MINERALS PROCESSING AND TECHNOLOGY RESEARCH AT THE UNIVERSITY OF JOHANNESBURG: STRATEGY FOR SUSTAINABILITY.

Antoine F. Mulaba-Bafubiandi

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Supervisor: Dr. Willem H. van Niekerk

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by

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LIST OF ACRONYMS

3rd MD  Third Most Dominant
3rd MPO  Third Most Preferred Option
LMD  Least Most Dominant
LPO  Least Preferred Option
MD  Most Dominant
MPO  Most Preferred Option
MPTRG  Minerals Processing and Technology Research Group
NMD  Next Most Dominant
NMPO  Next Most Preferred Option
NPO  Non-Preferred Option
NSD  Not So Dominant
TQM  Total Quality Management
UJ  University of Johannesburg
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DEDICACE

Dear Papa Francois Bafubiandi wa Kaniama who, once upon a time in your life, thought of taking a business administration related course. You made me, still in my early teenager life, get in touch with the accounting science while I was naughtily reading your books. When given the opportunity to study MBA, my thoughts of you, gave me the required inner strengths to complete this ever challenging course. This MBA dissertation crowning the above studies is dedicated to you Papa. It is done for you.

To you Junior Bafubiandi, who the intestine cancer has deprived us of and has removed so early from life, this piece of work is also dedicated.
DECLARATION

I declare that Minerals processing and technology research at the university of Johannesburg: Strategy for sustainability is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

Antoine F. Mulaba - Bafubiandi

Student No: 802025417
ABSTRACT

This study was conducted to investigate the strategy for sustainability of the Minerals Processing and Technology Research Group (MPTRG) of the University of Johannesburg. The background of the study established that a new institution, University of Johannesburg (UJ), was formed mainly from the merger of the previous Technikon Witwatersrand (TWR) and the Randse Afrikanse Universiteit (RAU). These two institutions had different vocations: career oriented and academic directed respectively. The merger has created a new institution with new needs, a new environment and new challenges. For a research group, each as the MPTRG, which existed in one of the merging institutions before the merger, to survive and to be sustainable, relevant strategies have to be designed and correctly implemented.

The aim of the study was to develop a strategy for MPTRG's sustainability in terms of assisting the faculty of engineering and the built environment of the UJ to achieve its strategic objectives of higher levels of postgraduate students, community, industry and government service quality and productivity in research.

The literature review investigated the research activities at university with focus on their sustainability, quality of services rendered (i.e. students trained, research projects conducted, reports drafted, stakeholders' satisfactions deriving from the above etc...) and the number and quality of research output generated. Particular emphasis was placed on the impact of people management in the quality of university research. This was with the assumption that the technology requirement was fulfilled.

A mainly qualitative research design was used as the primary methodology in this study and a deductive approach was adopted. As a result, Ulrich’s (1997) conceptual model depicting the role of human capacity in assisting the organization to achieve its strategic objectives was used to formulate the study's theoretical propositions.

The findings from the literature review revealed that the role of the MPTRG as a strategic partner, is central to the achievement of higher levels of postgraduate students service, research training quality and research productivity. It is therefore recommended that the
MPTRG must fully align with the corporate strategy of the Faculty of Engineering and the Built Environment. The following sequential steps must be undertaken:

The MPTRG manager, together with his team, should conduct an organizational diagnosis of the group's organizational architecture, which specifies systems that constitute the Faculty. These include the organization's shared mindset and culture, research staff competency levels, systems and standard for progressive assessment and evaluation of postgraduate students performance, assessment of the standards to use to benchmark progressive and final group research output etc... A formal integrated strategy including human capital, technology, relations (i.e. local and international collaborations with industry, as well as other institutions) must be developed which shall provide alternative and or supplementary actions and practices for each of the factors that were identified in the organizational diagnosis.

