = very important 3 = important 2 = moderately important 1 = least important) **and** score the level to which each objective was achieved **in percentage terms:**

    Objective Rating (%)
    i. ....
    ii. ....
    iii. ....
    iv. ....
    v. ....

11. Give **reasons for** the **ratings** given under item **10**:
    i. ....
    ii. ....
    iii. ....
    iv. ....
    v. ....

12. What **specific benefits** (commercial, economic, social, etc) has the project yielded?
    i. ....
    ii. ....
    iii. ....
    iv. ....
    v. ....

13. What are/were some of the **positive unintended impacts/spin-offs** of the project?
    i. ....
    ii. ....
    iii. ....
    iv. ....
    v. ....

14. What are/were some of the **negative unintended impacts** of the project?
    i. ....
    ii. ....
    iii. ....
    iv. ....
    v. ....

15. Did any effects/impacts occur that were **contrary** to the expected impact(s)? If so, list them **in descending order** of seriousness (where 5 = critical / severe 4 = very serious 3 = serious 2 = moderately serious 1 = not serious):

Effect / Impact	Seriousnesss
i.	
ii.	
iii.	
iv.	
v.	

16. How would you rate the project? **Mark with an X:**

    Successful ☐ Unsuccessful ☐ Inconclusive

17. If you consider the project successful, what are/were the **indicators of success**?
    i. ....
    ii. ....
    iii. ....
    iv. ....
    v. ....

18. What managerial **strategies** did you use **to achieve success**?
    i. ....
    ii. ....
    iii. ....
    iv. ....
    v.

19. If you rate the project unsuccessful or inconclusive, **what did not go well**?
    i. ....
    ii. ....
    iii. ....
    iv. ....
    v. ....

20. What would you do **differently** to ensure success?
    i. ....
    ii. ....
    iii. ....
    iv. ....
    v. ....

21. What **sector** does the project belong? **Mark with an X**

Agriculture	☐	Health	☐
Mining & Quarrying	☐	Manufacturing & Processing	☐
Electricity, Gas, Water Supply & Usage	☐		
Construction & Environment	☐		
Transport, Storage & Communication	☐		

22. For **how long** did it run/has it been running? **Mark with an X**

Less than 1yr	☐	1yr	☐	2 yrs	☐
3yrs	☐	4 yrs	☐	longer (state)	☐

23. What was the **total amount of funding** (in Rand) for the duration of the project? **Mark with an X**

Less than R499 999	☐	R499 999 - R999 000	☐
R1 000 000 - R1 999 999	☐	R2 000 000 - R4 999 999	☐
R5 000 000 - R7 999 999	☐	Above R8 000 000	☐

24. Make comments, if any (for example, on the state of the THRIP-researcher-industry relationship and suggestions to improve it, etc):

Appendix B: Questionnaire for sponsors

Your responses to this questionnaire is invaluable for a project entitled "Assessing the impact of applied research on communities".

Please, read each question/statement carefully and indicate your response with "X" in the appropriate box where options are given. In all other cases, give your response in brief, clear sentences. Use the plain section of the last sheet if space provided is inadequate.

Thank you for your time

Maurice Oscar Dassah
Doctoral candidate: Faculty of Management, Cape Technikon

These questions relate to the THRIP/industry research project that you funded in the recent past.

1. a. Project **ID**: b. Short **title**:

2. Is the project completed, ongoing or abandoned? **Mark with an X**

   Completed ☐ Ongoing ☐ Abandoned ☐

3. Name(s) telephone number(s) and email address(es) of **main beneficiary's/ beneficiaries'** contact person(s), if your organisation is not the main beneficiary:
   ....
   ....
   ....
   ....

4. Mention **secondary beneficiary/beneficiaries,** if any, and give name(s), telephone number(s) and email address(es) of contact person(s):
   ....
   ....
   ....
   ....
   ....

5. **Briefly** state the **main objectives** of your project and rank them **in descending order of importance** (where 5 = crucial 4 = very important 3 = important 2 = moderately important 1 = least important)

   Objective Rating
   i. ....
   ii. ....
   iii. ....
   iv. ....
   v. ....

10. Did any effects/impacts occur that were **contrary** to the expected impact(s)? If so, write them down **and** rate them **in descending order of seriousness** (where 5 = critical / severe 4 = very serious 3 = serious 2 = moderately serious 1 = not serious):

Effect/Impact Rating

i. ....
ii. ....
iii. ....
iv. ....
v. ....

11. On the whole, **how would you rate the project**? Mark with an X:

Successful ☐ Unsuccessful ☐ Inconclusive ☐

12. If you rate the project **successful**, what are/were **the indicators of success?**

i. ....
ii. ....
iii. ....
iv. ....
v. ....

13. If you rate the project **unsuccessful or inconclusive**, what would you attribute this to?

i. ....
ii. ....
iii. ....
iv. ....
v. ....

14. What **sector** does the project belong? **Mark with an X**

Agriculture ☐ Health ☐ Mining & Quarrying ☐

Manufacturing & Processing ☐ Electricity, Gas, Water Supply & Usage ☐

Construction & Environment ☐ Transport, Storage & Communication ☐

15. What was the **total amount of funding** (in Rand) for the duration of the project? **Mark with an X**

Less than R499 999 ☐ R499 999 - R999 999 ☐

R1 000 000 - R1 999 999 ☐ R2 000 000 - R4 999 999 ☐

R5 000 000 - R7 999 999 ☐ Above R8 000 000 ☐

16. Make comments, if any:

Appendix C: Project leaders' affiliations and contact details

Proj ID	Short title	Project leader	Institution	Contact details
698	Polymeric materials	Prof R D Sanderson	Univ of Stellenbosch	Tel: 021 808 3172 rds@sun.ac.za
1802	Bio-lipid chemicals for TB diagnosis	Prof Van Verschoor	Univ of Pretoria	Tel: 012 420 2477 jan.verschoor@bioagric.up.ac.za
2217	Electricity distribution improvement	Prof C T Gaunt	Univ of Cape Town	Tel: 021 650 2810 ctg@eng.uct.ac.za
1299	Novel anti-tumour compounds	Prof Connie Medlen	Univ of Pretoria	Tel: 012 319 2622 cmedlen@medic.up.ac.za
1691	Vision for inspection and control	Prof D G De Jager	Univ of Cape Town	Tel: 021 650 2791 gdj@eng.uct.ac.za
1815	Development in animal nutrition and Genetics	Prof N H Casey	Univ of Pretoria	Tel: 012 420 4018 nhcasey@postino.up.ac.za
1715	Plant genetic resources conservation	Prof P Berjak	Univ of Natal, Durban	Tel: 031 260 3197 berjak@biology.und.ac.za
1314	Oesophageal cancer: early diagnosis	Prof I M Parker	Univ of Cape Town	Tel: 021 406 6335 / 6259 mparker@curie.uct.ac.za
1377	LCA of pulp and paper	Prof C A Buckley	Univ of Natal, Durban	Tel: 032 260 3375 buckley@ukzn.ac.za
1496	Radar Remote Sensing Project (RRSP)	Prof M R Inggs	Univ of Cape Town	Tel: 021 650 2799 mikings@3b3.uct.ac.za
1582	Engine development technology	Dr A B Taylor	Univ of Stellenbosch	Tel: 021 808 4272 / 882 8820 abt@su.ac.za; abt@cae.co.za
1569	Minerals Bioprocessing	Prof G S Hansford	Univ of Cape Town	Tel: 021 650 2508 gsh@chemeng.uct.ac.za

Appendix C: Project leaders' affiliations and contact details

Proj ID	Short title	Project leader	Institution	Contact details
698	Polymeric materials	Prof R D Sanderson	Univ of Stellenbosch	Tel: 021 808 3172 rds@sun.ac.za
1802	Bio-lipid chemicals for TB diagnosis	Prof Van Verschoor	Univ of Pretoria	Tel: 012 420 2477 jan.verschoor@bioagric.up.ac.za
2217	Electricity distribution improvement	Prof C T Gaunt	Univ of Cape Town	Tel: 021 650 2810 ctg@eng.uct.ac.za
1299	Novel anti-tumour compounds	Prof Connie Medlen	Univ of Pretoria	Tel: 012 319 2622 cmedlen@medic.up.ac.za
1691	Vision for inspection and control	Prof D G De Jager	Univ of Cape Town	Tel: 021 650 2791 gdj@eng.uct.ac.za
1815	Development in animal nutrition and Genetics	Prof N H Casey	Univ of Pretoria	Tel: 012 420 4018 nhcasey@postino.up.ac.za
1715	Plant genetic resources conservation	Prof P Berjak	Univ of Natal, Durban	Tel: 031 260 3197 berjak@biology.und.ac.za
1314	Oesophageal cancer: early diagnosis	Prof I M Parker	Univ of Cape Town	Tel: 021 406 6335 / 6259 mparker@curie.uct.ac.za
1377	LCA of pulp and paper	Prof C A Buckley	Univ of Natal, Durban	Tel: 032 260 3375 buckley@ukzn.ac.za
1496	Radar Remote Sensing Project (RRSP)	Prof M R Inggs	Univ of Cape Town	Tel: 021 650 2799 mikings@3b3.uct.ac.za
1582	Engine development technology	Dr A B Taylor	Univ of Stellenbosch	Tel: 021 808 4272 / 882 8820 abt@su.ac.za; abt@cae.co.za
1569	Minerals Bioprocessing	Prof G S Hansford	Univ of Cape Town	Tel: 021 650 2508 gsh@chemeng.uct.ac.za

1598	Control of mango blackspot disease	Prof L Korsten	Univ of Pretoria	Tel: 012 420 3295 lkorsten@fabi.up.ac.za
2426	Detection and control of citrus blackspot	Prof L Korsten	Univ of Pretoria	Tel: 012 420 3295 lkorsten@fabi.up.ac.za
1628	HIV-1 Vaccine development	Prof C Williamson	Univ of Cape Town	Tel: 021 406 6683 cwilliamson@curie.uct.ac.za
1630	*Model predictive contrl package*	*Prof P L De Waal*	*Univ of Pretoria*	Tel: 012 420 2197 pdvaal@postino.up.ac.za
1651	Process synthesis for process development	Prof D Glasser	Univ of the Witwatersrand	Tel: 011 717 7510 dg@prme.wits.ac.za
1655	Reactive processes and reactor technology	Prof J H Knoetze	Univ of Stellenbosch	Tel: 011 808 4488 jhk@sun.ac.za
1690	Advancing management of colorectal cancer	Prof R S Ramesar	Univ of Cape Town	Tel: 021 406 6297 rr@curie.uct.ac.za
1748	Genetics of retinal diseases	Prof R S Ramesar	Univ of Cape Town	Tel: 021 406 6297 rr@curie.uct.ac.za
1716	Harmonics free Three-Phase Rectifier	Prof G P Hancke	Univ of Pretoria	Tel: 012 420 2386 ghancke@postino.up.ac.za
1811	Animal-driven electrical power	Prof G P Hancke	Univ of Pretoria	Tel: 012 420 2386 ghancke@postino.up.ac.za
1749	Non-engineering catalysis for Stable Fischer-Tropsch	Prof E W J van Steen	Univ of Cape Town	Tel: 021 650 3795 evs@chemeng.uct.ac.za
1756	Nutrient cycling in plantations	Prof M C Scholes	Univ of the Witwatersrand	Tel: 011 717 6407
1759	Crashworthiness of composite automotive components	Prof E V Morozov	Univ of Natal, Durban	Tel: 031 260 3200
1817	Optical communications	Prof P L Swart	Rand Afrikaans Univ	Tel: 011 489 2351
1865	SUNSAT Micro-satellite	Prof G W Milne	Univ of Stellenbosch	Tel: 021 808 4524

				milne@sun.ac.za
2366	Competitive industrial steel structures	Prof P E Dunaiski	Univ of Stellenbosch	Tel: 021 808 4434 ped@sun.ac.za
2392	Fruit juice preservation and probiotics	Prof L M T Dicks	Univ of Stellenbosch	Tel: 021 808 5849 lmtd@sun.ac.za
2465	esATI Regional Energy Management Programme	Mr G Diana	Univ of Natal, Durban	Tel: 031 260 2732 gdiana@ukzn.ac.za
2508	Radio frequency and antenna systems	Dr A R Clark	Univ of the Witwatersrand	Tel: 011 717 7223 a.clark@ee.wits.ac.za
2675	Power electronic converters	Prof M du Mouton	Univ of Stellenbosch	Tel: 021 808 4780
2825	Embedded system development	Prof A E Krzesinski	Univ of Stellenbosch	Tel: 021 808 4310 aek1@cs.sun.ac.za
2295	Vibration research & testing of overhead transmission and distribution lines	Dr M A Kaunda	Univ of Durban, Westville	Tel: 031 260 7692
2217	Mid-range laser range-finder	Mr A G Hattingh	Pretoria Technikon	Tel: 102 318 5452 hattinghag@tut.ac.za andre.hattingh@fsatie.co.za
1824	Free space laser communication link	Mr A G Hattingh	Pretoria Technikon	Tel: 102 318 5452 hattinghag@tut.ac.za andre.hattingh@fsatie.co.za
1822	Farm informations systems	Mr A G Hattingh	Pretoria Technikon	Tel: 012 318 5452 hattinghag@tut.ac.za andre.hattingh@fsatie.co.za
1610/ 1609	Limestone neutralisation/biological sulphate removal	Dr J S Maree	CSIR (Envirotek), Pretoria	Tel: 012 841 2285 jmaree@csir.co.za
2083	Telecommunication for rural development	Prof S Mneney	Univ of Durban, Wvle	Tel: 021 260 2732
755	Deepmine: Mapping of geology	Dr Durrheim	CSIR (Miningtek), Johannesburg	Tel: 011 358 0000 rdurrheim@csir.co.za

820	Deepmine: Transport of men, material and rock	Dr Durrheim	CSIR (Miningtek), Johannesburg	Tel: 011 358 0000 rdurrheim@csir.co.za
816	Deepmine: Refrigeration and ventilation	Dr Durrheim	CSIR (Miningtek), Johannesburg	Tel: 011 358 0000 rdurrheim@csir.co.za
1394	Environmentally sustainable use of waste water	Mr J S Beukes	CSIR (Coaltech), Johannesburg	Tel: 011 358 0189 jbeukes@csir.cp.za
1456	Development of a bacterial surrogate marker assay	Prof Van Helden	Univ of Stellenbosch	Tel: 021 938 9401
1696	Corrosion engineering research	Prof R F Sandenburg	Univ of Pretoria	Tel: 012 420 2440 Rsandb@postino.up.ac.za dean@eng.up.ac.za
1805	Surrogate markers for relapse in TB	Dr N Beyers	Univ of Stellenbosch	Tel: 021 938 9062 nb@sun.ac.za
2605	IP-based wireless networks	Prof F Takawira	Univ of Natal, Durban	Tel: 031 260 2728/2730 ftakaw@ukzn.ac.za
2684	Cement-based materials technology	Prof M G Alexander	Univ of Cape Town	Tel: 021 650 4012 mark@eng.uct.ac.za
2007	SASciSAT	Prof Schoonwinkel	Univ of Stellenbosch	Tel: 021 808 4204
1643	High voltage distribution network improvement	Prof N M Ijumba	Univ of Durban, Wvle	Tel: 031 260 8038 ijumba@ukzn.ac.za
2965	Electricity distribution network	Prof N M Ijumba	Univ of Durban, Wvle	Tel: 031 260 8038 ijumba@ukzn.ac.za
2458	High frequency components and systems	Prof P Meyer	Univ of Stellenbosch	Tel: 021 808 4322 pmeyer@sun.ac.za

Appendix D: Industry partners' contact persons' details

Proj ID	Short title	Contact person	Industry partner(s)	Contact details
698*	Polymeric materials	J F Engelbrecht Roediger Agencies CC	Barloworld Plascon Dr A H A Roediger	Tel: 021 887 2930 je@sun.ac.za Tel: 021 808 3175 ahar@sun.ac.za
1802*	Bio-lipid chemicals for TB diagnosis	Kuben Pillay	Adcock Ingrams Ltd	Tel: 011 709 9392
2218	Electricity distribution improvement	R Stephen M Bipath	Eskom Eskom	Cell: 083 326 2534 stepherg@eskom.co.za Tel: 011 629 5257 Minnesh.Bipath@eskom.co.za
1299	Novel anti-tumour compounds	Dr Albrecht	CANSA	Tel: 021 976 5389 Cell: 083 273 2024 calbrec@iafrica.com
1691*	Vision for inspection and control	Dr Colin Andrew	De Beers	Tel: 011 374 6293 colin.andrew@debeersgroup.com
1815	Development in animal nutrition and genetics	Not supplied	Nestec Ltd (Swit), Alltech (USA), Kanhym (Pty) Ltd, Bonsamara Breeders Association	Not supplied
1715	Plant genetic resources conservation	Dr Ehsan Dulloo	International Plant Genetic Resources Institute	0939-06-611 8206 e.dulloo@cgiar.org
1314	Oesophageal cancer: early diagnosis	Ms Perry Gameldien	CANSA	Tel: 011 616 7662
1377	LCA of pulp and paper	Not supplied	Mondi Kraft	Not supplied

			(Richards Bay)	
1496	Radar Remote Sensing Project (RRSP)	Bruce Dickson P-J Wolfaard Not supplied	De Beers Reutech Steel Anglo American	Tel: 011 659 1041; Cell: 082 875 2083 bruce.dickson@debeersgroup.c m pjwdf@rrs.co.za Not supplied
1582*	Engine development technology	Dr Arthur Bell Paul Doornbrack	Stellenbosch Automotive Engineering VW South Africa	Tel: 021 577 3411 ajbell@cae.co.za Tel: 041 994 5231
1569	Minerals Bioprocessing	Dr David Dew Dr David Beck	BHP Billiton Ex GFSA	Tel: 011 792 7090 dave.dew@bhpbilliton.com Now with AMIRA
1598	Control of mango blackspot disease	H Finnemore (no more with SAMGA)	South African Mango Growers Association	Cell: 082 786 5082 henrifin@penta-net.co.za
2426*	Detection and control of citrus blackspot	J Chadwick	South African Citrus Growers Association	Tel: 031 765 2514
1628	HIV-1 Vaccine development	Not supplied Prof Berry Schub	Alpha Vax (Durham, USA) Polio Research Foundation	Not supplied Not supplied
1630	Model predictive control package	E Watson	Process & Information Technology (Pty) Ltd	Company folded up
1651	Process synthesis for process development	Not supplied	Not supplied	Not supplied
1655*	Reactive processes and reactor	J F Engelbrecht	Barloworld Plascon	Tel: 011 877 2930

	technology			je@sun.ac.za
1690	Advancing management of colorectal cancer	Dr Albrecht L Lipparoni	CANSA De Beers Fund	Tel: 021 976 5389 Cell: 083 273 2024 calbrec@iafrica.com llipparoni@tsi.org.za
1748	Genetics of retinal diseases	C Medefindt	Retina South Africa	medefindt@intekoom.co.za
1716	Harmonics free Three-Phase Rectifier	C Dresel	Semikron South Africa	Tel: 012 333 3733
1811*	Animal-driven electrical power	Mr M da Ponte	Volt Ampere Electronic (Pty) Ltd	Tel: 012 328 6551 Fax: 012 324 4203
1749	Non-engineering catalysis for Stable Fischer-Tropsch	Not supplied	Not supplied	Not supplied
1756	Nutrient cycling in plantations	Dr Andrew Morris	SAPPI	Tel: 033 330 2455
1759	Crashworthiness of composite automotive components	Not supplied	Renault (France)	Not supplied
1817*	Optical communications	Cobus Malan J C Heynecke D R Browne	ATC Marconi Telkom	Tel: 012 381 1574 cmalan@atc.co.za Tel: 011 257 3532 Tel: 102 311 2440
1865	SUNSAT micro-satellite	Jeff Heinebach	Cape Venture Partners	Tel: 021 790 0764
2366	Competitive industrial steel structures	T Ter Harre S Erling J Turner F Du Toit	BKS Consulting Engineers SAISC Element Consulting Hatch Africa	Tel: 031 204 3800 timth@bks.co.za Tel: 011 726 6111 spencer@saisc.co.za Tel: 021 975 1718 jturner@eceng.co.za Tel: 011 239 5732