The qualitative and quantitative findings lead to conclude that the MPTRG is currently active in mainly administrative tasks including hiring postgraduate students, arranging their registration, securing scholarships, drafting reports and applications, following up on order to procurement etc... In order to enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, the MPTRG must engage itself with direct research oriented tasks, writing more publications, engaging with community outreach projects, engaging with professional body activities etc.... It is therefore recommended that the MPTRG must shift its focus away from administration in order to create scope and capacity to perform activities over and above administrative and transactional tasks. Complementary strategic research staff be recruited, appropriate research equipment be procured, number of postgraduate students be increased, number of postdoctoral fellows be increased, visiting scientists be attracted, collaborative projects with industry be expanded etc... This would require a high level of assistance from support and service departments (postgraduate student registration, research office, administration, finances, procurement, transport, secretary, etc...).

Findings could be summarized in following the strategic points. The MPTRG manager should:
• Remain alert and flexible about the market demand and changes (change in the types of prospective students, change in the industry demand, change brought by globalization etc...)  

• Recruit two permanent (or long tenure) research staff who could initiate research projects and supervise postgraduate students. They will participate in the strategic management of the research group.  

• Set a continuous postgraduate students' recruitment strategy: two masters degree students every year and one doctorate student every two years.  

• Set a continuous regular postgraduate students' completion rate: at least two postgraduate students graduating every year.  

• Maintain close collaboration with at least three major companies in the minerals industry.  

• Ensure and maintain capacity building in terms of research equipment and access to research facilities.  

• Initiate and conduct research and/or problem solving projects in collaboration with the above major companies.  

• Train employees from minerals industry  

• Organize regular workshops on metallurgy, minerals processing, and minerals beneficiation  

• Train extraction metallurgists to be employed at managerial levels in industry with decision power on directing research work and request for research services toward the MPTRG.  

• Expand on community related services (workshops on small scale mining for example, )-  

**Keywords:** Minerals Processing, Technology, Research, University, Industry
CHAPTER 1: INTRODUCTION

1.1 INTRODUCTION

The Technikon Witwatersrand and the Randse Afrikaanse Universiteit which incorporated the Soweto and the Eastern Rand campuses of Vista University merged in January 2005 to form a multi-campus Higher Education Institution known today as University of Johannesburg (UJ). Online The University of Johannesburg states (www.uj.co.za) that their vision, mission and values are:

Vision:
An internationally recognized South African University providing and expanding academic and technological knowledge and skills that promote growth and prosperity.

Mission:
We are committed to:
- Partnerships with our communities;
- Supporting access to a wide spectrum of academic and technological teaching, learning and research;
- Leading, challenging, creating and exploring knowledge.

Values:
We value:
- Academic distinction;
- Integrity and respect for diversity and human dignity
- Academic freedom and accountability
- Individuality and collective effort
- Innovation
A transitional interim period of two years was agreed upon to prepare the full integration and homogenization of different parties in one substantial institution. Amongst expected challenges ahead are the standardization of academic programmes and degrees. Just one example is the conflict between offering of diplomas and technology related foci leading to ready to work training (Diplomas, B-Tech, M-Tech., D-Tech) on one hand and the commonly known university degrees (BSc, B.Eng., MSc, M.Eng. and PhD) on the other. Other challenges include the alignment of conditions of service of staff, the finalization of student governance structures and the development of a sustainable strategic plan for the UJ including Research. While all the parties agree on the issues that have priority, “the scheduling of the process is more difficult” (Maree, 2005: 3). Today, two years down the line, the merged institution has completed the transition and although it can generally be stated that the merger has been successful, there are still issues such as the strategic direction with regard to research, and more specifically how this will impact on the structure, direction and sustainability of individual research groups of former institutions, that is not fully established.

In the merger process, the understanding was that former institutions “do not, by virtue of party to a merger, lose any rights nor shed any obligations that they have in terms of contracts with third parties. These rights and obligations devolve onto the new institution formed by the merger” [online, TENET].