		Dr I P De Villiers M Schoeman	Partnership De Villiers ISCOR / Mittal Steel	fdutoit@hatch.co.za Tel: 012 99 6975 idev@pdv.co.za Tel: 016 889 2398 martiens.schoeman@iscor.com
2392	Fruit juice preservation and probiotics	Bodley M	Amp Biotech	Cell: 082 464 7019
2465	esATI Regional Energy Management Programme	Chris Nel	IST Otokon	Cell: 082 574 3548 www.ist.co.za
2508*	Radio frequency and antenna systems		Optinum Solutions	Tel: 011 325 6238
2675	Power electronic converters	Not supplied	Not supplied	Not supplied
2825	Embedded system development	Henry de Ruyter	San People	Tel: 021 882 8811
2295	Vibration Research & testing of overhead transmission and distribution lines	Logan Pillay	Eskom	Tel: 011 629 5170 Fax: 011 629 5366
2217*	Mid-range laser range-finder	D Z Janse van Vuuren	Periseo CC	Tel: 012 318 5024 082 447 7536 dawie@periseo.com
1824*	Free space laser communication link	Inus Druckmeyer	Netshield (formerly Otex Concepts)	Tel: 012 460 0736
1822*	Farm information systems	A J Swanepoel	Createk Systems CC	Tel: 012 349 1400 Cell: 082 903 5851 andre@createk.co.za
1610/ 1609*	Limestone neutralisation / Biological sulphate removal	Francois Le Roux Peter Gunther Bongani Buthelezi Johann Claasen	Thuthuka Project Mgrs Anglo Coal Ticor/Iscor Heavy Metals Zincor	Tel: 011 466 9788 Tel: 011 637 6000 Tel: 035 902 7270 bongani.buthelezi@ticor-a.com Tel: 011 812 9500 Cell: 084 401 3688
2083	Telecommunication for rural development	Not supplied	Telkom	Confidentiality agreement

			Ericsson	Confidentiality agreement
755*	Deepmine: Mapping of geology	David Diering Dannie van der Bergh John Klokow	Anglogold Ashanti Durban Roodepoort Deep Goldfields	Tel: 011 637 6266; ddiering@anglogold.com.bullion Tel: 011 760 3167 vdbergd@drd.org.za Tel: 011 644 2400 Cell: 083 680 4507 johank@goldfields.co.za
820	Deepmine: Transport of men, material and rock	Same as for 755	Same as for 755	Same as for 755
816	Deepmine: Refrigeration and ventilation	Same as for 755	Same as for 755	Same as for 755
1394*	Environmentally sustainable use of waste water	Ian Douglas	Xstrata	Tel: 011 772 0635 Cell: 082 490 4649 douglas@xstratacoal.co.za
1456	Development of a bacterial surrogate marker assay	Not supplied	Not supplied	Not supplied
1696*	Corrosion engineering research	Chris Gross J Jacobs J Devos Lucien Mathews	Eskom TSI Iscor Sasol Columbus Steel	Tel: 011 629 5012 Tel: 016 889 8635/6 016 889 8636 Not supplied Tel: 021 914 6363
1805	Surrogate markers for relapse in TB	Dr Ken Duncan	Glaxo-Smithkline	Not supplied
2605	IP-based wireless networks	David Browne Chris Chavaranis	Telkom Alcatel	Tel: 021 311 2440 Tel: 011 542 3023
2684*	Cement-based materials technology	Dr G Grieve S Crossswell	C&CI PPC	Tel: 011 315 0300 graham@cncl.prg.za Tel: 021 550 2100 scrosswell@ppc.co.za

	..	J Gosling	Eskom	Tel: 011 800 3852 John.gosling@eskom.co.za
		W Smithers	SIKA	Tel: 031 792 6500 Smithers.wayne@za.sika.com
2007*	SunSAT	Geoff Heinebach Llew Jones Sybrand Grobblaar A Engelbrecht	Siemens Plessey Grintek Sunspace	Tel: 021 790 0764 Tel: 021 710 2732 Tel: 012 348 9626 Tel: 021 880 8102
1643*	High voltage distribution network improvement	Tony Britten Logan Pillay	Eskom Eskom	Tel: 01 629 5033 tony.britten@eskom.co.za Tel: 011 629 5170; Logan.Pillay@eskom.co.za
2965*	Electricity distribution network	Rob Stephen	Eskom	Tel: 031 710 5423 stepherg@eskom.co.za
2458*	High frequency components and systems	Prof P W van der Walt	Reutech Radar Systems	Tel: 021 880 1150 pwvdwalt@rrs.co.za

Key: * means response to questionnaire received from contact person

Appendix E: Secondary beneficiaries mentioned by project leaders

Proj ID	Short title	Project leader	Industry partner(s)	Secondary beneficiaries
698	Polymeric materials	Prof R Sanderson	Barloworld Plascon Dr A H A Roediger	Vinguard, Sasol, Mondi Plastics, Marmoran, plastics converting industry, public
1802	Bio-lipid chemicals for TB diagnosis	Prof Van Verschoor	Adcock Ingrams Ltd	TB sufferers
2218	Electricity distribution improvement	Prof C T Gaunt	Eskom	None indicated
1299	Novel anti-tumour compounds	Prof Connie Medlen	CANSA	None indicated
1691	Vision for inspection and control	Prof D G De Jager	De Beers	None indicated
1815	Development in animal nutrition and genetics	Prof N H Casey	Nestec Ltd (Swit), Alltech (USA), Kanhym (Pty) Ltd, Bonsamara Breeders Association	None indicated
1715	Plant genetic resources conservation	Prof P Berjak	International Plant Genetic Resources Institute	None indicated
1314	Oesophageal cancer: Early diagnosis	Prof M I Parker	CANSA	None indicated
1377	LCA of pulp and paper	Prof C A Buckley	Mondi Kraft (Richards	Other Mondi companies

			Bay)	
1496	Radar Remote Sensing Project (RRSP)	Prof M R Inggs	De Beers Reutech Steel Anglo American	None indicated
1582	Engine development technology	Dr A B Taylor	Stellenbosch Automotive Engineering VW South Africa	University of Stellenbosch and students, tecknikon in-service trainees, First and second tier suppliers to motor industry
1569	Minerals Bioprocessing	Prof G S Hansford	BHP Billiton Ex GFSA	None indicated
1598	Control of mango blackspot disease	Prof L Korsten	South African Mango Growers Association	Capespan, Colours, Katope, Dole
2426	Detection and control of citrus blackspot	Prof L Korsten	South African Citrus Growers Association	Capespan, Colours, Katope
1628	HIV-1 Vaccine development	Prof C Williamson	Alpha Vax (Durham, USA) Polio Research Foundation	SA Aids Vaccine Initiative, Medical Research Council, UCT
1630	Model predictive control package	Prof P L De Vaal	Process & Information Technology (Pty) Ltd	Technology developed is available to industry due to availability of students' dissertations
1651	Process synthesis for process development	Prof D Glasser	Not supplied	None indicated

1655	Reactive processes and reactor technology	Prof J H Knoetze	Barloworld Plascon	None indicated
1690	Advancing management of colorectal cancer	Prof R S Ramesar	CANSA De Beers Fund	Non indicated
1748	Genetics of retinal diseases	Prof R S Ramesar	Retina South Africa	None indicated
1716	Harmonics free Three-Phase Rectifier	Prof G P Hancke	Semikron South Africa	None indicated
1811	Animal-driven electrical power	Prof G P Hancke	Volt Ampere Electronic (Pty) Ltd	None indicated
1749	Non-engineering catalysis for Stable Fischer-Tropsch	Prof E W J Van Steen	Not supplied	None indicated
1756	Nutrient cycling in plantations	Prof M C Scholes	SAPPI	All forestry industries, research institutions, collaborative bilateral programmes (e.g. SIDA-NRF)
1759	Crashworthiness of composite automotive components	Prof E V Morozov	Renault (France)	None indicated
1817	Optical communications	Prof P L Swart	ATC Marconi Telkom	None indicated
1865	SUNSAT micro-satellite	Prof G W Milne	Cape Venture Partners	Amateur Radio Movement worldwide, electronics industry in South Africa, Univ of Stellenbosch students

2366	Competitive industrial steel structures	Prof P E Dunaiski	BKS Consulting Engineers SAISC Element Consulting Hatch Africa Partnership De Villiers ISCOR / Mittal Steel	None indicated
2392	Fruit juice preservation and probiotics	Prof L T M Dicks	Amp Biotech	University of Stellenbosch
2465	esATI Regional Energy Management Programme	Mr G Diana	IST Otokon	None indicated
2508	Radio frequency and antenna systems	Dr A R Clark	Optinum Solutions	None indicated
2675	Power electronic converters	Prof H du Mouton	Not supplied	University of Stellenbosch
2825	Embedded system development	Prof A E Krzensinski	San People	None indicated
2295	Vibration Research & testing of overhead transmission and distribution lines	Dr M A E Kaunda	Eskom	Industry, collaborators (ABB Hardware Assemblies), PLP, Aberdare
2217	Mid-range laser range-finder	Mr A G Hattingh	Periseo CC	Other companies
1824	Free space laser communication link	Mr A G Hattingh	Netshield (formerly Otex Concepts)	Not indicated

1822	Farm informations systems	Mr A G Hattingh	Createk Systems CC	Not indicated
1610/ 1609	Limestone neutralisation/Biological sulphate removal		Thuthuka Project Managers Anglo Coal Ticor/Iscor Heavy Metals Zincor	None indicated
2083	Telecommunication for rural development	Prof H Mneney	Telkom Ericsson	M Sc students (subsidy), University of Durban, Westville
755	Deepmine: Mapping of geology	Dr Durrheim	Anglogold Ashanti Durban Roodepoort Deep Goldfields	CSIR and other research gained knowledge for future research and consulting
820	Deepmine: Transport of men, material and rock	Dr Durrheim	Same as for 755	Same as above
816	Deepmine: Refrigeration and ventilation	Dr Durrheim	Same as for 755	Same as above
1394	Environmentally sustainable use of waste water	Mr J S Beukes	Xstrata	None indicated
1456	Development of a bacterial surrogate marker assay	Prof Van Helden	Not supplied	Academics (University of Stellenbosch)
1696	Corrosion engineering research	Prof Sandenburg	Eskom TSI Iscor	Students trained

			Sasol Columbus Steel	
1805	Surrogate markers for relapse in TB	Dr N Beyers	Glaxo-Smithkline	None indicated
2605	IP-based wireless networks	Prof Takawira	Telkom Alcatel	University of Durban, Westville/ University of Natal, Durban
2684	Cement-based materials technology	Prof Alexander	C&CI NPC, PPC Holcim, Eskom Lafarge, SIKA	Participating students, information is freely available to practising engineers
2007	SunSAT	Prof Schoonwinkel	Siemens Plessey Grintek Sunspace	All of South Africa's electronics industry to which graduates went
1643	High voltage distribution network improvement	Prof N M Ijumba	Eskom Eskom	Utilities in the SADC Region (Botswana, Angola, Namibia, DRC, Mozambique)
2965	Electricity distribution network	Prof N M Ijumba	Eskom	Ethikwini Electricity, Tongaat Hullet
2458	High frequency components and systems	Prof P Meyer	Reutech Radar Systems	None indicated

Appendix F: Secondary beneficiaries mentioned by contact persons

Proj ID	Short title	Contact person	Industry partner(s)	Secondary beneficiaries
698	Polymeric materials	J F Engelbrecht	Barloworld Plascon Dr A H A Roediger	None indicated
755	Deepmine: Mapping of geology	John Diering	Anglogold Ashanti Durban Roodepoort Deep Goldfields	Miningtek
1817	Optical communications	Cobus Malan	Eskom Eskom	None indicated
1394	Environmentally-sustainable use of water	Ian Douglas	Xstrata	None indicated
1696	Corrosion engineering research	Chris Gross	Eskom	None indicated
2508	Radio frequency and antenna systems	Grant Grobbelaar	Optinum Solutions	Poynting
1582	Engine development technology	Dr A J Bell	VW Powertrain, SAE, Murray & Roberts	None indicated
1824	Free space optical link	Inus Druckmeyer	Netshield (Otex Concepts Pty Ltd)	Network distribution and dealer channels in Africa

1610/1609	Limestone neutralisation/Biological sulphate removal	Francois Le Roux	Thuthuka Project Mgrs Anglo Coal Ticor/Iscor Heavy Metals Zincor	Landau Colliery (Amcoal), Navigation section
1811	Animal-driven electric power	M da Ponte	Volt Ampere Electronic	None indicated
1822	Farrn information systems	A J Swanepoel	Createk Solutions	None indicated
2217	Mid-range laser rangefinder	Van Vuuren	Periseo	None indicated
2007	SASciSat	Llew Jones	Plessey (Tellumat)	None indicated
2426	Detection and control of citrus blackspot	T Grant	South African Citrus Growers Association	None indicated
1802	Bio-lipid chemicals for TB diagnosis	Kuben Pillay	Adcock Ingrams	None indicated
1691	Vision for inspection and control	Dr Colin Andrew	De Beers Consolidated Mines	Peralox Electronics
1655	Reactive processes and reactor technology	J F Engelbrecht	Barloworld Plascon	None indicated
2684	Cement-based materials	Dr Graham Grieve	C&CI	C&CI Technical Advisory Committee
2458	High frequency components and systems	P W van der Walt	Reutech Radar Systems	None indicated
1643	High Voltage Distribution Studies	Tony Britten	Eskom	None indicated
2965	Electricity delivery network improvement	Rob Stephe	Eskom	None indicated

Appendix G: State of evaluation globally

STATE OF EVALUATION GLOBALLY

Maurice Dassah and
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Faculty of Informatics & Design, and
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Cape Peninsula University of Technology

ABSTRACT

'Evaluation' is a modern term for a practice that dates back to antiquity. It has an international, transnational and global dimension. The elasticity of 'evaluation' implies that evaluation is carried out by governments in different countries covering a wide range of activities. The diversity of evaluands, approaches, influences and practices hold important lessons for countries contemplating to adopt the evaluation technique. This article sketches the state of evaluation in 21 countries across four continents, tabulating various characteristics for comparison purposes. It locates each within a decade called first-, second- and third-wave, referring to when evaluation was first adopted in that country. Some key features are discussed, including globalisation of evaluation; factors that influenced its adoption; location of evaluation jurisdiction - push-pull mechanisms; education, training, professionalisation and supply of expertise; approaches to adoption; utilisation; and prospects. The role of the African Evaluation Association and factors militating against establishing more effective evaluation systems in developing countries, particularly in Africa, are briefly examined.

INTRODUCTION

Evaluation has an international, transnational and, in fact, global character (Chelimsky & Shadish, 1997:xi) and diverse approaches, directions and practices have emerged in different countries that hold vital lessons. Chelimsky and Shadish (1997:xii) acknowledge the pervasiveness of evaluation and the wide diversity of evaluands. According to these authors, owing to the proliferation of evaluands, evaluators are developing new methods, adopting and adapting methodologies from the social sciences and logical tools from philosophy to arm themselves for the new tasks as well as finding new ways of approaching evaluation (Chelimsky & Shadish, 1997:xiii).

The elasticity of 'evaluation' or 'programme evaluation' implies that evaluation is carried out in government circles of different countries under a variety of activities such as auditing, inspection, management analysis, monitoring, planning, policy analysis, programme analysis, and research (Wholey, Newcomer & Associates, 1989:5-6).

The approach used in this article involves identifying, tabulating and briefly discussing some key aspects of evaluation based on Furubo, Rist and Sandahl (2002). Information is drawn from other sources to enhance the analysis. By presenting information graphically, similarities and differences on key aspects among countries are brought to the fore, shrinking the range of semantics commonly used. To put the discussion in perspective, the three waves of evaluation are briefly examined and the countries located within this historical framework.

THREE WAVES OF EVALUATION

The adoption of evaluation by countries around the world came in three phases or waves, reflecting key concerns of the time and the needs evaluations were meant to serve.

First-wave evaluation

The first wave of evaluation adoption was in the 1960s and the 1970s when there was a recognised need to use policy as an instrument to modernise political and administrative structures. This wave involved a three-step approach: policy formation and planning; implementation; and evaluation. The emphasis was, thus, on policy evaluation aimed at improving policy results and maximising output effectiveness (Wollmann, 2003:2).

Rist (1990) identifies Canada, Germany, the United Kingdom and United States as first-wave countries. Sweden and New Zealand are also in this category. Korea, with a performance evaluation, and audit and inspection systems dating back to 1962 and 1948, respectively, is also a first-wave country.

Second-wave evaluation

Second-wave took place in the wake of the oil price hike in 1973, leading to worldwide economic and budgetary crises. This forced governments to focus on budgetary retrenchments and cost efficiency. In this situation, policy evaluation amounted to reducing policies and maximising input efficiency.

In the 1970s and 1980s, according to Derlien and Rist (2002:441), the focus of evaluation was two-fold: at the political level, it was meant to justify policies and at the budgetary process level, to help make decisions on resource allocation. The role of external auditors was central. Denmark, The Netherlands, and Switzerland adopted evaluation in this period (Rist, 1990). Another second-wave country, according to Furubo and Sandahl (2002:11), is Australia which is the only non-European country in the group. Norway is placed in this group by Rist (1990), whilst Furubo and Rist (2002:11) eventually classified it as a latecomer, or a third-wave country.

Third-wave evaluation

The third wave occurred in the late 1980s and 1990s, occasioned by ever-deepening budgetary crisis and the prevalence of the New Public Management (NPM) discourse and practice with a goal-setting - implementation - evaluation cycle. This era was characterised by internal evaluative institutions and tools. It was during this time that new vocabulary such as 'management audit', 'policy audit' and 'performance monitoring' crept in. Third-wave evaluation focused on results, measuring effectiveness, quality control and a democratic evaluation orientation. It emphasised aspects of NPM such as cost control, financial transparency, autonomisation of organisational sub-units, decentralisation of management authority, creation of market or quasi-market mechanism, contracts, and enhancement of accountability to customers for quality of service through the creation of performance indicators. According to Furubo and Sandahl (2002:11), the 1990s saw a number of European and non-European countries adopting an evaluation culture: Finland, Ireland, Italy, Spain, Norway (see section on second-wave evaluation), China and Zimbabwe (Furubo & Sandahl, 2002:11). These are third-wave countries. France, Israel and Japan also belong to this group.