As the strategic direction with respect to research was not always clear, individual research groups of the newly formed university needed to take a proactive approach in addressing prospective challenges. This had to be in line with what one, at that time, would expect, the strategic plan of the university to be in relation to the mission and vision. Hence, it was decided by the Minerals Processing and Technology Research Group (MPTRG) of the extraction metallurgy department, Faculty of Engineering and the Built Environment to investigate possible future strategies in the light of the formation of the new university produced from the merger.
To date, the council of the university has been established, the positions of the Vice Chancellor and Principal, all the other vice-chancellor related positions, Registrar, Executive Deans (nine faculties) and Executive Directors including research and innovation have been filled. Policies pertaining to Research, Academic matters and Administration and Human Resources have been or are being set.

The Minerals Processing and Technology Research Group formerly from the Technikon Witwatersrand focused its activities in solving problems for the local Southern African minerals industry with a focus on technology innovation for the 21st century. One of the challenges for individual research groups was to ensure that after the merger, they ensure that the essential values of UJ are reflected in their approach to research.

Academic research, and research and innovation vocations of universities research groups culminate into sustained research outputs in terms of journal articles, publication in conference proceedings, patents and artefacts, number of postgraduate students trained etc… As a (mini)-organization, a research group is bound to be profitable, sustainable and competitive locally and/or globally while as a corporate sub-set, its direction and activities have to be aligned with the corporate strategic goals.

Minerals Processing and Technology Research Group aims at having a diversified portfolio, which supports innovation in minerals industry, metal extraction, mining and environmental management. It can be simply viewed as the application of technology to solve industry related problems or proactively attempt to address minerals industry related future challenges for a particular benefit, such as the production of new knowledge, products, processes or services. In business, a successful innovation, as Renko, Carsrud, Brännback, and Jalkanen (2005:250) observe, depends on new product development efforts that employ both a corporate-wide and customer-oriented perspective intertwined with a scientific-technological, functional perspective. This study looks behind these issues for the MPTRG while striving to remain aligned to the University’s set of values.
1.2 STATEMENT OF THE PROBLEM

1.2.1 Research Context: Background and Rationale

1.2.1.1. Background on the Faculty of Engineering and the Built Environment of the University of Johannesburg

As per the Higher Education Act, 1997 (ACT No.101 of 1997) and the South African government's national plan implemented in 2003, the merger, i.e. amalgamation of South African institutions of higher learning was called for. One of the motivation points was the rationalization of the thirty three state funded tertiary institutions including the homogenization of the students' population on campuses contributing to redressing of social and educational imbalances brought within the South African demography by the former political dispensation. Randse Afrikaanse Universiteit, the Technikon Witwatersrand and the Soweto Campus of Vista University, the Eastern Rand Campus merged to form the University of Johannesburg. The following eight faculties were consolidated: Faculty of Engineering and the Built Environment (FEBE), Faculty of Science (FS), Faculty of Management (FM), Faculty of Economic and Financial Sciences (FE-FS), Faculty of Education (FE), Faculty of Humanities (FH), Faculty of Law (FL), Faculty of Health Sciences (FHS), Faculty of Art Design and Architecture (FADA).

1.2.1.2. Background on the Department of Extraction Metallurgy of the Faculty of Engineering and the Built Environment at the University of Johannesburg.

The Department of Extraction Metallurgy is one of the fifteen departments of the Faculty of Engineering and the Built Environment at UJ. With a staff (academic + technicians)/students ratio of one to twenty (1/20), the Department of Extraction Metallurgy at UJ is composed of 55% academic staff, 45% technicians. 70% of the lecturing staff is over 60 (in
The research development and innovation is mainly carried out by just 10% of the lecturing staff.

1.2.1.3. **Background on the research group Minerals Processing and Technology.**

An overview on the MPTRG is given below. Its internal structure, as well as its position within the bigger institution will be discussed. Prior to the presentation and discussion of its organizational structure, a justification of its selection as the objective for this study will be given.