GLOBALISATION OF EVALUATION

Albæk and Rieper (2002:44) refer to evaluation as a NPM novelty. Like all novelties, it started somewhere and eventually spread across the world. Diffusion of innovations theory explains how ideas (and products) gain wide acceptance. Rogers formalised the theory in *Diffusion of Innovations* (1962). 'Diffusion' refers to "the process in which innovation is communicated through certain channels over time among members of a social system" (Rogers, 2003:5). Rogers contends that diffusion is special in that what is communicated is a new idea. This definition covers both planned and spontaneous spread of new ideas.

Adopters of innovation or new ideas fall into five categories (Rogers, 2003:280). Rogers' categorisation is based on innovativeness, or the degree to which an individual, or other unit of adoption, is relatively early in adopting new ideas ahead of other members of a social system. The five adopter categories have certain characteristics. These, and the approximate percentage of individuals in each category, are summarised Table 1.

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Table 1: Characteristics and frequency of adopter categories

Category	Description	Per cent
Innovators	Venturesome, gatekeepers, substantial financial resources, multiple information sources	2,5
Early adopters	Respected, opinion leaders, role models, popular	13,5
Early majority	Deliberate, have many informal social contacts	34,0
Late majority	Sceptical and cautious, motivated by peer pressure	34,0
Laggards (or latecomers)	Traditional, isolated, suspicious, precarious economic position and fearful of debt	16,0
		100 %

Rogers (2003:169) suggests that in the social system, decisions are neither authoritative nor collective, but that every member makes an individual innovation-decision that follows a five-stage model, namely:

- Knowledge - awareness of innovation and how it works.
- Persuasion - formation of a favourable or unfavourable attitude.
- Decision - choice to adopt or reject.
- Implementation - use of innovation.
- Confirmation - evaluation of results.

While Rogers' theory has sparked widespread interest in relation to the behaviour of individuals in a marketing context, the theory is equally applicable to countries in respect of the adoption of ideas such as universal adult suffrage, democratic values, and evaluation. The contribution made by various countries towards globalisation of evaluation may be classified as shown in Table 2.

Table 2: Stages of globalisation of evaluation

Category	Country	Motivation
Innovators	USA, Canada	Need to evaluate defence, health, education, welfare programmes
Early adopters	United Kingdom, Sweden, Germany, New Zealand, Korea	Influence of pioneering countries
Early majority	Australia, Denmark, Norway, Spain, Switzerland, Netherlands	Oil crisis of 1973, leading to worldwide economic and budgetary crises
Late majority	China, Finland, France, Ireland, Italy, Israel, Japan, Zimbabwe	Deepening budgetary crises; prevalence of New Public Management discourse and practice
Laggards	Ghana, South Africa, Uganda and other African countries	African Peer Review Mechanism, popularisation of New Public Management and to enhance good governance

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INFLUENCES ON ADOPTION OF EVALUATION

Furubo and Sandahl (2002:21) categorise countries according to whether their adoption of evaluation was strongly (S) influenced by internal (I) or external (E) factors, or whether such factors were not all that decisive (W). Based on the strength or weakness of internal and external factors, countries fall into one of four different categories: strong external-strong internal (SESI); strong external-weak internal (SEWI); strong internal-weak external (SIWE); and weak internal-weak external (WIWE). These influences may be classified as shown in Table 3.

Table 3: Influences on adoption of evaluation

Type of influence	Countries	Source of influence
Strong-External, Strong-Internal	France, Germany, Denmark, Finland, Sweden, Netherlands Netherlands, United Kingdom	Membership of Organisation for Economic Cooperation and Development and European Union; World Bank agreements; various domestic situations
Strong-External, Weak-Internal	China, Ireland, Italy, Spain, Zimbabwe	European Union membership; multi-national development assistance organisations
Strong-Internal, Weak-External	USA, Canada, Australia, Norway, Korea	Need to modernise political and administrative structures; need to evaluate effectiveness of health, education and welfare programmes; budgetary retrenchment and cost efficiency
Weak-Internal, Weak-External	Israel, Japan, Switzerland, New Zealand	Weaknesses in countries' internal administrative systems militated against

PUSH-PULL FOR EVALUATION

Mayne, Divorski and Lemaire (1999:24-25) underline the importance of location of evaluation, that is the jurisdiction in which key evaluation decisions such as its scope, timing, funding and methodology are made within a political system. Jurisdiction may not, however, be where actual capacity to undertake evaluation lies. Four main jurisdictional options are available: key decisions about evaluation may be anchored in the executive: in programme managers, an organisational corporate group, or central corporate staff such as cabinet secretariats or central agencies like Ministry of Finance, Treasury or Budget Office. Secondly, evaluation may be legislative-anchored in an Audit Office or a legislative body. A combination of executive and legislative anchor is a third option. Finally, there is the option of having outside anchors such as universities and research groups or non-governmental organisations (Mayne *et al.*, 1999:24). A fifth option is judicial anchoring of evaluation. Table 4 outlines the various possibilities and provides some country examples.

Table 4: Mechanisms for initiating and/or conducting evaluation

Mechanism	Location of jurisdiction	Country examples
Push for evaluation (Supply)	Executive branch	Australia: Department of Finance Finland: Minister of Administration, and Prime Minister's Office Israel: Programme managers in Ministries of Education, Culture, and Sport; Defence, and the National Insurance Institute France: National Evaluation Council, National Urban Policy Evaluation Committee, National Research Evaluation Council
	Legislative branch	No country has a solely legislative-anchored evaluation. In countries where legislatures play a central role (Denmark, Ireland, Norway, Switzerland), they work alongside the executive
	Executive & Legislative	United States: Federal Departments, Committees and sub-Committees of Congress Canada: Treasury Board Secretariat, Programme Evaluation Branch of the Office of the Comptroller General, and Office of the Auditor General Switzerland: Administration Control of the Government, and Federal Finance Control Netherlands: Public Accounts Committee
	Judicial	Courts listed here are involved, to different extents, in evaluation alongside their executive and legislative counterparts: Italian and Dutch Courts of Audits German Federal Court of Accounts Spanish Court of Auditors
	External	No country has a sole externally-anchored evaluation, but NGOs and universities play a central role in most countries
Push for evaluation (Demand)	Intensity: Strong	Australia, China, France, Denmark, Germany, Italy, Japan, Spain, Sweden, Switzerland, Netherlands, United Kingdom, Zimbabwe
	Weak	United States, Canada, Ireland, New Zealand, Israel, Norway

HUMAN RESOURCES FOR EVALUATION

Opportunities for evaluation education, training and professionalisation, and hence availability of expertise, vary from country to country. They are abundant in a number of countries, opening up in some, but virtually non-existent in others. The situation may be summarised in Table 5.

Table 5: Global status and opportunities for the training of evaluators

Country	Level of training	Opportunities
Australia	University graduate courses	Widely available
Canada	University graduate courses	Plentiful but declining
China	Evaluation embedded in relevant courses in major universities	Inadequate
Denmark	Training done in social science core disciplines, also graduate and Ph D levels	Adequate. Short-term courses also available
Germany	No specific university courses	Rare. No sign of increased special training for future evaluators
France	Some university evaluation-focused training	Inadequate. Other courses touch on evaluation
Finland	Rare systematic evaluation education and training (only one dedicated university programme)	Inadequate. New courses are being offered and existing ones strengthened
Ireland	No specific degree courses in evaluation; no serious attempts to develop skills	Adequate. Strong social science tradition ensures good supply of expertise
Israel	Major universities offer courses related to evaluation in several fields	Adequate
Italy	No official university or polytechnic curriculum in undergraduate and master's courses. No post-doctoral courses	Not readily available. Workshops, occasional courses, on-the-job training are main sources of gaining expertise
Japan	Training in policy methodologies specific to Different fields viable	Inadequate. No dedicated evaluation courses
Korea	University training courses	Abundant. Few experts in policy/programme evaluation
New Zealand	Almost no academic courses	Limited
Netherlands	Evaluation courses offered in universities	Adequate
Norway	No regular university education in evaluation	Adequate. Short-term evaluation and other courses
Spain	Specialised university degree programmes	Adequate
Sweden	No training institutions dedicated to evaluation	Inadequate. Other courses address evaluation issues
Switzerland	Some university training courses	Inadequate. Self-study or on-the-job training is main source
UK	No information on training available	Unknown
United States	University graduate courses	Available but declining
Zimbabwe	No university or other training programmes	Almost non-existent, on-the-job training is the norm

APPROACHES TO EVALUATION ADOPTION

Kusek and Rist (2004:25) identify three main strategies or approaches countries may use to adopt results-based M&E systems. The whole-of-government (also called broad or comprehensive) approach involves setting up systems in many sectors and policies. This is not, however, to say that all ministries must be covered at the same time. Sequencing may be necessary so that systems that work well would benefit other government levels vertically or horizontally.

Many developing countries cannot deal with wide-ranging changes associated with the whole-of-government approach and may choose to take it more slowly. In this case, a fragmented, limited, enclave-focused or targeted approach is more appropriate. This involves initially piloting M&E in key ministries, departments or agencies or at local, state, or regional government levels with eventual horizontal and vertical diffusion to other levels.

The blended or mixed approach involves combining comprehensive and sporadic M&E activities. This means that while some areas are comprehensively monitored and evaluated, sporadic activities are conducted in others. This approach may be a plausible alternative for some developing countries. Irrespective of approach used, piloting is essential and has been adopted in developing countries such as Albania and Egypt (Kusek & Rist, 2004:26). An alternative to the blended approach involves focusing on issues pertaining to a specific customer group and ministries putting measures in place to track and monitor indicators of progress towards meeting established goals (Kusek & Rist, 2004:26). The first three approaches to building M&E systems are evident in the 21 countries. Table 6 shows the categorisation of countries according to evaluation approaches they have adopted.

Table 6: Approaches to evaluation adoption

Approach	Features	Examples (countries)
Comprehensive (Whole-of-government)	Evaluation is widespread and covers most, if not, all policy domains	United States, Canada, Italy, Australia, Sweden, France, Netherlands, United Kingdom, Germany, Denmark, Norway, New Zealand
Fragmented (Enclave-focused)	Evaluation systems in key ministries, state departments, agencies, local or regional government, with a view to later extending it vertically and horizontally	China, Finland, Israel, Japan, Korea, Spain, Switzerland, Zimbabwe
Blended	Full monitoring and evaluation of some policy domains, with sporadic activities in others	Ireland

GENERAL

Application of evaluation

The level of evaluation utilisation varies from country to country. It is high in Australia, Denmark, Germany, Finland, Korea, and the United Kingdom. In The Netherlands and Ireland it is medium. Low-level utilisation obtains in Israel, New Zealand, Norway, Zimbabwe, France, Canada, China, Spain, US, Switzerland, and Italy. In two countries, Sweden and Japan, the level of evaluation utilisation is unclear.

Effective utilisation of evaluation is critically important for developed and developing countries alike, probably even even more so for the latter. Measures to encourage more effective utilisation of evaluations are discussed in Dassah and Uken (2007:119-136).

Evaluation is mandatory in countries where European Union funds are involved. Thus, evaluation will continue to be important for the foreseeable future. In the United States and Canada, evaluation seems to have matured and is on the wane. In European, Asian and African countries, on the other hand, it is on the increase.

Evaluation in Africa

The state of evaluation in Africa has received very little coverage in world evaluation literature mainly because the continent has been late in adopting M&E. Furubo *et al.* (2002), the most comprehensive and up-to-date study of the state of evaluation worldwide, features only Zimbabwe among the 21 countries. Owing to this under-representation, and to highlight the fact that M&E is increasingly being adopted on the African continent, the state of evaluation in Ghana and South Africa is examined in Dassah and Uken (2006:702-720).

Evaluation is catching on fast in Africa. Since its inception in 1999, the African Evaluation Association (AfrEA) has been playing an important advocacy role to stimulate M&E on the continent. Some 20 national associations and networks are currently affiliated to the AfrEA. Its fourth conference was held in Niamey, Niger from 15-21 January, 2007. In the light of the demand, supply, and demand-supply mismatch in capacity development outlined by Picciotto (1998:39-40), stimulation of evaluation demand in Africa is the focus of Dassah and Uken (2005:733-743).

Asamoah (1988:169) states that the need for research in programme planning and evaluation in Africa is particularly acute because "developing countries struggle to design social development programs that will maximise positive benefits for the majority within the constraints imposed by fragile economies and limited resources". The author is of the opinion that programme evaluation will help planners make informed decisions about retaining or discarding individual programmes.

Although many developing countries have not yet established results-based M&E systems, the foundation for evaluation is being built (Kusek & Rist, 2004:36). Kusek and Rist (2004:32-34) outline some of the challenges in the way of establishing workable M&E systems in developing countries, including: weak information systems; lack of demand owing to the absence of an evaluation culture which, in turn results from absence of performance orientation in the public sector; lack of sufficient governmental cooperation and co-ordination; few highly placed champions ready to play an advocacy role; ineffective or nascent institutions; lack of a traditional implementation-focused M&E system; shortage of or inappropriately skilled human resource base; lack culture of accountability and transparency, avoidance of conflicts of interest; and absence or weak link between performance and public expenditure framework strategy.

Piccioto (1998:39-40) mentions "three formidable sets of obstacles" that hamper evaluation capacity development in Africa. The first concerns weak demand, a situation attributed mainly to the weak performance orientation of the public sector which, in turn, is associated with ineffective governance mechanisms. Other factors inhibiting evaluation demand are the incipient or nascent state of feedback in formulating policies and managing public expenditures, fear of political fallout and of public criticism, and shortage of trained staff. The second cluster of inhibiting factors relate to supply. This is owes to the "fragmented, uncoordinated, and supply-driven" nature of capacity development efforts made by development assistance agencies that tend to focus on individual projects as opposed to fostering "a coherent countrywide public sector reform strategy". Finally, an asymetrical match between supply and demand for capacity development assistance has led to "a supply-driven, expatriate-centered, and poorly adopted" assistance framework that encourages a "one-size-fits-all" approach.

CONCLUSION

What is clear from this paper is that evaluation has gained wide acceptance on some continents, but has yet to become established in others. Diffusion has been spectacular in the developed countries of North America, Europe and the Australian sub-continent, where countries have been among the *innovators, early adopters, early* or *late majority*. In some, evaluation has almost reached maturity. In the case of the United States and Canada, in particular, a decline in the importance of evaluation is noticeable. The developing countries of Asia hold promise. On the contrary, among the mainly *laggard* developing countries of Africa, a number of obstacles have to be overcome before evaluation can become a routine practice in government. As yet, diffusion is slow but positive changes are unfolding with potential to ignite a boom.

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Appendix H: Towards more effective utlisation of evaluations

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TOWARDS MORE EFFECTIVE UTILISATION OF EVALUATIONS

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ABSTRACT

An attempt is made to improve understanding of evaluation utilisation and, hopefully, promote broader utilisation by locating the discourse in the *Weiss-Patton debate* and exploring other views. In recognition of the importance of utilisation generally, and particularly in the context of the African Peer Review Mechanism, the article first examines and reviews various studies on the multi-faceted concept of *utilisation* or *use*, outlines what it is that is used, identifies the multiplicity of potential users and draws attention to misutilisation or misuse of evaluations. Secondly, drawing from evaluation literature, strategies are outlined that could enhance instrumental utilisation. Finally, Johnson's theoretical model of evaluation utilisation which merges elements of various conceptual frameworks is examined as an advance in the attempt to link theory to practice.

INTRODUCTION

Evaluation literature, particularly in the United States of America where programme evaluation has been practised since the 1960s, indicates that evaluation findings are not utilised or, at best, under-utilised (Vedung, 1997:265). Rog and Bickman (1984:169) highlight the minimal direct impact of evaluation results on policy and programme development, citing "the frequent findings of negative and null evaluation results" as one reason for dampened use.

The concern about use is vitally important for Africa since utilisation or use is the ultimate goal of evaluation. Interest in utilisation is reflected in the wide literature on the subject starting from Weiss (1967), the first paper ever published on evaluation utilisation, through Patton's (1978) exposition, the works of Alkin, Daillak and White (1979), Weiss (1984), Stake (1990), Alkin (1990) and Cousins and Earl (1992), to mention a few.

Use has been the central issue in the *Weiss-Patton debate* that ensued following Weiss's comments at the 1987 American Evaluation Association annual meeting in Boston. These comments drew a sharp reaction from Patton. A brief sketch of the background of this debate is imperative since it reinvigorated the discourse on evaluation utilisation. The debate was sparked by Weiss's contention that evaluators have had "indifferent success in making evaluation the basis of decisions" (Alkin, 1990:209) and her seemingly pessimistic (in Patton's words, *dismal*) vision of the future of evaluation utilisation (Alkin, 1990:187,188). For Weiss, evaluators should aspire to influence utilisation not to attain "... the status of philosopher-kings whose dictates determine program futures" (Alkin, 1990:211). This view is informed by the fact that "too many other considerations intrude on program decisions and operations" and "we should not expect evaluations to supplant all the other knowledge and values that democratic societies employ to make social choices" (Alkin, 1990: 219). As such, evaluators "should not hold themselves responsible if other contingencies ... outweigh the power of evidence" (Alkin, 1990:219-220).

Taking a different stand, Patton, (in Alkin 1990:188) argues that evaluators should play an active role in promoting and cultivating use. He insists that evaluators "... negotiate up front with intended users what an evaluation ought to achieve to make its benefits worth its cost" and then "deliver on that, or be judged as not having met our goal for use". Patton proceeds to refute Weiss's assertion of *indifferent success* of utilisation by claiming that substantial evidence exists indicating that "cases of high-level targeted utilizations are far from the exceptions" and that evaluators who have followed advice to work with intended users to achieve evaluation use and who have developed skills in implementing that advice, "have been well served ... and have served well their clients". He roundly criticises the unmarketability of Weiss's position and puts forward a results-oriented accountability perspective of utilisation, namely *intended use by intended users* (Alkin, 1990:192). To Patton, "catching a garbage fish does not make you a fisherman". Further, he contends that *"a fisherman is a fisherman if he catches the desired fish"*, and concludes thus: "you are not a programme evaluator until you catch the desired fish – which is getting your results used, that is intended use by intended users" (Alkin, 1990:193).

The *Weiss-Patton debate*, according to Shulha and Cousins (1997:197), received prominent coverage in *Evaluation Practice* and has been credited with assisting to influence the development of evaluation utilisation theory. This debate on utilisation hinges on the common sense view that evaluations are undertaken to facilitate decision-making, that is, for instrumental use. However, it is known that decisions on programmes, projects and policies are sometimes made with no regard for evaluation findings. Given that evaluations are important, it is surprising why findings often "wind up as litter in the bureaucratic mill" (Weiss, 1972:11).