As mentioned earlier academic and industry problem-solving research projects are carried out by the MPTRG whilst postgraduate students are trained under the supervision of the research group leader. As defined by Slack et al., (2001: 515), a project is a set of activities with a defined start point and a defined end state, which pursues a defined goal and uses a defined set of resources. It is a one-time only set of activities that has a definite beginning and ending point in time (Greco, 1997:57). Once a project has started it should finish in the expected span of time as the industry ("customer") wants the results (outcomes) by that time, or a full-time postgraduate research student has to complete his/her studies by that time. Reasons why this research group was chosen include the following:

- the fact that the researcher is personally interested in it as he is the brain father of the group. He initiated it from scratch, developed it up to its current state and is striving for it survival and sustainability in this changing academic environment. The researcher has heard the "wake up call" (Anderson and Anderson, 2001:13) as a new institution, the University of Johannesburg, was born with as mission to be an "internationally recognized South African University providing and expanding academic and technological knowledge and skills that promote growth and prosperity". As other many sub-sets of the newly formed university, the MPTRG has
to adapt to the global culture of the new organization. Strategies to use to ensure that the MPTRG is aligned to the University's vision and mission have to be designed and implemented.

- The MPTRG is the only research group Extraction Metallurgy and is the only South African National Research Foundation (NRF) approved active research at the Faculty of Engineering and the built environment on the Doornfontein campus (DFC). 95% of the postgraduate students from the Faculty of Engineering and the Built Environment trained on DFC are from MPTRG.

- In 2006, more than 65% of journal articles published by the faculty of engineering and the built environment were produced by the MPTRG.

1.2.1.4. Organizational structure of the Minerals Processing and Technology Research Group of the University of Johannesburg.

The minerals processing and technology research group of the faculty of engineering and the built environment is located on the Doornfontein campus of the University of Johannesburg (UJ). Its previous vision was: The minerals processing and technology research niche area, your centre for excellence in research training. That vision was aligned to the vision of the former Technikon Witwatersrand, one of the merging components, which was: Technikon Witwatersrand, your preferred choice for excellence (Storm, 2002: 120). The former mission statement for the MPTRG is presented by the Figure 1.1.
Figure 1.1: Mission statement of the research laboratory of the minerals processing and technology research niche area.

The MPTRG at the University of Johannesburg is housed by the department of extraction metallurgy at the faculty of Engineering and the Built Environment (Figure 1.2).
Figure 1.2: The organizational structure for the University of Johannesburg. The reporting line for research matters of the Professor (leader of the research group) is mainly through the Executive Dean of the Faculty while the Head of the department (HOD) has to be informed if the Professor in charge of the research group is not the HOD. In the same time the HOD is the custodian of the research activities within the department.

*: see Figure 1.3 on the structure below the Professor in charge of the research group.
It is staffed by four technicians and eighteen post graduate students and researchers who are all supervised by Prof. A.F.M. Bafubiandi. Herman Steyn is the technician in charge of chemical analysis, Martin Oosthuizen in the mechanical technician of the group while Sophia Mapelane is the minerals processor. Figure 3 below illustrates the position of different members of the research group as well as their mutual relationships.

Figure 1.3: The organizational structure of the research laboratory of the minerals processing and technology niche area. All the staff report to the supervisor while master degree students, doctoral degree students, post-doctoral researchers, laboratory technicians and laboratory assistants and B-Tech students interact with each other.
1.3 RESEARCH OBJECTIVES

The main aim of this study is to identify or develop a model that can be utilized by the MPTRG to ensure its sustainability at the University of Johannesburg, in South Africa and globally.

The objectives of the present study are:

i. To evaluate the current direction of the MPTRG in terms of research programs, number of postgraduate students training, minimal number of annual publications, extent of community involvement, amount of research fund annually secured etc...

ii. To ensure that new strategic direction of the MPTRG is aligned with the vision and mission of the newly created university.

iii. To strategically position the MPTRG locally and internationally to ensure its sustainability.

iv. To identify the driving forces and obstacles for the MPTRG for its sustainability.

v. To identify strategic measures that can promote the above positioning.

vi. To develop a business model for the sustainability of the minerals processing and technology research group while it remains competitive locally and internationally.

1.4 RESEARCH QUESTIONS

The major research question is: What should be the appropriate strategic model to be implemented at the Minerals Processing and Technology Research Group (MPTRG) for it to be a competitive, sustainable, internationally recognized South African research group “providing and expanding academic and technological knowledge and skills that promote growth and prosperity”.
Addressing the following issues will assist in finding a model that will address the central issues of the study:

i. What is the research and development model being used at the Department of Extraction Metallurgy of the University of Johannesburg?

ii. What are the driving forces and obstacles for the development and growth of research activities at the department of extraction metallurgy of the University of Johannesburg?

iii. What structural, organizational, legal and regulatory issues regarding and circumscribing research activities and research development and innovation does the Minerals Processing and Technology Research Group, at the University of Johannesburg face?

iv. Learning from the experiences of the former TWR, the former RAU and other merged institutions, from global practices and theory, what is the strategic research model that could help advance the Minerals Processing and Technology Research Group at the University of Johannesburg to be sustainable and become internally recognized?

1.5 **Significance of the Study**

The alignment of the minerals processing and technology research group with the vision, mission and values of the university will ensure the integration of the research group into the university as a whole and will definitely lead to the avoidance of conflicting strategies thereby contributing to its sustainability.
1.6 **OUTLINE OF THE DISSERTATION**

The study is divided into six chapters as follows:

Chapter 1 contains the reasons why the merger took place and presents the vision, mission and values of the newly created University of Johannesburg. The chapter provides brief background information on the South African academic institutions and background on the merger. The possible impact on the Southern African minerals industry is also here elaborated. It presents a discussion of reasons why the above merger poses a challenge to the Minerals Processing and Technology research group. Furthermore, the problems addressed by the study are defined; the aims and objectives are set out. The chapter is therefore a general introduction of the study.

Chapter 2 explains the related literature review in terms of challenges associated to merger and acquisitions of organizations. Their impacts on academic and research institutions are here discussed.

Chapter 3 elaborates on the research methodology used in the study, including but not limited to, sampling, research instrument(s), data collection, data analysis and the (de)limitations of the study.

Chapter 4 presents the main findings and analysis of the study. These are presented for both the minerals processing and technology research group and for the university at a large. Strategies for a sustainable alignment will be developed, presented and discussed.

Chapter 5 discusses the results obtained from the study in the light of the contents of the literature.

Chapter 6 offers a summary, conclusions and key recommendations.
1.7 CONCLUSIONS

This chapter presented the background and motivation for the study. Firstly, the background and the rationale to the problem and the motivation for the study were presented; followed by the aims and objectives of the study. The problem statement was formulated, which was followed by research questions, assumptions, limitations and outline of the study.

In the next chapter the focus will be on reviewing literature that is relevant to the study.
CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

The aim of this chapter is to review literature regarding research at university, sustainability of academic research, issues of research quality, and university research and people management. This review will be completed to provide a framework against which to explore the problem statement articulated in chapter 1 and background to the study.

2.2 RESEARCH AT UNIVERSITY

Universities through teaching and innovative research are transferring know-how and skills to students, related communities and industries while creating knowledge for next generations. Collaborative and multidisciplinary research projects have become one of the key words in the field. Research intensive institutions have invested in senior management positions such as Vice-Chancellor Research and Innovation, as is the case for the University of Johannesburg, to oversee and facilitate matters related to research and creative activities by faculty, staff and students. At the University of Johannesburg research structures including research niche areas, research units, research centres and research centres of excellence have been established. The MPTRG is one of the research niche areas accredited by the National Research Foundation (NRF).

UJ strategic research actions are championed from the Research Development and Innovation office through the University Research Committee (URC). The research office manages the university central research funds with the following key imperatives (Van der Merwe and Auf der Heyde, 2005:1):

- Systematize contract research, innovation and Intellectual Property (IP) management
- Develop and formalize turn-around strategy for research output
Promote strategic alignment and wider recognition of UJ research.

Research activities at UJ are categorized as basic research, strategic research, and applied research. The MPTRG is dealing with all the above three but at different ratios depending on specific research projects.