This article has a three-fold purpose. The first is to throw wide open the utilisation cauldron and examine the complex, multi-faceted concept of *utilisation* or *use*; highlight what it is that is used; indicate the multiplicity of (potential) users; and raise the issue of

possible misuse of evaluation. Secondly, the paper looks at some strategies that could be employed to enhance instrumental utilisation. Finally, it examines Johnson's (1998) attempt to forge a comprehensive theoretical meta-model of utilisation from elements of various conceptual frameworks. It is hoped that the article will contribute to a better understanding of *utilisation* or *use* and promote the enabling strategies discussed. This, in turn, would help improve the low level of utilisation of not only mainstream evaluation results on the African continent but also promote utilisation of findings that are slowly emerging from the African Peer Review Mechanism.

SEMANTIC CONTROVERSY SURROUNDING *USE* AND *UTILISATION*

Use and utilisation are two commonly used terms in evaluation literature, but there is evidence that consensus does not exist among writers regarding their use. The table below captures the essence of the debate on them. To avoid being drawn into the debate, the terms are used interchangeably as synonyms in this article regardless of whatever subtle or overt differences there may be.

As is clear from the table, though with some controversy, *use* is the preferred term. *Utilisation*, is overwhelmingly rejected on various grounds.

Table 1: Views on use and utilisation

Author	'Use'	'Utilisation'	Reference
Alkin	Daillak equates 'use' to 'utilisation'	Confining meaning	1982:153
		Implies positive uses only	1982:154
		"...unduly limited by the assumption of profitability or productive result"	1982:154
Braskamp	'Usefulness' and 'use' preferred to 'utilisation' as they represent his current thinking	Represents his past thinking	1982:169
Daillak		Loosely defined by evaluators, who rather rely on implicit definitions given by research respondents	1982:157
		Distinguishes between 'evaluation utilization' and 'utilization of evaluation produced information'	1982:159
Rutman		Meaning is contingent on purpose(s) and methodology of evaluation study	1982:163

Author	'Use'	'Utilisation'	Reference
Henry & Mark	Useful for some purposes but may have become laden with multiple meanings ... may be too imprecise ... to guide research and practice.		2003:311
Sridharan	'Use' is also controversial. Henry & Mark (2003) and Kirkhart (2003) prefer 'influence'		2003:486
Vedung	'Use' means almost the same thing as 'utilisation'	Carries a kind of scientific authority and is preferred by writers trying to develop a more precise, technical definition	1997:289
Weiss	Has few inappropriate connotations	Carries inappropriate ... imagery because of its overtones of instrumental episodic implication	1979:2

Dimensions of utilisation

Utilisation is a complex, multi-faceted phenomenon with several and different dimensions. Some evaluators, however, tend to associate it with immediacy in relation to decision-making. Table 2 captures different dimensions of evaluation utilisation and briefly characterises them.

WHAT MAKES AN EVALUATION USEFUL AND WHAT ASPECTS ARE RELEVANT FOR UTILISATION ?

Interest in the usefulness of evaluation and the factors relevant to utilisation has been foremost in the minds of evaluators. While these are important issues, there are no definite answers. Ginsberg and Rhett (2003:490) consider a useful evaluation to be *"one that adds to the body of timely, relevant evidence to increase the likelihood that policy decisions improve performance"*. They further assert that "the value of a *new evaluation* is determined by the additional information it adds to the existing body of knowledge in the field".

Grasso (2003) underlines the necessity of meeting the needs and expectations of those commissioning or contracting for the evaluation as well as maximising the utility of the evaluation to those carrying out the programmes or projects that are evaluated while maintaining the integrity of the evaluation. To meet the often conflicting requirements

Table 2: Main dimensions of evaluation utilization

Instrumental (concrete or action-oriented)	Conceptual (education-oriented)	Interactive	Tactical 'Potemkin Villages' or 'conspiratorial use'	Legitimising or legitimative use	Process
Based on engineering model "...evaluation findings are utilized as means in goal-directed problem-solving processes" (Vedung, 1997:269). Findings are used as basis for action. (Johnson, 1998:93) Use occurs within a short time frame based on rational organisation model, which assumes uni-directional linearity and finely-tuned organisation. This involves: identifying problem, determining goals, designing alternative solutions, valuing and prioritising, choosing and implementing. Involves 2-stage decision-making process: i. Politicians set goals by identifying knowledge gaps. ii. Evaluators are commissioned to find the most efficient means to reach goals through experimentation.	Influences thought not action. Focuses on concepts, normative and cognitive insights gained. Awareness, attitudes, opinions formed Specific and general knowledge gained.	Opposed to engineering model Based on "the Open Mouth Principle": decision-makers "taste, swallow and digest various kinds of information of which data on program results, program costs, and program structure form only a minor part" (Vedung, 1997:274). *Evaluation information* cannot be the sole basis in decision-making. Ethics, legality, *alignment with due* process and democratic values, and political consequences are important. Balance of forces determines use.	Evaluation as an end, rather than as a means to an end; persuasive use involving ulterior motives. Strategic use of evaluation to create false impressions *and disguise reality*. Evaluation may be done to gain time, avoid responsibility (Vedung,1997:276). Also used to cover up faulty results, whitewash failures, avoid public debate and/or deflect criticism.	Political use of findings. Evaluation findings constitute knowledge that becomes ammunition in the hands of political players to "justify established positions *grounded in other* considerations" (Vedung, 1997:275). Findings that strengthen positions are appropriated while those that are destructive, and would exacerbate a situation, are ignored or dismissed.	Partially overlaps with instrumental and conceptual use. "Behaviour and cognitive changes occur in persons involved in evaluation as a result of their participation" (Johnson, 1998:94). Involves logic, *reasoning and being* guided by the values that undergird the profession (Patton, 1997:88). Enables non-evaluators to learn to think like evaluators and improves their skills, communication and decision making.

... (2003:508) suggests that evaluators

... questions:

- ... use the evaluation? In this respect, the evaluator needs to identify the potential users, assess and set priorities to meet the needs of different users and get early buy-in from potential users.
- What will potential users need from the evaluation? To satisfy potential users' information, needs have to be clearly communicated with sufficient evidence and discussion as to how the information was obtained and analysed. This will enable the credibility of the findings and recommendations to be assessed. It is also important to use anecdotes or stories to illustrate the findings so that understanding and use are improved.
- When will potential users need the information? On the last question, flexibility in timing is fundamental to ensure that the evaluation is completed at a time it will have maximum impact. A certain degree of luck is also needed as political, organisational or other environmental changes might make the evaluation irrelevant or open up unexpected uses.

Adherence to these measures, however, is not a guarantee that evaluation findings will be used, but it is suggested that the probability of more and better use is greatly enhanced.

Connolly and Porter (1980:133) hypothesise, based on data for their study, that

Evaluations are more likely to be utilised in decision-making if they meet two requirements. *Firstly,* they must be produced in response to a specific informational need of a specific decision-maker. *Secondly,* the generation, timing and dissemination of results of the study are under his or her control. Conversely, utilisation is less likely when evaluations are designed with no specific decision in mind, and thus when generation, timing and dissemination are determined largely by the logic of the evaluation process and the needs of the evaluator.

For Connolly and Porter (1980:131), "the crucial determinant of utilization is the extent to which an evaluation study addresses the informational needs of a specific decision-maker confronting or anticipating a decision". This implies that there will be high utilisation for user-focused evaluations and low utilisation for evaluator-focused evaluations. They raise a concern about the very small number of evaluation studies that have an impact on actual decisions and cite several possible explanations: methodological weaknesses, poor presentation and dissemination of findings, lack of attention to the policy-making time frame, poor organisational placement of evaluation groups and political naivety of evaluators.

While acknowledging internal, external, construct and statistical validity as important threats to the validity of evaluation findings, Connolly and Porter (1980:136) stress that more attention should be directed at "a new set of pragmatic concerns that threaten the utility of the study ...". These concerns are credibility, user-relevance, feasibility, timing and cost.

Based on a review of literature on utilisation, Brown and Braskamp (1980:98) conclude that "a relationship between the evaluator and key program staff, and the evaluator's understanding of the organization in its internal and external political environment are critical for successful utilization".

WHAT IS USED IN EVALUATION AND WHO ARE THE USERS?

Objects of use

Weiss (1998:21) acknowledges that *use of evaluation* used to mean the use of result for making programme decisions, but that now there is awareness of its larger dimensions and use encompasses a broad array of effects by multiple classes of users. She identifies three objects of use.

Firstly are findings about programme processes and outcomes that decision-makers are expected to use to make wiser decisions, including terminating programmes, projects or policies, extending them or modifying their objectives. Additionally, recommendations made by evaluators constitute an object of use. For this reason, studies on evaluation tend to count the number of recommendations that have been implemented.

Secondly, for enlightenment, people involved in programmes, policies or projects can use the ideas, insights and generalisations from evaluation, without using its findings.

Thirdly, the fact that an evaluation is being conducted, can serve to indicate accountability, demonstrate good management or be used to delay change and action. Positive or negative feelings about a programme may be engendered simply by the fact that an evaluation is in process. When an evaluator agrees to undertake an evaluation, it lends some aura of substance and legitimacy to the programme. It also sends a message that the programme needs to be scrutinised and maybe modified.

Preskill and Caracelli (1997) distinguish evaluation learning from the evaluation process itself (process use). They consider use of evaluation results and decisions about changing programmes based on findings (instrumental and persuasive use) as two distinct objects of use. Additionally, they indicate that the findings of evaluation may form a knowledge base and constitute an object of use (conceptual use or enlightenment).

Users of evaluation

Generally speaking, users of evaluation fall into two categories. i.e. as one category individuals in organisations use them. The bulk of users, as another category however, are in the collective domain. Undoubtedly, these users are many and tend to have diverse interests and agendas. To avoid any doubt, the collective use of findings is applicable in the political and administrative context, where potential users include governments, opposition parties, ministries, agencies and their sections or bureaus (Vedung, 1997:276-277). All five categories of evaluation utilisation outlined in Table 2 recognise that evaluation findings have many potential users.

According to Weiss (1998:27), one class of major users of evaluations is stakeholders: those who commission and pay for evaluations, administrators at national and local levels and staff directly in touch with clients. Increasingly, however, the needs and wants, values and interests of the largely powerless clients are considered and their concerns addressed as a means of remedying inequalities and redistributing power.

A number of users are beyond the programme, project or policy environment. Managers of similar programmes and projects use evaluations to learn how to improve their programmes; foundation officers work out how to fund or improve the workings of programmes they fund; policy makers make changes to existing policies or new ones; and social scientists take new knowledge and build it into theory and textbooks.

Members of learning organisations, that is organisations that are forward-looking and constantly adapting to changes in their environment to ensure survival, use evaluation to pinpoint conditions that need to be changed so that bottlenecks are taken out, supportive structures built in, and for new approaches and activities to be instituted to improve things.

The informed public or *civil society*, that part of society with a keen interest in socio-political issues and that is active in communal and associational life, can use evaluative information in the programme activities in which they are engaged as volunteers, board members, and advisors and being opinion leaders, "they can use evaluation to illustrate the successes that programs can have and help to counteract the apathy and hostility that many social programs face these days" (Weiss, 1998:29).

MISUTILISATION OR MISUSE OF EVALUATION

The issue of misutilisation **or** misuse inevitably arises in discussing evaluation utilisation. Like *utilisation, misutilisation* is a complex term. It is ambiguous and defies serious empirical systematic inquiry. The ambiguity and complexity of misuse are highlighted by Weiss (Alkin, 1990:254). Shulha and Cousins (1997:201) indicate that Alkin and Coyle (1988) were among the first pioneers to distinguish questionable practices such as *justified non-use* of evaluation data, mischievious use (*misuse*) of evaluation, *misevaluation* (the use of data of dubious quality) and *abuse* or the suppression of quality information for political or other covert reasons. Alvin and Coyle (1988:336) classify misuse into three major categories: misuse of commissioning an evaluation, misuse of the evaluation process, and misuse of evaluative findings, reflecting the stages during evaluation when misutilisation may occur. They (1988:334) underline the distinction between intentional misuse (abuse) and unintentional misuse (non-use) of evaluation. In the former case, those involved are aware of the inappropriateness of their actions whereas unintentional misuse could arise from ignorance. Further, they cite (1988:337) accepting evaluation findings uncritically, using results from studies with methodological flaws, selecting parts from results that do not represent the whole picture, prematurely releasing results and shelving findings to minimise likelihood of result utilisation as categories of misuse or abuse, depending on the user's intent.

Shulha and Cousins (1997:201) indicate that Patton (1988) contrasts utilisation with non-utilisation of evaluation findings and pitches *non-misutilisation* (justified use) against *misutilisation* on the basis that methods suitable for studying misutilisation are likely to be very different from popular methods of researching utilisation. He identifies *intentionality* as a variable to consider in researching misutilisation, citing examples of misutilisation as including commissioning evaluation for purely symbolic purposes, deliberate subversion of evaluation processes, and purposeful non-use of high quality information (Shulha & Cousins, 1997:202). They also outline (1997:203) three recommendations evaluation theorists have put forward to assist evaluators avoid situations that could lead to misuse:

- getting independent checks on their evaluation processes;
- conducting methodological reviews;
- consulting codes of practice.

According to Shulha and Cousins (1997:202), Stevens and Dial (1994) include changing evaluation conclusions; selective reporting of results; attributing findings to a study different from actual results; oversimplifying results; not qualifying results; and making negative results more prominent as typical misuse scenarios.

STRATEGIES TO ENHANCE INSTRUMENTAL UTILISATION

Although dissemination is an important variable in instrumental utilisation, it is clear that publishing evaluation findings *ipso facto* does not guarantee utilisation. As Evans (1977:39), according to Connolly and Porter (1980:132), puts it: "The mere production and dissemination of findings, however intellectually or methodologically compelling they may be, is usually not enough to sway a decision, change a program, alter a budget, or change a law". This view is echoed by Connolly and Porter (1980:131), thus: "(M)erely to disseminate evaluation findings, even those of the highest technical excellence and ethical care, offers little hope that they will influence the decisions of relevant policymakers."

The linear, unidirectional instrumental utilisation model assumes that once evaluation findings are disseminated utilisation will necessarily occur. Vedung (1997:279) suggests that while dissemination of findings, engaging in scholarly debate and allowing the political process to take its course is the basic-science road, a consciously active role by evaluators is vital to use. She presents four broad strategies that may be used to enhance evaluation utilisation: diffusion-centred strategy, production-focused strategy, user-oriented strategy, and meta-evaluation.

Diffusion-centred strategy

This strategy is premised on the assumption that faulty utilisation is caused by noise and other communication barriers between producers and consumers of evaluation (Vedung, 1997:282). It highlights the necessity of ensuring effectiveness in disseminating evaluation findings since recipients must of necessity have knowledge of the existence of evaluation information and understand it as a precursor or pre-condition to using it.

The diffusion-centred strategy hinges on two methods, namely reporting and linkage. Reporting is aimed at widely broadcasting evaluation findings through papers, tracts and oral briefings. Success of this method requires the evaluator to be resolutely committed to utilization, find likely users, makes his or her writing easy to understand, make papers and briefings user-friendly and to strongly advocate use of findings (Vedung, 1997:280-281) outlines specific measures evaluators can take to ensure success of the reporting method:

- ...tion-catching unusual facts;
- employing brevity;
- writing reports focusing on single issues;
- producing to-the-point executive summaries;
- advance identification of clearly-defined potential clients;
- using plain language;
- using graphics to enhance written information;
- adopting stylistic presentation to highlight crucial results;
- reducing focus on methodological issues in main text;
- continual prior dissemination of findings, insights and recommendations ahead of final report;
- inclusion of recommendations for action;
- being prompt and timely in producing reports;
- distributing preliminary and final reports to relevant managers and stakeholders;
- personally communicating results;
- personally selling results;
- availability to talk with managers;
- giving brief and regular talks;
- using stories and performance anecdotes for illustration;
- engagement in public debate.

Owing to the existence of strong barriers, user-friendly reporting and proper dissemination are not guarantees for utilisation.

The linkage method promotes dissemination by using intermediary agents between evaluators and practitioners by "opening up channels into the recipient organization in a sustainable, organized, and systematic fashion" (Vedung, 1997:280). A number of linkage options are available:

- Setting up advisory commissions of relevant stakeholders to advise on ways of diffusing findings within an organisation. They could possibly also serve as disseminators.
- Engaging people who are influential in their communities (opinion leaders) to play a gate-keeping role by obstructing, filtering, delaying and precipitating information flow. This role could extend to dissemination, if they are members of advisory commissions.
- Engaging information transfer specialists who, as advisory board members, would advise on ways of bolstering evaluator-user communication.
- In this era of modern technologies, especially computerisation, evaluation information could be electronically documented in a database and made part of the new documentation system. This would facilitate easy dissemination to relevant recipients.

Production-focused strategy

Working on the assumption that "evaluations are dismissed ... because they are irrelevant, if not faulty" (Vedung, 1997:282). This strategy focuses on adapting the evaluation process to meet the demands and desires of potential users five options are available.

- In line with the production-focused strategy, Vedung (1997:282) suggests evaluations be conducted at each stage along the lines of a four-stage scheme programme development: breadboard, super realisation, prototype and operati programme, reflecting different stages of programme maturity.
- Addressing users' concerns. Since users are diverse and have different informatio needs at different stages of intervention maturity, one way of attending to thei concerns is to allow them to formulate questions for evaluators' investigation.
- Using feasible and manipulable variables as contingent factors. Since users are interested in practical contingencies people can act on, evaluations based on explanatory theories and politically acceptable variables are preferable.
- Evaluators adapting their methodologies to the needs of users. While there is agreement about the need for a user-friendly methodology, there is no consensus among evaluation theorists about which methodology can best be adapted to enhance utilisation. For Vedung (1997:284), it is essential for "the utilization-focused evaluator to choose softer, process-oriented anthropological methods which ensure close evaluator-user interaction", to use open-ended interviews and involve those commissioning the evaluation and users in formulating the issues to be investigated. Grasso (2003:511) considers methodological issues of much less interest to evaluation audiences. For him, presenting enough evidence to illustrate the key points is more effective.
- Stakeholder consultation is the most radical version of the production-focused strategy. Consulting potential users during problem identification, data collection, data processing, report writing, dissemination and utilisation phases are thought to be helpful in that it increases the likelihood that users will be committed to the findings and possibly use them or recommend them to others. Patton's treatises (1978, 1986) on utilisation-focused evaluation advocate this sub-strategy. While it may lead to an increased possibility of providing the right information, ensuring responsiveness to critical issues and fostering learning, its shortcomings include the risk of evaluators getting caught up in political processes, the possibility that issues may be of minor research interest and the likely sacrifice of objectivity for usefulness.

User-oriented strategy

The crux of the user oriented strategy is that utilisation is not solely an individual user's issue; organisational set-up is also an important factor. The strategy, according to Vedung (1997:285), adapts five factors identified by Richard Stankiewicz in research utilisation, and how they influence users' capacity to receive and apply information, to evaluation utilisation. The factors are:

- disposition to change;
- the importance an organisation attaches to analytical functions and activities;
- its evaluation capacity;
- how seriously development of staff professionalism is taken; and
- the existence of a mechanism to develop and sustain linkages to external evaluation communities.

Two ways to promoting utilisation in an organisation using this strategy are:

- Setting up a unit or having an individual to champion the cause of evaluation as well as educated users. In this respect, it would be useful institutionalising evaluation by incorporating it into the management system so that it becomes a routine formation (Vedung, 1997:285).
- Adapting the policy formulation process to meet the requirements of evaluation research. A two-group experimentation methodology which aligns with the policy-making process is thought to enhance utilisation.

On the user-focused strategy, Connolly and Porter (1980:131) argue that "the crucial determinant of utilisation is the extent to which an evaluation study addresses the informational needs of a specific decision maker confronting or anticipating a specific decision". They suggest that while the familiar *threats to validity*, that is internal and external as well as construct and statistical conclusion validity, are still important considerations attention should be paid to a new set of more serious pragmatic *threats to utility*. These include credibility (plausibility of findings), user-relevance (match between evaluator's answers and user's questions), feasibility (*doability* in the actual situation), time frame (dealing with *a priori and a posteriori* evaluation and how quickly information can be produced) and, finally, cost (the user's willingness to pay for evaluative information).

Meta-evaluation

The fourth strategy to improve utilisation of evaluation involves evaluators engaging in meta-evaluation. Vedung (1997:286) suggests three sets of actions:

- Evaluators should self-evaluate the final report of their evaluations before submitting them to the commissioners. This would eliminate weaknesses and could contribute to improved use.
- Encouraging critical commentaries from enlightened and passionate scholars. If findings of evaluations are synthesised to form a body of knowledge, decision makers would have access to what works and what does not. This is thought to help improve utilisation.
- Auditing of the evaluation function within organisations and self-evaluations of performance could give visibility to the importance attached to evaluation.

IN SEARCH OF A LINK BETWEEN THEORY AND PRACTICE

To date, there is no model of evaluation utilisation that gives relative weights to the relevant variables thought to be critical for utilisation. According to Shulha and Cousins (1997:196), attempts to identify factors that enhance evaluation use led to the realisation that use is pervasive and spans the instrumental, conceptual and symbolic domains. Predictors of use identified, tended to be in clusters relating to relevance, credibility, user involvement, effectiveness of communication, potential for information processing, clients' information needs, expected degree of programme change, perceived value of evaluation as management tool, quality of evaluation implementation, and contextual characteristics of the decision or policy setting.

Cousins and Leighwood (1986), according to Shulha and Cousins (1997:196) attempted to develop a meta-analytic method aimed at assessing the relative weights of factors' ability to predict use. They found quality, sophistication, and intensity of evaluation methods to be particularly important in influencing the use of evaluation findings. However, Levin's (1987) application of Cousins and Leighwood's framework to empirically test the relative weight of factors influencing different types of use, by employing a framework developed by Cousins and Leighwood's (1986), showed that contextual factors were centrally important in patterns of use, thus contradicting Cousins and Leighwood's findings.

Johnson's (1998) attempt at synthesising diverse utilisation conceptual frameworks into a meta-model has been beneficial in pinpointing the nature and inter-relational properties of variables that explain use. Advanced as it may be in identifying variables in the utilisation equation, it has failed to spell out the relative weight of factors influential in utilisation (Shulha & Cousins, 1997:197).

Despite the existence of many implicit and explicit process-models of evaluation utilisation the absence of, and hence need for, a theory-based model is palpable. Johnson (1998:93) laments the fact that few integrated theoretical process-models have been developed that show the interrelationship among various variables involved in utilisation. He reviews (1998:95-101) a number of implicit and explicit utilisation process-models in the literature in an attempt to develop a meta-model. For the sake of clarity, the variables or process in implicit models are implied, rather than directly stated by the evaluator, whereas with explicit models the variables already exist in depicted forms in published works. In Johnson's words, the models reviewed "are based on qualitative or qualitative data or from purely theoretical models not ...based on *empirical data*" (1998:95).

Key facilitators of evaluation utilisation

Johnson's endeavour to develop a single multi-dimensional meta-model incorporating the general factors considered important in evaluation utilisation is an ambitious one. By eliminating and consolidating variables, he arrives at a model that sees cognitive use, behavioural use and organisational learning, which occur as iterations through the *theoretical model during and after a programme evaluation, as being especially important* (Johnson, 1998:103). His review of implicit and explicit utilisation process-models has led to the identification of key categories and themes, with their attendant properties and sub-categories (not outlined here), as facilitators of evaluation utilisation:

- participation by programme stakeholders;
- continual (multi-way) dissemination;
- communication and feedback of information and results to evaluators and users during and after a programme to help increase use by increasing evaluation relevance;
- programme modification and stakeholder ownership of results;

- collaborative employment by evaluators, managers and other key stakeholders of organisational design principles to help increase the amount and quality of participation, dissemination, utilisation and organisational learning (Johnson, 1998:104).

Attributes and components of Johnson's meta-model

The model, shown in Figure 1, has several attributes. *Firstly,* it may be used for any evaluation, whether formative or summative, and in any environment, be it internal or external, and with multiple stakeholder groups. *Secondly,* it assumes a social structure that transforms and reproduces itself through use. *Thirdly,* it is based on the causal process form of theory, with the probable causal links visually indicated, rather than listed as propositions (Johnson, 1998:106). *Lastly,* the model envisages the utilisation process as taking place in an open, dynamic and complex system and, if any factor changes, feedback may lead to changes in other factors. This underlines the fact that evaluation use is not a static or linear process.

The external environment and context is the first major aspect of the meta-model. It is characterised by complexity and perpetual change, affects and is in turn affected by the internal environment of evaluation and the explicit process variables in operation. To maximise utilisation of results, evaluators are advised to conduct external environmental analysis.

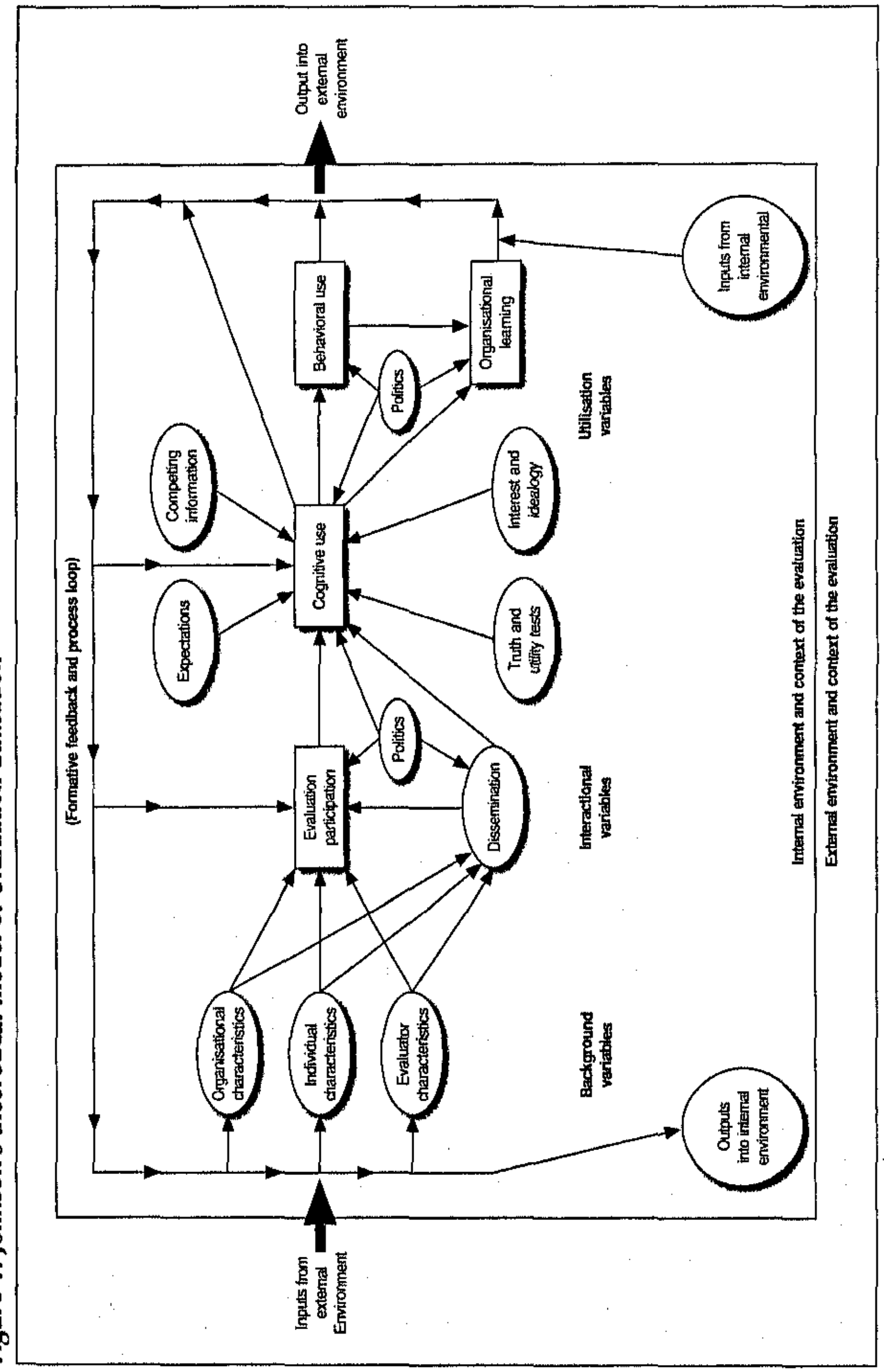
The internal environment and context, which is prone to continual change and politics, is the second major component. Aspects of the internal environment and context include programme and organisational history and culture, and the formal bureaucratic structure. Within this environment, Johnson (1998:107) stresses the importance of having a group of people who are very conversant with programmes and evaluation to monitor, evaluate and facilitate programme improvement and long term organisational learning, and to train others in evaluation, and organisational development and change.

The third major component of the meta-model is made up of three variables, namely organisational characteristics, individual characteristics and evaluator characteristics, collectively dubbed 'background variables' because they combine with the internal and external environment to facilitate utilisation and organisational learning. Like the internal and external environments, these variables change as feedback takes place.

Two social psychological variables, the process or interactional variables - participation and dissemination, are directly affected by organisational, individual and evaluator characteristics. It is presupposed that participation will be highest for organic, for change-oriented *learning* individuals and for evaluation-for-use evaluators. It is affected by utilisation variables through feedback. The nature of participation is determined by the type of organisation, resulting in three different degrees and types of utilisation: cognitive, behavioural and organisational.

A healthy, reciprocal symbiotic relationship is known to exist between participation and dissemination. The latter involves formal, informal communication and formal reports. Like participation, dissemination is also affected by politics as well as organisational, individual and evaluator characteristics. The model hypothesises that change-oriented persons have an interest in evaluation and are likely to participate and disseminate

Figure 1: Johnson's theoretical model of evaluation utilisation



Source: Johnson, R. B. 1998.

evaluation information and results formally and informally. Participation and dissemination have a direct effect on cognitive use and are also affected by it through feedback.

Cognitive use is directly affected by competing information, expectations, truth and *utility testing, interest and ideology, participation and dissemination*, and politics, but it is also indirectly affected by organisational, individual and evaluator characteristics, and politics. In addition, it is directly and indirectly affected by behavioural use and organisational learning through feedback. An important aspect of the meta-model is that cognitive use is held to occur before behavioural use, underlining the fact that it is a basic requirement not only for behavioural use, but also for organisational learning.

It is hypothesised that high participation and dissemination will lead to high cognitive use and that will also be the case when competing information is limited, when individuals' values, beliefs and interest are validated, and when positive and realistic expectations about the evaluation and programme are held (Johnson, 1998:108).

Finally, the model shows that organisational learning is a result of cognitive as well as behavioural use and politics and is also affected by all the other variables through feedback and the internal and external contexts of the evaluation. Cognitive and behavioural use affect organisational learning as time goes on.

CONCLUSION

There is no gainsaying the fact that utilisation is a multi-dimensional phenomenon with decision-support and problem-solving, educative, and political dimensions. While concern about weak- or non-utilisation is genuine, it is focused on decision-making presumably because it is immediate and concrete. However, it is known that utilisation is far more complex than just instrumental use. It has other dimensions: conceptual or enlightenment, interactive, legitimising, tactical and process, though they do not seem to attract equal attention.

The *Weiss-Patton debate* has immensely contributed to the quest to develop a utilisation theory. The literature on utilisation provides numerous conceptual frameworks or models, both implicit and explicit, with a multiplicity of factors thought to be essential to utilisation, as Johnson's review (1998) indicates. Knowledge of practical strategies that may be used to increase the likelihood of use is greatly enhanced by Vedung (1997).

Description of different types of use, and identification and listing of various contributory factors are still a long way from ensuring increased utilisation of evaluation. An adequate utilisation theory is needed. Levin's (1987) empirical test to determine the relative weights of factors thought to influence different types of use is a step in that direction although it failed to confirm Cousins and Leighwood's (1986) framework.

Johnson's meta-model (1998), based on variables distilled from implicit and explicit conceptual frameworks or models in utilisation literature, is by far the most important contribution towards developing a comprehensive utilisation theory. Despite its usefulness, are still some distance away from an empirical model that links all the relevant variables thought to be influential, and specifies their respective weights in predicting use. As the model stands, it is an improvement on individual explicit models, implicit models and other published lists of utilisation variables. The fact remains, however, that it is but *a tentative meta theoretical process-model* (Johnson, 1998:108) whose usefulness depends on the strength and empirical value of the numerous models from which its key components are derived.

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THE RELATIONSHIP BETWEEN GOVERNMENT AND CENTRAL BANKS: HOW INDEPENDENT ARE CENTRAL BANKS IN THE COMMON MONETARY AREA (CMA) OF SOUTHERN AFRICA?

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ABSTRACT

Central banks are unique public institutions. Generally, they are established by government, funded by government, and their governors and directors are appointed by government. Yet they have to be autonomous or independent from government! If not independent, grave risks entailing political manipulation and exploitation awaits them, harbouring threatening consequences for the economy and social structure of the country. Consequently, central bank independence (CBI) is currently internationally regarded as an essential yardstick for measuring good practice in governments.

The Common Monetary Area (CMA) region in Southern Africa consists of Southern Africa, Lesotho, Namibia, and Swaziland and they have agreed to achieve, together with the other 10 countries of the South African Development Community (SADC), a monetary and economic union by 2016. This article assesses the current adequacy of the legal (*de jure*) independence of the four CMA central banks from their governments. The article establishes and applies political as well as economic criteria for measuring CBI in the four CMA central banks. The results are utilised to indicate the extent to which each bank satisfies the criteria for legal independence and how much they need to transform towards the accepted principles of a respected, independent central bank.

INTRODUCTION

Central bank independence (CBI) from government is currently regarded as crucially important in international policy-making circles and is a widely debated and topical issue. The importance of and support for CBI derives from the argument

Appendix I: Monitoring and evaluation in Africa with reference to Ghana and South Africa

Editorial

very topical in South Africa and thus makes a valuable contribution to the literature on the topic. Mkhize and Ajam assess the new budgeting system in South Africa and clearly indicate that various reforms have been introduced. It also confirms the view expressed above that contemporary society requires the efficient application of a complex system of public administration to ensure that services are rendered efficiently and effectively. The last contribution by Van Dyk is more specialised and concerns military leadership. However it is still within the public sector domain and proves the point that in any large organisation, success is largely determined by the quality of its leadership.

C. Thornhill
Editor

MONITORING AND EVALUATION IN AFRICA WITH REFERENCE TO GHANA AND SOUTH AFRICA

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ABSTRACT

A general overview of the state of monitoring and evaluation in Africa is offered. It indicates that efforts by the World Bank, African Development Bank, Development Bank of Southern Africa and other agencies to develop evaluation capacity alongside sweeping public sector reforms and to enhance good governance have not yet yielded the desired results. Monitoring and evaluation are still, by and large, at the nascent stage. Positive developments are emerging, but challenges remain. Zimbabwe probably provides the only example of a "mature" monitoring and evaluation system on the continent. Ghana and South Africa, however, show signs of paying serious attention to establishing monitoring and evaluation systems. On this note, the paper focuses on these countries. The approach, used is a framework of juxtapositional analysis derived from Furubo, Rist and Sandahl who examines the two countries on a number of key factors.

INTRODUCTION

That the African continent has come into monitoring and evaluation (M&E) at a late stage, in its third wave, is indisputable. The World Bank, African Development Bank, Development Bank of Southern Africa, other development-focused agencies and the African Evaluation Association (AfrEA) have been making concerted efforts at developing evaluation capacity in African countries alongside public sector reforms and to enhance good governance. These efforts have, however, not yet translated into widespread acceptance, diffusion and institutionalisation of M&E systems and its routine practice in the public sector of many African countries. Schacter (2000:5-6) attributes the poor showing of sub-Saharan Africa in the M&E stakes to several factors, including issues related to asymmetrical demand-supply relations, the lack of information infrastructure and, in some cases, patrimonialism. More pointedly, he indicates that:

> *... the key constraint to successful monitoring and evaluation capacity development in Sub-Saharan Africa is lack of demand. Lack of demand is rooted in the absence of a strong evaluation culture, which stems from the absence of performance orientation in the public sector (2000:15).*

Despite these constraints, it is not an altogether bleak story for the continent. There are positive signs that M&E is catching on. Furubo, Rist and Sandahl (2002:6-7) acknowledge the existence of *islands* of evaluation activities in Ghana and Morocco but with "little evidence of any national evaluation initiatives in the public sector". South Africa is categorised among countries "that have just begun to create institutional prerequisites for bringing evaluation into the political system in a more general way", while Zimbabwe is counted among national states with a *mature* evaluation culture (Furubo, *et al* 2002:5). However, there are challenges to be overcome in adopting and institutionalising M&E. Thus, while this paper focuses on Ghana and South Africa to illuminate what is going on in the M&E scene, it offers a glimpse at some emerging positive aspects of M&E practice in Africa and challenges that must be overcome for it to gain a strong foothold.

The approach used in examining the M&E scenario in Ghana and South Africa is a side-by-side examination of a number of key dimensions, mainly informed by Furubo, *et. al.* (2002). Of interest is the fact that both countries have taken the ambitious whole-of-government approach that is particularly difficult for developing countries, instead of the modest enclave or a partial one.

DEVELOPMENTS IN THE AFRICAN MONITORING AND EVALUATION SCENE

Four positive developments are worth noting: realisation of the importance and increasing use of more participatory methods, *Africanisation* of evaluation, increased focus on evaluating development, and gender and rights.

Advocacy for and use of more participatory methods

There is a growing realisation of the importance of citizens' input in the evaluation process and, consequently, advocacy for more participatory methods and practices. Thus, the need to involve ordinary citizens in evaluating government policies, programmes and projects and to incorporate their voice in evaluation reports is increasingly coming to the fore.

Africanising evaluation

African evaluators are also beginning to take ownership of evaluation and *Africanising evaluation* rather than 'practising evaluation in Africa', as the President of the International Development Evaluation Association, Dr Sulley Gariba, put it at the 2004 AfrEA Conference in Cape Town. This is being achieved by African evaluators adopting and incorporating indigenous knowledge systems as relevant methodology in evaluation practice. Increasingly, then, evaluation in Africa is being thought of not as something that should be done to African countries by outside evaluators using imported methods, but as a mechanism grounded in African values and infused with the abundant stock of home-grown knowledge. African evaluators themselves, in collaboration with the marginalised majorities, should be using such innovative techniques.

Evaluating development

M&E in Africa has tended to focus on programmes and projects. Of late, however, attention has increasingly been on evaluating development, particularly important in the light of the fact that development plans are implemented by governments. Yet there are no mechanisms to gauge their successes and failures and to outline lessons to be learnt. Development evaluation is critical given that in the next few years African governments need to evaluate their progress towards meeting the Millennium Development Goals. In this light, it is important that the theme of the fourth AfrEA Conference to be held in Niamey (Niger) from 15 – 21 January 2007, to "strengthen capacity in monitoring and evaluation in order to improve policy development and programme performance in Africa", focuses on evaluating development.

Gender and rights evaluation

The last positive aspect is the increasing importance accorded to gender and rights-based M&E. This is based on the premise that Africa cannot develop if it continues to marginalise women, who constitute one half of its population. AfrEA has linked up with the United Nations Development Fund for Women to promote this aspect of M&E. They have created an African Gender and Development Network that boasts twenty-two M&E specialists on the continent. In 2003 they organised a gender and right-based workshop in South Africa to build capacity in this area.

CHALLENGES

Despite the positive developments indicated, M&E in Africa faces challenges which need the concerted efforts of governments, national associations, networks and societies to overcome.

Late development and acceptance of evaluation as a profession

In the first place, M&E practice and its value as a profession are still in its infancy. In some countries the practice is undeveloped, rather than under-developed. Some have established M&E systems and have associations, networks or societies, representing practitioners. In others, neither the systems nor the professional supporting structures exist. The African Evaluation Association (AfrEA) itself, the umbrella body for evaluation associations, networks and societies on the continent, was inaugurated in 1999 and is a mere **seven** years old. Despite its tender age, AfrEA has already organised three international conferences. African and international M&E practitioners met in 1999 and 2002 (Nairobi) and 2004 (Cape Town) and will meet in 2007 (Niamey) to promote the M&E agenda in Africa and to develop capacity through participatory workshops.

Conception of 'monitoring' and 'evaluation'

Secondly, among countries that have adopted M&E there is no uniformity in the way 'monitoring' and 'evaluation' are conceived. Routinely, monitoring seems to be widely practised whereas evaluation does not attract as much attention. In some countries M&E is synonymous with just monitoring. In Zimbabwe, for example, monitoring is emphasised to a point where evaluation is virtually neglected, according to a Zimbabwean delegate at the Third AfrEA Conference held in Cape Town, 4-6 December, 2004. In South Africa, both aspects are equally emphasised. On the whole, in many countries evaluation is perceived negatively as a mechanism that focuses on exposing and criticising failures and weaknesses in the performance of policies, programmes and projects rather than celebrating their strengths and successes. This negative, fault-finding perception of evaluation presents it as something to be feared or, at best, tolerated and can be attributed to the third challenge: donor dominance.

Donor dominance

That the M&E arena is donor-dominant and donor-driven can be explained by the fact that many African countries, including Ghana and South Africa, depend heavily on World Bank loans and other donor funds to finance the implementation of policies, programmes and projects. The same is true of projects implemented by non-governmental organisations (NGOs), where donor funding usually comes with evaluation as a requirement.

Funding constraints

Non-availability of funds to evaluate, is a major challenge. This phenomenon is attributable to the high costs involved in undertaking evaluations. Few, if any, NGOs have their own means to either initiate projects or evaluate them. While African governments launch many policies, programmes and projects, few are eager to commit additional funds to evaluate them. This brings into sharp focus the issue of resources for evaluation in Africa and the need for governments to consider committing their own resources. So far, no African country allocates a percentage of its budget to M&E activities. On the positive side, however, M&E is considered so important in South Africa that the Constitution, 1996 has specifically mandated the Public Service Commission (PSC) to undertake all public sector evaluation, thus providing a model of how seriously M&E should be taken in Africa.

Near-neglect of learning role

The fifth challenge has to do with near-neglect of the learning role of M&E. While the accountability role of M&E, as part of a general management function, is emphasised, its role in fostering learning from failures and successes of policies, programmes and projects, an equally or even more important role, is generally downplayed or even overlooked. This was pointed out by Dr Elliot Stern during the 2004 AfrEA Conference. The two roles are not necessarily mutually exclusive. In fact, the synergy of the two makes M&E an indispensable tool for African countries.

Weak or non-utilisation

The final issue is under-utilisation, or even non-utilisation, of M&E findings owing to the lack of feedback mechanisms. Owing to Africa lagging behind in information communication technologies, there is a lack of well-organised and co-ordinated information systems in the ministries and departments of many African countries. The usefulness of M&E results, as feedback, is thus still under-developed. What Mazikana and Brushett (2002:312) write about Zimbabwe is symptomatic of the general situation in Africa: the culture of demanding, receiving and discussing M&E of programmes and projects has not yet caught on. Ministries and departments generally lack libraries with facilities to aggregate, catalogue and retrieve information leading to evaluation reports residing with individuals. Where they exist, databases are not networked to make access to individual units and systems, located in offices, possible. There is very little systematic follow-up on M&E findings and recommendations. Such follow-up depends on the diligence and capacity of implementing agencies and donors. Consequently, evaluation reports are not fully used in problem-solving and decision-making, except in cases of donor involvement.

MONITORING AND EVALUATION LANDSCAPE IN GHANA AND SOUTH AFRICA

From the onset, it needs to be emphasised that neither country has as yet achieved a fully developed M&E system adequately suited to its needs. To a large extent, and at different stages, both are still experimenting with, figuring out, adopting and adapting workable M&E aspects.

Framework of analysis

While the analysis of the state of M&E in Ghana and South Africa given here is not comprehensive, it offers a view of what is happening in this domain. The framework of analysis is derived from Furubo, *et. al.* (2002). It involves a juxtapositional examination of relevant aspects: history of adoption; institutional arrangements, that is, the role of various players; level of demand and utilisation of findings; supply of expertise, including

opportunities for education, training and professionalisation; and use of participatory approaches, that is citizens' involvement.

Government-wide approach

A common denominator Ghana and South Africa have, lies in their ambitious adoption of the whole-of-government (government-wide), rather than an enclave or partial, approach. In the case of Ghana, however, it has turned out to be a *de facto* piece-meal approach in the sense that although the law requires all sector ministries to have Policy, Planning, Monitoring and Evaluation Departments (PPMEDs), there is no indication that this is really the case (The World Bank, 2000:5). The PSC in South Africa pursues M&E with a passion reminiscent of the efforts of the Department of Finance in Australia in the late 1980s. In fact, South Africa's approach to institutionalising M&E is modelled, consciously or unconsciously, on the Australian experience, but with the driving force or evaluation champion being the PSC rather than the Department of Finance.

Background and impetus to adoption

The forces implicated in the development of M&E in Ghana and South Africa are different and unique to either country. They may be categorised into internal and external mechanisms.

Reforms, 'Ghana-vision 2020' and Comprehensive Development Framework

The comparatively early but low-key adoption of M&E in Ghana (1980s) may be attributed to external pressure on the country dictated by its domestic circumstances. Ghana experienced strong external pressure to adopt M&E systems in the face of loans received from development assistance agencies and donors to implement development projects, economic and public sector reforms. Multilateral and bilateral loans typically include the implementation of M&E systems as an integral part of the package.

According to Kannae (1999:99-100) poor public sector performance, a call for more responsibility, effectiveness and efficiency led to the government's recognition of the need to strengthen M&E capacity. Consequently, technical support was sought from the World Bank in 1999 to conduct a diagnostic study of M&E capacity and recommend which measures to take. This was followed by a stakeholders' workshop where institutionalization became a focal point. At the time, M&E was critical to Ghana for two main reasons. First, Ghana was a pilot country for the Comprehensive Development Framework (CDF), which emphasises results and accountability. Secondly, sweeping public sector reforms were being undertaken to downsize and re-engineer for efficient and effective performance. M&E capacity building was, therefore, aimed at enhancing the government's capacity to measure and report on the effectiveness of public sector organisations and development projects and to create a pool of expertise to complement that of donors involved in promoting results-based management in the public sector.

By emphasising that the impetus to adopt M&E has been reinforced by the fact that Ghana is a site for the CDF, whose guiding principles emphasise results-based management, accountability and open dialogue with civil society, elements which are themselves essential to M&E capacity building, The World Bank (2000:i) confirms Kannae's analysis.

Koranteng (2000:75) gives a succinct analysis of the dire socio-economic conditions in the 1970s and 1980s that forced Ghana to adopt reform policies and M&E. The Economic Recovery Programme that saw deregulation, decentralisation and grass-root level participation in governance introduced alongside other measures in 1983, was a consequence of this. A Structural Adjustment Programme was also launched that created a leaner public service, reduced costs and privatised state enterprises.

Reinforcement of M&E in Ghana can also be attributed to the adoption of 'Ghana-vision 2020' by the government of the Fourth Republic (1992) to enable the country attain a middle-income status through reforming the Civil/Public Service and private sector. Achieving the objectives of 'Ghana-vision 2020' led to the establishment of the National Institutional Renewal Programme (NIRP) in 1994, to deal with problems related to reforming the public sector, co-ordinating and providing accountability for the reforms, and fostering a conducive climate for the private sector to champion development (Koranteng, 2000:76).

Transforming the South African Public Service

The late start of M&E in South Africa (post 1994) owes much to the fact that the pre-conditions for introducing M&E, transparency and accountability, did not exist. South Africa has experienced both a lack of any significance internal pressure at different times, as well as weak external pressure. The apartheid regime did not consider evaluation as a priority and was not put under external pressure either. Nor was the post-apartheid government of the African National Congress put under any severe external pressure. Since after 1994, however, the government has been under strong self-imposed pressure to fast-track the transformation agenda in the Public Service and other institutions in order to meet the needs and aspirations of the wider population, particularly the previously disadvantaged. Initially, M&E was donor-driven. The President's State of the Nation Addresses (SONA) of 2004 and 2005 have served as the rallying point for improving M&E capacity. The South African Public Service (SAPS) is being transformed from one based on rigid rules and control to a more flexible, dynamic and citizen oriented one, where departments can adjust and adapt, according to the needs of the people they serve and the nature of the service they provide (Fraser and Sing, 2004:3).

Efforts by the PSC to transform SAPS into a service-oriented one is underpinned by its commitment to the following nine fundamental principles: (State of the Public Service Report, 2004:3-4) and (Fraser and Sing, 2004:5).

- adherence to and promotion of a high standard of professional ethics;
- efficient, economic and effective use of resources;
- development orientation;
- impartial, fair, equitable and unbiased provision of services;

- responsiveness to citizens' needs and public participation in policy making;
- accountability;
- transparency through providing timely, accessible and accurate information to the public;
- sound human resource management and career development practices;
- broad representation of the population based on ability, objectivity and fairness and redress of past imbalances.

Institutional arrangements for conducting monitoring and evaluation

In the developed countries of Europe and North America the executive tends to be the major initiator of M&E. Legislatures have tended to be weaker despite their watch-dog role in a checks and balances system to ensure government accountability. This pattern of executive pre-eminence is emerging in Africa. In both Ghana and South Africa the executive champions M&E activities.

The Executive and other players in Ghana

The Policy Management Group

According to the World Bank (2000:1), the Policy Management Group (PMG) has been set up by the President and charged with monitoring and controlling policy processes. It makes sure government policies and priorities are implemented; it also assesses the impact of policies on development, develops policy options as well as assesses government performance.

Policy, Planning, Monitoring and Evaluation Departments

Responsibility for M&E activities is vested in line ministries. Each is supposed to have a PPMED that implements M&E policies. They collect and coordinate data from ministries and departments and the agencies they oversee as well as plan and co-ordinate budget bids within ministries. Although they have a very important role to play in monitoring and evaluation, PPMEDs have no uniform size, functions and performance, according to The World Bank (2000:5). In addition, they tend to focus on monitoring the financial inputs of projects and activities and are in need of capacity development and clarification of their roles and functions. Koranteng (2000:77) indicates that most institutions, programs and projects have set up their own approaches to undertake the M&E function, either *in part or in full*. In addition, central government agencies have established mechanisms for M&E in several areas.

National Institutional Renewal Programme

NIRP is chaired by the Vice-President and operates from that Office while reporting to the National Overview Committee (NOC). With the NOC, they 'are responsible for the development of M&E capacities and systems for the GOG' (Government of Ghana) Adrien (2001:1). More specifically, NIRP is responsible for pushing, monitoring and evaluating the reform process.

Role of the executive and others in the South African monitoring and evaluation scene

There are several players in the South African M&E arena, with the Presidency playing a leading role.

The Presidency

The government-wide M&E system is driven at the highest level. The Presidency sets the framework for M&E, drawing on various transversal systems, including value for money from the Treasury, governance from the PSC, human resource and early warning systems from the Department of Public Service and Administration and service delivery from the Department of Provincial and Local Government. This framework enables government departments to establish their own M&E systems. Efforts are being made to develop indicators that would allow questions about performance on any parameters to be answered.

The President sets out a programme of action (POA) with targets for cabinet clusters after an annual *lekgotla*, where the successes and failures of departments are noted. In the SONA of 21 May 2004, the President underlined the importance of M&E for the Public Service:

> *...government is in the process of refining our systems of Monitoring and Evaluation, to improve the performance of our system of governance and the quality of our outputs, providing an early warning system and a mechanism to respond speedily to the problems, as they arise (Ramafoko, 2004:1).*

The Cabinet Cluster System

The drive to achieve integrated governance has seen programmes of the thirty-nine government departments grouped into five cabinet cluster committees dealing with similar sectoral challenges: Governance and Administration; International Relations, Peace and Security; Justice, Crime Prevention and Security; Economic, Investment and Employment; and Social Services (The Machinery of Government, 2003:5). Ministers oversee the activities of their departments within the cluster system. The Governance and Administration Cluster, chaired by the Minister of Public Service and Administration, is responsible for M&E policy issues.

For purposes of monitoring and coordinating the implementation of the POA, each cluster is made up of a Cabinet Committee consisting of Ministers, Deputy Ministers and Directors-General of relevant departments who meet every two months to track the progress of their tasks. Speaking in Parliament on 23 June 2004, during the debate on the Presidency's Budget Vote, the President indicated that the function of cluster committees is to ensure that the programmes of the various ministries and departments are consistent with one another.

The Public Service Commission

Responsibility for monitoring and evaluating public sector performance is conferred on the PSC by section 196 of the Constitution 1996. It is charged with promoting 'the constitutionally enshrined democratic principles and values in the Public Service by investigating, monitoring, evaluating, communicating and reporting on the Public Administration.' (*PSC News*, November/December 2004:52). Its main task is to implement M&E policies and programmes. The PSC is accountable and reports to the National Assembly. It has implemented the Public Service M&E system, programme evaluation, conducted Heads of Departments' evaluation, *Batho Pele* surveys, and established an evaluation culture.

National departments

The M&E function is located in directorates in national departments. Constitutionally, therefore, Ministers have oversight and coordination responsibility for M&E in their departments.

Provincial administrations and departments

Premiers have coordination and oversight responsibility in this spheres. Each department is expected to have line function M&E systems and mechanisms in place, overseen and coordinated by the Office of the Premier (Soko, 2004:12).

Demand for and utilisation of evaluation results

Central agencies in Ghana

According to The World Bank (2000:10), the GOG is committed to public sector reform and M&E capacity development. There is high demand for M&E within the senior echelons of key central agencies such as the PMG and NIRP, ascertained by the World Bank missions of June and October 1999. An indication of this is the desire of senior staff for assistance to set up an effective sectoral and national M&E framework. The Government requested the World Bank to assist in implementing the Public Sector Management Reform Program (PSMRP) aimed at reforming and improving management of the public sector using a battery of measures such as downsizing, functional and structural review and performance agreements with senior civil servants. It also introduced a Medium-Term Expenditure Framework (MTEF), established performance plans for ministries, departments and agencies (MDAs) and conducted client/customer satisfaction surveys. All this does not, however, imply that there is universal high demand for M&E at MDAs, hence the need to sensitise civil servants to the benefits of M&E and stimulate demand.

The World Bank (2000:11) also indicates that both senior government officials and civil society have raised the need for capacity building in communication, fund raising, advocacy, building alliances and assessing public sector performance through M&E and budget analysis. Despite the interest in and demand for M&E stated above, there is no indication of sustained use of M&E results in decision-making.

The Public Service in South Africa

There is high demand for M&E given the state of the Public Service inherited from the previous regime in 1994 and the need to transform it. The Presidency, Offices of provincial premiers and those of national and provincial departments are being transformed. Bottlenecks are being removed and they are being re-oriented to ensure smooth operations and optimum delivery of services. Since assuming 'the mantle of being the leader and custodian of good governance' in 1999 (Sangweni, 2004:2), the PSC has faced the mammoth task of evaluating the President's Office and all one hundred and thirty national and provincial departments with regard to service standards and the *Batho Pele* principles.

A framework for evaluating Heads of Departments has been compiled and used. According to Fraser and Sing (2004:4) a Public Service Monitoring and Evaluation (PS M&E) system, with accompanying performance indicators based on nine basic values and principles in the Constitution, 1996 has been developed. This allows for research and comparison of the same issues in all departments. It also helps to identify and promote good practices (learning). Support is given in weak areas, leading to better governance and service delivery.

Training and supply of expertise

One of the major constraints to evaluation capacity development in Africa is the very limited opportunities or even total lack of formal education in M&E and professional training facilities in many countries. This is reflected in the limited availability and quality of expertise.

Training facilities in Ghana: a regional centre of excellence in the making?

Given the strong demand for M&E within the senior ranks of key central agencies in Ghana mentioned earlier, there is a corresponding need to equip key personnel with vital M&E skills. Statistical skills, skills in setting objectives and measuring performance are adequate as well as experience in collecting performance indicators (The World Bank, 2000:11). However, there is a shortage of skilled personnel in policy review and formal evaluation.

Adrien (2001) assesses a number of training organisations in Ghana and their capacities:

- Ghana Institute of Management and Public Administration (GIMPA) in Accra;
- Institute of Statistical, Social and Economic Research (ISSER) at the University of Ghana, (Legon);
- School of Administration at the University of Ghana (Legon);
- Department of Planning at the Kwame Nkrumah University of Science and Technology (KNUST) in Kumasi;
- Institute of Local Government Studies (ILGS) in Accra.

Notable among the training organisations are GIMPA and UST, which are briefly discussed below.

GIMPA offers three hands-on executive masters programmes (Business Administration; Development Management; Public Administration, Governance and Leadership) with twelve options as well as two bachelors degrees in Leadership and Governance and Public Administration. In addition, it presents a variety of short courses for middle-level and senior managers and provides consulting services to national and international clients. It also organises workshops for a diverse clientele: individuals in the civil, private and public sectors, bilateral and multilateral agencies, NGOs and associations and sub-regional organisations. Further, it engages in research, publishes on issues of national concern and is a platform for debating and resolving national issues.

The quest by GIMPA to become a regional centre of excellence in M&E has been boosted by ongoing World Bank support to update the content of its M&E courses and expand on the range as well as opportunities to twin or form partnerships with academic or consulting organisations specialising in M&E. Other forms of support include networking opportunities through membership of evaluation associations to enable staff gain M&E knowledge, publish and share knowledge in M&E methods and applications and to utilise M&E findings.

The Planning Department at KNUST offers an undergraduate programme in Development Planning as well as two postgraduate programmes in Development Planning and Management and National Development Policy and Planning (Adrien, 2001:23). Two of these programmes are in collaboration with Dutch universities. Although the programmes focus on planning, M&E is integrated into the courses and M&E modules are offered as part of larger programmes.

World Bank support to the Planning Department includes assistance to integrate M&E into the existing planning programmes, training for trainers to familiarise all faculty members with core M&E concepts, ongoing coaching through regular exchanges, co-design, co-facilitation to develop and adapt the M&E course. There is also a campaign to raise M&E awareness and to strengthen a local network of M&E training organisations (Adrien, 2001:28).

University programmes and training opportunities in South Africa

The supply of M&E expertise is low and training opportunities in South Africa are surprisingly inadequate. Louw (1998:260) indicates that the demand for evaluation outstrips the supply of evaluation expertise and that opportunities to receive formal training in evaluation methodology, such as degree conferring programmes, are almost non-existent. He cites only four masters level courses with programme evaluation elements offered at four universities:

- University of Witwatersrand, Department of Education;
- University of Western Cape, Department of Psychology;
- University of Cape Town, the Department of Psychology;
- University of Stellenbosch, Department of Sociology (Louw, 1998:258).

These courses, according to Louw, are supplemented by some introductory courses in programme evaluation offered by the Forum for the Advancement of Adult Education. Well-known American evaluation personalities like Mark Lipsey, Carol Weiss and David Fetterman have also contributed to evaluation capacity development by conducting training seminars/workshops.

A positive development in the formal evaluation training front is the launching, in early 2006, of a postgraduate diploma in evaluation at the Centre for Research on Science and Technology (CREST), University of Stellenbosch. It is the first fully-fledged evaluation training programme undertaken by a tertiary institution in South Africa.

Fraser and Sing (2004:7) suggest that the South African Management Development Institute (SAMDI) recognises the increasing role of M&E for the Public Service and is poised to play a leading role in capacity building and training strategies for public servants and other role players. Its expertise ranges from training to organisational development interventions related to service delivery. SAMDI also serves as facilitator to organisations that undertake evaluations to satisfy donor requirements.

Participatory approaches (voice of the people)

Involvement of civil society in Ghana

The importance of involving civil society, including NGOs and other civil society organisations in assessing government and broader public sector performance on issues such as the amount, quality and cost of services provided by government, (Mackay and Gariba, 2000: vii), is well recognised in Ghana. This is illustrated by the saving of the centrally controlled community water and sanitation strategy initiative from collapse after consultations led to communities taking ownership of water pumps and planning, operating and maintaining them successfully. According to Mackay and Gariba (2000:ix) workshop participants exploring ways for civil society's involvement in assessing public sector performance in Ghana in 1999 identified two areas for skills and capacity building for community service organisations: monitoring, evaluation, sector review techniques, policy and budget analysis; and basic competencies such as communication and networking, fundraising, citizen action research, policy advocacy and alliance building. An annual forum of government and civil society representatives to showcase performance assessment best practices and facilitate joint sectoral or cross-sectoral assessment activities was also recommended.

The Civil Service Performance Improvement Program (CSPIP) has brought a new dimension to M&E in that civil servants themselves at all levels are to be involved in appraising their own strengths and weaknesses, and in designing their own programmes for improvement. (Goetz and Gaventa, 2001:3-4). Self-appraisal is reinforced with beneficiary surveys aimed at making civil servants aware of what the public think about them. While these initiatives at citizens participation is laudable, 'there is presently no regular opportunity in Ghana for civil society and government to exchange ideas, skills, and best practices on public sector performance (Mackay and Gariba, 2000:x).

Batho Pele (people first) in South Africa

Batho Pele underlies service delivery. It is based on eight principles: consultation, service standards, access, courtesy, information, openness and transparency, redress, and value for money (How Amatole Tries to Put people First, 2001:14-17). That participatory M&E has taken hold in South Africa can be seen in three mechanisms. Firstly, departments adhere to the *people first we belong, we care, we serve* principle and its in-built redress mechanism. Secondly, through satisfaction surveys citizens assess services provided to them by national and provincial departments. Thirdly, *imbizos* or citizens' forums are held to give South Africans a voice in policy making and feedback on service delivery.

CONCLUSION

The two countries show similarity in some respects: whole-of-government approach, strong executive role, decentralised systems with central co-ordinating authorities, high home-grown demand and mechanisms for incorporating citizens' voice. Two spheres of government and several players are involved in M&E in South Africa. In Ghana, the main actors are the Office of the Vice-President, the central coordinating body (NOC), NIRP and the PPMEDS.

On the contrary, Ghana and South Africa adopted M&E under different circumstances, the former under external pressure and the latter mainly internal. The motivation for Ghana's adoption was reaction to domestic circumstances. On the contrary, South Africa has been proactive, using M&E as a tool to reform the Public Service to meet changed circumstances. Thus, M&E findings provide useful feedback to improve the Public Service. There is little sustained use of M&E for decision-making in Ghana.

Opportunities for training are, however, more readily available in Ghana. On this front, South Africa is lagging. While SAMDI might play a vital role in training public servants in M&E, collaboration of key players like the government, the newly-formed South African Monitoring and Evaluation Association and the higher education sector is vital for any sustainable solution. The 'imbizo' system shows participatory methodologies are better harnessed to involve ordinary citizens in South Africa. Neither country can yet be said to have a deeply entrenched M&E culture. Each is working to achieve a system that best fits its requirements but the pace appears to be quicker in South Africa. It remains to be seen how long it takes.

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SOCIAL RESPONSIBILITY AND ACCOUNTABILITY: THE CASE OF MULTINATIONAL ENTERPRISES OPERATING IN SOUTH AFRICA

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ABSTRACT

This article examines corporate social responsibility from the perspective of documented cases of governmental institutional failures in holding foreign multinational enterprises (MNEs) accountable in the host states in which they operate. Such institutional failures are evident in a number of cases involving multinational enterprises operating in South Africa and other developing host countries. These cases demonstrate that with weak regulation, the foreign direct investment (FDI) of MNEs can in some cases do more harm than good, resulting in lapses in accountability, harming the environment and human health. Accordingly, it is argued that special attention should be given to MNEs as a result of their unique nature and characteristics, as well as for the dynamic global context within which they operate. The focal area of the paper is concentrated on examining some of the legal aspects and complications associated with the FDI of MNEs with the expectation of exploring the prospects for regulatory reform in South Africa.

INTRODUCTION

Corporate social responsibility is a relatively modern concept that refers to taking account of societal (as contrasted to internal organizational) costs and benefits that result from an organization's activities (Brockington 1993:207). Organizations take cognizance of corporate social responsibility not necessarily out of a need to act benevolently, but more so for survival in a globally competitive and legally complex modern environment (Moeti 2000). It is also intuitively justified to argue that governments must be involved in ensuring that organizations are held accountable for their actions.

Appendix J: Stimulating evaluation demand in Africa

very topical in South Africa and thus makes a valuable contribution to the literature on the topic. Mkhize and Ajam assess the new budgeting system in South Africa and clearly indicate that various reforms have been introduced. It also confirms the view expressed above that contemporary society requires the efficient application of a complex system of public administration to ensure that services are rendered efficiently and effectively. The last contribution by Van Dyk is more specialised and concerns military leadership. However it is still within the public sector domain and proves the point that in any large organisation, success is largely determined by the quality of its leadership.

C. Thornhill
Editor

MONITORING AND EVALUATION IN AFRICA WITH REFERENCE TO GHANA AND SOUTH AFRICA

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ABSTRACT

A general overview of the state of monitoring and evaluation in Africa is offered. It indicates that efforts by the World Bank, African Development Bank, Development Bank of Southern Africa and other agencies, to develop evaluation capacity alongside sweeping public sector reforms and to enhance good governance have not yet yielded the desired results. Monitoring and evaluation are still, by and large, at the nascent stage. Positive developments are emerging, but challenges remain. Zimbabwe probably provides the only example of a "mature" monitoring and evaluation system on the continent. Ghana and South Africa, however, show signs of paying serious attention to establishing monitoring and evaluation systems. On this note, the paper focuses on these countries. The approach used is a framework of juxtapositional analysis derived from Furubo, Rist and Sandahl, who examines the two countries on a number of key factors.

INTRODUCTION

That the African continent has come into monitoring and evaluation (M&E) at a late stage, in its third wave, is indisputable. The World Bank, African Development Bank, Development Bank of Southern Africa, other development-focused agencies and the African Evaluation Association (AfrEA) have been making concerted efforts at developing evaluation capacity in African countries alongside public sector reforms and to enhance good governance. These efforts have, however, not yet translated into widespread acceptance, diffusion and institutionalisation of M&E systems and its routine practice in the public sector of many African countries. Schacter (2000:5-6) attributes the poor showing of sub-Saharan Africa in the M&E stakes to several factors, including issues related to asymmetrical demand-supply relations, the lack of information infrastructure and, in some cases, patrimonialism. More pointedly, he indicates that:

> *... the key constraint to successful monitoring and evaluation capacity development in Sub-Saharan Africa is lack of demand. Lack of demand is rooted in the absence of a strong evaluation culture, which stems from the absence of performance orientation in the public sector (2000:15).*

Despite these constraints, it is not an altogether bleak story for the continent. There are positive signs that M&E is catching on. Furubo, Rist and Sandahl (2002:6-7) acknowledge the existence of *islands* of evaluation activities in Ghana and Morocco but with "little evidence of any national evaluation initiatives in the public sector". South Africa is categorised among countries "that have just begun to create institutional prerequisites for bringing evaluation into the political system in a more general way", while Zimbabwe is counted among national states with a *mature* evaluation culture (Furubo, *et al* 2002:5). However, there are challenges to be overcome in adopting and institutionalising M&E. Thus, while this paper focuses on Ghana and South Africa to illuminate what is going on in the M&E scene, it offers a glimpse at some emerging positive aspects of M&E practice in Africa and challenges that must be overcome for it to gain a strong foothold.

The approach used in examining the M&E scenario in Ghana and South Africa is a side-by-side examination of a number of key dimensions, mainly informed by Furubo, *et. al.* (2002). Of interest is the fact that both countries have taken the ambitious whole-of-government approach that is particularly difficult for developing countries, instead of the modest enclave or a partial one.

DEVELOPMENTS IN THE AFRICAN MONITORING AND EVALUATION SCENE

Four positive developments are worth noting: realisation of the importance and increasing use of more participatory methods, *Africanisation* of evaluation, increased focus on evaluating development, and gender and rights.

Advocacy for and use of more participatory methods

There is a growing realisation of the importance of citizens' input in the evaluation process and, consequently, advocacy for more participatory methods and practices. Thus, the need to involve ordinary citizens in evaluating government policies, programmes and projects and to incorporate their voice in evaluation reports is increasingly coming to the fore.

Africanising evaluation

African evaluators are also beginning to take ownership of evaluation and *Africanising evaluation* rather than 'practising evaluation in Africa', as the President of the International Development Evaluation Association, Dr Sulley Gariba, put it at the 2004 AfrEA Conference in Cape Town. This is being achieved by African evaluators adopting and incorporating indigenous knowledge systems as relevant methodology in evaluation practice. Increasingly, then, evaluation in Africa is being thought of not as something that should be done to African countries by outside evaluators using imported methods, but as a mechanism grounded in African values and infused with the abundant stock of home-grown knowledge. African evaluators themselves, in collaboration with the marginalised majorities, should be using such innovative techniques.

Evaluating development

M&E in Africa has tended to focus on programmes and projects. Of late, however, attention has increasingly been on evaluating development, particularly important in the light of the fact that development plans are implemented by governments. Yet there are no mechanisms to gauge their successes and failures and to outline lessons to be learnt. Development evaluation is critical given that in the next few years African governments need to evaluate their progress towards meeting the Millennium Development Goals. In this light, it is important that the theme of the fourth AfrEA Conference to be held in Niamey (Niger) from 15 – 21 January 2007, to "strengthen capacity in monitoring and evaluation in order to improve policy development and programme performance in Africa", focuses on evaluating development.

Gender and rights evaluation

The last positive aspect is the increasing importance accorded to gender and rights-based M&E. This is based on the premise that Africa cannot develop if it continues to marginalise women, who constitute one half of its population. AfrEA has linked up with the United Nations Development Fund for Women to promote this aspect of M&E. They have created an African Gender and Development Network that boasts twenty-two M&E specialists on the continent. In 2003 they organised a gender and right-based workshop in South Africa to build capacity in this area.

CHALLENGES

Despite the positive developments indicated, M&E in Africa faces challenges which need the concerted efforts of governments, national associations, networks and societies to overcome.

Late development and acceptance of evaluation as a profession

In the first place, M&E practice and its value as a profession are still in its infancy. In some countries the practice is undeveloped, rather than under-developed. Some have established M&E systems and have associations, networks or societies, representing practitioners. In others, neither the systems nor the professional supporting structures exist. The African Evaluation Association (AfrEA) itself, the umbrella body for evaluation associations, networks and societies on the continent, was inaugurated in 1999 and is a mere **seven** years old. Despite its tender age, AfrEA has already organised three international conferences. African and international M&E practitioners met in 1999 and 2002 (Nairobi) and 2004 (Cape Town) and will meet in 2007 (Niamey) to promote the M&E agenda in Africa and to develop capacity through participatory workshops.

Conception of 'monitoring' and 'evaluation'

Secondly, among countries that have adopted M&E there is no uniformity in the way 'monitoring' and 'evaluation' are conceived. Routinely, monitoring seems to be widely practised whereas evaluation does not attract as much attention. In some countries M&E is synonymous with just monitoring. In Zimbabwe, for example, monitoring is emphasised to a point where evaluation is virtually neglected, according to a Zimbabwean delegate at the Third AfrEA Conference held in Cape Town, 4-6 December, 2004. In South Africa, both aspects are equally emphasised. On the whole, in many countries evaluation is perceived negatively as a mechanism that focuses on exposing and criticising failures and weaknesses in the performance of policies, programmes and projects rather than celebrating their strengths and successes. This negative, fault-finding perception of evaluation presents it as something to be feared or, at best, tolerated and can be attributed to the third challenge: donor dominance.

Donor dominance

That the M&E arena is donor-dominant and donor-driven can be explained by the fact that many African countries, including Ghana and South Africa, depend heavily on World Bank loans and other donor funds to finance the implementation of policies, programmes and projects. The same is true of projects implemented by non-governmental organisations (NGOs), where donor funding usually comes with evaluation as a requirement.

Funding constraints

Non-availability of funds to evaluate, is a major challenge. This phenomenon is attributable to the high costs involved in undertaking evaluations. Few, if any, NGOs have their own means to either initiate projects or evaluate them. While African governments launch many policies, programmes and projects, few are eager to commit additional funds to evaluate them. This brings into sharp focus the issue of resources for evaluation in Africa and the need for governments to consider committing their own resources. So far, no African country allocates a percentage of its budget to M&E activities. On the positive side, however, M&E is considered so important in South Africa that the Constitution, 1996 has specifically mandated the Public Service Commission (PSC) to undertake all public sector evaluation, thus providing a model of how seriously M&E should be taken in Africa.

Near-neglect of learning role

The fifth challenge has to do with near-neglect of the learning role of M&E. While the accountability role of M&E, as part of a general management function, is emphasised, its role in fostering learning from failures and successes of policies, programmes and projects, an equally or even more important role, is generally downplayed or even overlooked. This was pointed out by Dr Elliot Stern during the 2004 AfrEA Conference. The two roles are not necessarily mutually exclusive. In fact, the synergy of the two makes M&E an indispensable tool for African countries.

Weak or non-utilisation

The final issue is under-utilisation, or even non-utilisation, of M&E findings owing to the lack of feedback mechanisms. Owing to Africa lagging behind in information communication technologies, there is a lack of well-organised and co-ordinated information systems in the ministries and departments of many African countries. The usefulness of M&E results, as feedback, is thus still under-developed. What Mazikana and Brushett (2002:312) write about Zimbabwe is symptomatic of the general situation in Africa: the culture of demanding, receiving and discussing M&E of programmes and projects has not yet caught on. Ministries and departments generally lack libraries with facilities to aggregate, catalogue and retrieve information leading to evaluation reports residing with individuals. Where they exist, databases are not networked to make access to individual units and systems, located in offices, possible. There is very little systematic follow-up on M&E findings and recommendations. Such follow-up depends on the diligence and capacity of implementing agencies and donors. Consequently, evaluation reports are not fully used in problem-solving and decision-making, except in cases of donor involvement.

MONITORING AND EVALUATION LANDSCAPE IN GHANA AND SOUTH AFRICA

From the onset, it needs to be emphasised that neither country has as yet achieved a fully developed M&E system adequately suited to its needs. To a large extent, and at different stages, both are still experimenting with, figuring out, adopting and adapting workable M&E aspects.

Framework of analysis

While the analysis of the state of M&E in Ghana and South Africa given here is not comprehensive, it offers a view of what is happening in this domain. The framework of analysis is derived from Furubo, *et. al.* (2002). It involves a juxtapositional examination of relevant aspects: history of adoption; institutional arrangements, that is, the role of various players; level of demand and utilisation of findings; supply of expertise, including

opportunities for education, training and professionalisation; and use of participatory approaches, that is citizens' involvement.

Government-wide approach

A common denominator Ghana and South Africa have, lies in their ambitious adoption of the whole-of-government (government-wide), rather than an enclave or partial, approach. In the case of Ghana, however, it has turned out to be a *de facto* piece-meal approach in the sense that although the law requires all sector ministries to have Policy, Planning, Monitoring and Evaluation Departments (PPMEDs), there is no indication that this is really the case (The World Bank, 2000:5). The PSC in South Africa pursues M&E with a passion reminiscent of the efforts of the Department of Finance in Australia in the late 1980s. In fact, South Africa's approach to institutionalising M&E is modelled, consciously or unconsciously, on the Australian experience, but with the driving force or evaluation champion being the PSC rather than the Department of Finance.

Background and impetus to adoption

The forces implicated in the development of M&E in Ghana and South Africa are different and unique to either country. They may be categorised into internal and external mechanisms.

Reforms, 'Ghana-vision 2020' and Comprehensive Development Framework

The comparatively early but low-key adoption of M&E in Ghana (1980s) may be attributed to external pressure on the country dictated by its domestic circumstances. Ghana experienced strong external pressure to adopt M&E systems in the face of loans received from development assistance agencies and donors to implement development projects, economic and public sector reforms. Multilateral and bilateral loans typically include the implementation of M&E systems as an integral part of the package.

According to Kannae (1999:99-100) poor public sector performance, a call for more responsibility, effectiveness and efficiency led to the government's recognition of the need to strengthen M&E capacity. Consequently, technical support was sought from the World Bank in 1999 to conduct a diagnostic study of M&E capacity and recommend which measures to take. This was followed by a stakeholders' workshop where institutionalization became a focal point. At the time, M&E was critical to Ghana for two main reasons. First, Ghana was a pilot country for the Comprehensive Development Framework (CDF), which emphasises results and accountability. Secondly, sweeping public sector reforms were being undertaken to downsize and re-engineer for efficient and effective performance. M&E capacity building was, therefore, aimed at enhancing the government's capacity to measure and report on the effectiveness of public sector organisations and development projects and to create a pool of expertise to complement that of donors involved in promoting results-based management in the public sector.

By emphasising that the impetus to adopt M&E has been reinforced by the fact that Ghana is a site for the CDF, whose guiding principles emphasise results-based management, accountability and open dialogue with civil society, elements which are themselves essential to M&E capacity building, The World Bank (2000:i) confirms Kannae's analysis.

Koranteng (2000:75) gives a succinct analysis of the dire socio-economic conditions in the 1970s and 1980s that forced Ghana to adopt reform policies and M&E. The Economic Recovery Programme that saw deregulation, decentralisation and grass-root level participation in governance introduced alongside other measures in 1983, was a consequence of this. A Structural Adjustment Programme was also launched that created a leaner public service, reduced costs and privatised state enterprises.

Reinforcement of M&E in Ghana can also be attributed to the adoption of 'Ghana-vision 2020' by the government of the Fourth Republic (1992) to enable the country attain a middle-income status through reforming the Civil/Public Service and private sector. Achieving the objectives of 'Ghana-vision 2020' led to the establishment of the National Institutional Renewal Programme (NIRP) in 1994, to deal with problems related to reforming the public sector, co-ordinating and providing accountability for the reforms, and fostering a conducive climate for the private sector to champion development (Koranteng, 2000:76).

Transforming the South African Public Service

The late start of M&E in South Africa (post 1994) owes much to the fact that the pre-conditions for introducing M&E, transparency and accountability, did not exist. South Africa has experienced both a lack of any significance internal pressure at different times, as well as weak external pressure. The apartheid regime did not consider evaluation as a priority and was not put under external pressure either. Nor was the post-apartheid government of the African National Congress put under any severe external pressure. Since after 1994, however, the government has been under strong self-imposed pressure to fast-track the transformation agenda in the Public Service and other institutions in order to meet the needs and aspirations of the wider population, particularly the previously disadvantaged. Initially, M&E was donor-driven. The President's State of the Nation Addresses (SONA) of 2004 and 2005 have served as the rallying point for improving M&E capacity. The South African Public Service (SAPS) is being transformed from one based on rigid rules and control to a more flexible, dynamic and citizen oriented one, where departments can adjust and adapt, according to the needs of the people they serve and the nature of the service they provide (Fraser and Sing, 2004:3).

Efforts by the PSC to transform SAPS into a service-oriented one is underpinned by its commitment to the following nine fundamental principles: (State of the Public Service Report, 2004:3-4) and (Fraser and Sing, 2004:5).

- adherence to and promotion of a high standard of professional ethics;
- efficient, economic and effective use of resources;
- development orientation;
- impartial, fair, equitable and unbiased provision of services;

opportunities for education, training and professionalisation; and use of participatory approaches, that is citizens' involvement.

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- adherence to and promotion of a high standard of professional ethics;
- efficient, economic and effective use of resources;
- development orientation;
- impartial, fair, equitable and unbiased provision of services;

- responsiveness to citizens' needs and public participation in policy making;
- accountability;
- transparency through providing timely, accessible and accurate information to the public;
- sound human resource management and career development practices;
- broad representation of the population based on ability, objectivity and fairness and redress of past imbalances.

Institutional arrangements for conducting monitoring and evaluation

In the developed countries of Europe and North America the executive tends to be the major initiator of M&E. Legislatures have tended to be weaker despite their watch-dog role in a checks and balances system to ensure government accountability. This pattern of executive pre-eminence is emerging in Africa. In both Ghana and South Africa the executive champions M&E activities.

The Executive and other players in Ghana

The Policy Management Group

According to the World Bank (2000:1), the Policy Management Group (PMG) has been set up by the President and charged with monitoring and controlling policy processes. It makes sure government policies and priorities are implemented; it also assesses the impact of policies on development, develops policy options as well as assesses government performance.

Policy, Planning, Monitoring and Evaluation Departments

Responsibility for M&E activities is vested in line ministries. Each is supposed to have a PPMED that implements M&E policies. They collect and coordinate data from ministries and departments and the agencies they oversee as well as plan and co-ordinate budget bids within ministries. Although they have a very important role to play in monitoring and evaluation, PPMEDs have no uniform size, functions and performance, according to The World Bank (2000:5). In addition, they tend to focus on monitoring the financial inputs of projects and activities and are in need of capacity development and clarification of their roles and functions. Koranteng (2000:77) indicates that most institutions, programs and projects have set up their own approaches to undertake the M&E function, either *in part or in full*. In addition, central government agencies have established mechanisms for M&E in several areas.

National Institutional Renewal Programme

NIRP is chaired by the Vice-President and operates from that Office while reporting to the National Overview Committee (NOC). With the NOC, they 'are responsible for the development of M&E capacities and systems for the GOG' (Government of Ghana) Adrien (2001:1). More specifically, NIRP is responsible for pushing, monitoring and evaluating the reform process.

Role of the executive and others in the South African monitoring and evaluation scene

There are several players in the South African M&E arena, with the Presidency playing a leading role.

The Presidency

The government-wide M&E system is driven at the highest level. The Presidency sets the framework for M&E, drawing on various transversal systems, including value for money from the Treasury, governance from the PSC, human resource and early warning systems from the Department of Public Service and Administration and service delivery from the Department of Provincial and Local Government. This framework enables government departments to establish their own M&E systems. Efforts are being made to develop indicators that would allow questions about performance on any parameters to be answered.

The President sets out a programme of action (POA) with targets for cabinet clusters after an annual *lekgotla*, where the successes and failures of departments are noted. In the SONA of 21 May 2004, the President underlined the importance of M&E for the Public Service:

> *...government is in the process of refining our systems of Monitoring and Evaluation, to improve the performance of our system of governance and the quality of our outputs, providing an early warning system and a mechanism to respond speedily to the problems, as they arise (Ramafoko, 2004:1).*

The Cabinet Cluster System

The drive to achieve integrated governance has seen programmes of the thirty-nine government departments grouped into five cabinet cluster committees dealing with similar sectoral challenges: Governance and Administration; International Relations, Peace and Security; Justice, Crime Prevention and Security; Economic, Investment and Employment; and Social Services (The Machinery of Government, 2003:5). Ministers oversee the activities of their departments within the cluster system. The Governance and Administration Cluster, chaired by the Minister of Public Service and Administration, is responsible for M&E policy issues.

For purposes of monitoring and coordinating the implementation of the POA, each cluster is made up of a Cabinet Committee consisting of Ministers, Deputy Ministers and Directors-General of relevant departments who meet every two months to track the progress of their tasks. Speaking in Parliament on 23 June 2004, during the debate on the Presidency's Budget Vote, the President indicated that the function of cluster committees is to ensure that the programmes of the various ministries and departments are consistent with one another.

The Public Service Commission

Responsibility for monitoring and evaluating public sector performance is conferred on the PSC by section 196 of the Constitution 1996. It is charged with promoting 'the constitutionally enshrined democratic principles and values in the Public Service by investigating, monitoring, evaluating, communicating and reporting on the Public Administration.' (*PSC News*, November/December 2004:52). Its main task is to implement M&E policies and programmes. The PSC is accountable and reports to the National Assembly. It has implemented the Public Service M&E system, programme evaluation, conducted Heads of Departments' evaluation, *Batho Pele* surveys, and established an evaluation culture.

National departments

The M&E function is located in directorates in national departments. Constitutionally, therefore, Ministers have oversight and coordination responsibility for M&E in their departments.

Provincial administrations and departments

Premiers have coordination and oversight responsibility in this spheres. Each department is expected to have line function M&E systems and mechanisms in place, overseen and coordinated by the Office of the Premier (Soko, 2004:12).

Demand for and utilisation of evaluation results

Central agencies in Ghana

According to The World Bank (2000:10), the GOG is committed to public sector reform and M&E capacity development. There is high demand for M&E within the senior echelons of key central agencies such as the PMG and NIRP, ascertained by the World Bank missions of June and October 1999. An indication of this is the desire of senior staff for assistance to set up an effective sectoral and national M&E framework. The Government requested the World Bank to assist in implementing the Public Sector Management Reform Program (PSMRP) aimed at reforming and improving management of the public sector using a battery of measures such as downsizing, functional and structural review and performance agreements with senior civil servants. It also introduced a Medium-Term Expenditure Framework (MTEF), established performance plans for ministries, departments and agencies (MDAs) and conducted client/customer satisfaction surveys. All this does not, however, imply that there is universal high demand for M&E at MDAs, hence the need to sensitise civil servants to the benefits of M&E and stimulate demand.

The World Bank (2000:11) also indicates that both senior government officials and civil society have raised the need for capacity building in communication, fund raising, advocacy, building alliances and assessing public sector performance through M&E and budget analysis. Despite the interest in and demand for M&E stated above, there is no indication of sustained use of M&E results in decision-making.

The Public Service in South Africa

There is high demand for M&E given the state of the Public Service inherited from the previous regime in 1994 and the need to transform it. The Presidency, Offices of provincial premiers and those of national and provincial departments are being transformed. Bottlenecks are being removed and they are being re-oriented to ensure smooth operations and optimum delivery of services. Since assuming 'the mantle of being the leader and custodian of good governance' in 1999 (Sangweni, 2004:2), the PSC has faced the mammoth task of evaluating the President's Office and all one hundred and thirty national and provincial departments with regard to service standards and the *Batho Pele* principles.

A framework for evaluating Heads of Departments has been compiled and used. According to Fraser and Sing (2004:4) a Public Service Monitoring and Evaluation (PS M&E) system, with accompanying performance indicators based on nine basic values and principles in the Constitution, 1996 has been developed. This allows for research and comparison of the same issues in all departments. It also helps to identify and promote good practices (learning). Support is given in weak areas, leading to better governance and service delivery.

Training and supply of expertise

One of the major constraints to evaluation capacity development in Africa is the very limited opportunities or even total lack of formal education in M&E and professional training facilities in many countries. This is reflected in the limited availability and quality of expertise.

Training facilities in Ghana: a regional centre of excellence in the making?

Given the strong demand for M&E within the senior ranks of key central agencies in Ghana mentioned earlier, there is a corresponding need to equip key personnel with vital M&E skills. Statistical skills, skills in setting objectives and measuring performance are adequate as well as experience in collecting performance indicators (The World Bank, 2000:11). However, there is a shortage of skilled personnel in policy review and formal evaluation.

Adrien (2001) assesses a number of training organisations in Ghana and their capacities:

- Ghana Institute of Management and Public Administration (GIMPA) in Accra;
- Institute of Statistical, Social and Economic Research (ISSER) at the University of Ghana, (Legon);
- School of Administration at the University of Ghana (Legon);
- Department of Planning at the Kwame Nkrumah University of Science and Technology (KNUST) in Kumasi;
- Institute of Local Government Studies (ILGS) in Accra.

Notable among the training organisations are GIMPA and UST, which are briefly discussed below.

GIMPA offers three hands-on executive masters programmes (Business Administration; Development Management; Public Administration, Governance and Leadership) with twelve options as well as two bachelors degrees in Leadership and Governance and Public Administration. In addition, it presents a variety of short courses for middle-level and senior managers and provides consulting services to national and international clients. It also organises workshops for a diverse clientele: individuals in the civil, private and public sectors, bilateral and multilateral agencies, NGOs and associations and sub-regional organisations. Further, it engages in research, publishes on issues of national concern and is a platform for debating and resolving national issues.

The quest by GIMPA to become a regional centre of excellence in M&E has been boosted by ongoing World Bank support to update the content of its M&E courses and expand on the range as well as opportunities to twin or form partnerships with academic or consulting organisations specialising in M&E. Other forms of support include networking opportunities through membership of evaluation associations to enable staff gain M&E knowledge, publish and share knowledge in M&E methods and applications and to utilise M&E findings.

The Planning Department at KNUST offers an undergraduate programme in Development Planning as well as two postgraduate programmes in Development Planning and Management and National Development Policy and Planning (Adrien, 2001:23). Two of these programmes are in collaboration with Dutch universities. Although the programmes focus on planning, M&E is integrated into the courses and M&E modules are offered as part of larger programmes.

World Bank support to the Planning Department includes assistance to integrate M&E into the existing planning programmes, training for trainers to familiarise all faculty members with core M&E concepts, ongoing coaching through regular exchanges, co-design, co-facilitation to develop and adapt the M&E course. There is also a campaign to raise M&E awareness and to strengthen a local network of M&E training organisations (Adrien, 2001:28).

University programmes and training opportunities in South Africa

The supply of M&E expertise is low and training opportunities in South Africa are surprisingly inadequate. Louw (1998:260) indicates that the demand for evaluation outstrips the supply of evaluation expertise and that opportunities to receive formal training in evaluation methodology, such as degree conferring programmes, are almost non-existent. He cites only four masters level courses with programme evaluation elements offered at four universities:

- University of Witwatersrand, Department of Education;
- University of Western Cape, Department of Psychology;
- University of Cape Town, the Department of Psychology;
- University of Stellenbosch, Department of Sociology (Louw, 1998:258).

These courses, according to Louw, are supplemented by some introductory courses in programme evaluation offered by the Forum for the Advancement of Adult Education. Well-known American evaluation personalities like Mark Lipsey, Carol Weiss and David Fetterman have also contributed to evaluation capacity development by conducting training seminars/workshops.

A positive development in the formal evaluation training front is the launching, in early 2006, of a postgraduate diploma in evaluation at the Centre for Research on Science and Technology (CREST), University of Stellenbosch. It is the first fully-fledged evaluation training programme undertaken by a tertiary institution in South Africa.

Fraser and Sing (2004:7) suggest that the South African Management Development Institute (SAMDI) recognises the increasing role of M&E for the Public Service and is poised to play a leading role in capacity building and training strategies for public servants and other role players. Its expertise ranges from training to organisational development interventions related to service delivery. SAMDI also serves as facilitator to organisations that undertake evaluations to satisfy donor requirements.

Participatory approaches (voice of the people)

Involvement of civil society in Ghana

The importance of involving civil society, including NGOs and other civil society organisations in assessing government and broader public sector performance on issues such as the amount, quality and cost of services provided by government, (Mackay and Gariba, 2000: vii), is well recognised in Ghana. This is illustrated by the saving of the centrally controlled community water and sanitation strategy initiative from collapse after consultations led to communities taking ownership of water pumps and planning, operating and maintaining them successfully. According to Mackay and Gariba (2000:ix) workshop participants exploring ways for civil society's involvement in assessing public sector performance in Ghana in 1999 identified two areas for skills and capacity building for community service organisations: monitoring, evaluation, sector review techniques, policy and budget analysis; and basic competencies such as communication and networking, fundraising, citizen action research, policy advocacy and alliance building. An annual forum of government and civil society representatives to showcase performance assessment best practices and facilitate joint sectoral or cross-sectoral assessment activities was also recommended.

The Civil Service Performance Improvement Program (CSPIP) has brought a new dimension to M&E in that civil servants themselves at all levels are to be involved in appraising their own strengths and weaknesses, and in designing their own programmes for improvement. (Goetz and Gaventa, 2001:3-4). Self-appraisal is reinforced with beneficiary surveys aimed at making civil servants aware of what the public think about them. While these initiatives at citizens participation is laudable, 'there is presently no regular opportunity in Ghana for civil society and government to exchange ideas, skills, and best practices on public sector performance (Mackay and Gariba, 2000:x).

Batho Pele (people first) in South Africa

Batho Pele underlies service delivery. It is based on eight principles: consultation, service standards, access, courtesy, information, openness and transparency, redress, and value for money (How Amatole Tries to Put people First, 2001:14-17). That participatory M&E has taken hold in South Africa can be seen in three mechanisms. Firstly, departments adhere to the *people first we belong, we care, we serve* principle and its in-built redress mechanism. Secondly, through satisfaction surveys citizens assess services provided to them by national and provincial departments. Thirdly, *imbizos* or citizens' forums are held to give South Africans a voice in policy making and feedback on service delivery.

CONCLUSION

The two countries show similarity in some respects: whole-of-government approach, strong executive role, decentralised systems with central co-ordinating authorities, high home-grown demand and mechanisms for incorporating citizens' voice. Two spheres of government and several players are involved in M&E in South Africa. In Ghana, the main actors are the Office of the Vice-President, the central coordinating body (NOC), NIRP and the PPMEDS.

On the contrary, Ghana and South Africa adopted M&E under different circumstances, the former under external pressure and the latter mainly internal. The motivation for Ghana's adoption was reaction to domestic circumstances. On the contrary, South Africa has been proactive, using M&E as a tool to reform the Public Service to meet changed circumstances. Thus, M&E findings provide useful feedback to improve the Public Service. There is little sustained use of M&E for decision-making in Ghana.

Opportunities for training are, however, more readily available in Ghana. On this front, South Africa is lagging. While SAMDI might play a vital role in training public servants in M&E, collaboration of key players like the government, the newly-formed South African Monitoring and Evaluation Association and the higher education sector is vital for any sustainable solution. The 'imbizo' system shows participatory methodologies are better harnessed to involve ordinary citizens in South Africa. Neither country can yet be said to have a deeply entrenched M&E culture. Each is working to achieve a system that best fits its requirements but the pace appears to be quicker in South Africa. It remains to be seen how long it takes.

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SOCIAL RESPONSIBILITY AND ACCOUNTABILITY: THE CASE OF MULTINATIONAL ENTERPRISES OPERATING IN SOUTH AFRICA

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ABSTRACT

This article examines corporate social responsibility from the perspective of documented cases of governmental institutional failures in holding foreign multinational enterprises (MNEs) accountable in the host states in which they operate. Such institutional failures are evident in a number of cases involving multinational enterprises operating in South Africa and other developing host countries. These cases demonstrate that with weak regulation, the foreign direct investment (FDI) of MNEs can in some cases do more harm than good, resulting in lapses in accountability, harming the environment and human health. Accordingly, it is argued that special attention should be given to MNEs as a result of their unique nature and characteristics, as well as for the dynamic global context within which they operate. The focal area of the paper is concentrated on examining some of the legal aspects and complications associated with the FDI of MNEs with the expectation of exploring the prospects for regulatory reform in South Africa.

INTRODUCTION

Corporate social responsibility is a relatively modern concept that refers to taking account of societal (as contrasted to internal organizational) costs and benefits that result from an organization's activities (Brockington 1993:207). Organizations take cognizance of corporate social responsibility not necessarily out of a need to act benevolently, but more so for survival in a globally competitive and legally complex modern environment (Moeti 2000). It is also intuitively justified to argue that governments must be involved in ensuring that organizations are held accountable for their actions.