2.3 ACADEMIC RESEARCH, SUSTAINABILITY AND QUALITY

The academic research unit based at the Extraction Metallurgy Department, has been established at the Faculty of Engineering of the University of Johannesburg to cater for research activities pertaining to minerals processing, metals extraction and metals refining. Named Minerals Processing and Technology Research Group (MPTRG), it has to sustainably deliver in terms of quality projects conducted, number of postgraduate students trained and graduated, amount of research funds secured, number of industry problems solved, number of community outreach projects carried out, number and quality of technical reports submitted, number and quality of conference papers delivered, and number and quality of journal articles published. As defined by the United Nations, the concept of sustainability implies "meeting the needs of the present while the ability for future generations to meet their needs is not compromised" (World Commission on Environment and Development, 1987: 8). The MPTRG has then to remain sustainable in its mission. In agreement with Clugston and Calder (1999: 15) approaches to sustainability include "activities ecologically sound, socially just, economically viable and humane, and that they will continue to be so for future generations". Although sustainability seems to accentuate preservation of the environment, in the case of universities and higher education institutions including their research groups extrapolation is made to environmentally adapted academic programs, energy and purchasing practices, outreach, faculty hiring and development leading to a sustainable products and services delivery for a sustainable economy (Clugston and Calder, 1999:4).
Sustainability, as any other deliverable and measurable, has to be planned and monitored over time (Shediac-Rizkallah and Bone, 1998:89). The researcher agrees with these authors on that while planning for and implementing sustainability, programmatic approaches and strategies that favor long-term program delivery should be used.

Collaboration between academic research groups and industry has been named as one of the element of sustainability of projects. It has been encouraged and commanded by many authors (Jastorff et al., 2003: 136). Yong (2000: 111) argues that University – Industry collaboration is a social experiment where, in the nation's innovation system, involved academic members of staff and industry technology managers sit in a win-win situation. It was noticed that through the above vehicle industry gained an increased access to new university research, innovation and discoveries while faculty members complement their own academic research by securing funds for postgraduate students, and laboratory equipment. They also use this platform to seek insights into their own research.

Academic life is by default linked to research. Increasing current demands in academic throughput (in terms of numbers of students the system sees through in a defined period of time) and research output may seem to compromise the required quality of the education and training process. As amplified by Allwright (1997:368) research also seems to be challenging for many of the members of academic staff. In the case of the UJ, this situation is mainly observed from staff from the former Technikon Witwatersrand whose background was far from being academically and research oriented. The lack of an appropriate research background may also constitute a possible barrier to good quality research.

2.4 UNIVERSITY RESEARCH AND INDUSTRY

As argued by White (1998: 2), although very often academics at Universities are blamed to live in their “Ivory-Tower” fearing corporate influence exacerbated by their profit motive, those academics who did not limit themselves only to the pursuit and dissemination of
knowledge through research, publication and teaching, and dared to approach and let themselves be approached by the industry have played and continue to play major roles in the development of industrial innovations. "Silicon Valley" is the term conventionally used to illustrate the above (Jaffe, 1989:957). In addition to the trust in the project brought by the university involvement, it has been noticed that the University tends mainly to participate in "areas involving "new" science and therefore experience more difficulty and delay but also are more likely not to be aborted prematurely implying that universities are contributing to basic research awareness" (Hall et al., 2000:5). Despite the fact that in the economics of technology the identification and measurement of university Research and Development spillovers, or the extent to which a firm economically exploits the investment in R&D made by the university is still unresolved (Acs et al., 1992:363), the trend observed from Technical universities is that they mostly tend to take up industry problem-solving projects. This is the case of the MPTRG of the University of Johannesburg.

2.5 UNIVERSITY RESEARCH AND PEOPLE MANAGEMENT

An important question in determining whether or not addressing the people training function can assist the MPTRG to achieve its strategic objectives is to answer the simple question as to whether or not the people function has the ability to drive business results for the MPTRG. Hartog, Boselie and Paauwe (2004:558) hold that current research shows that there is a link between people management and organizational performance.

Buchan (2004:2) reviewed the studies that claimed that there is a positive correlation between people management and organizational performance. He refers to a multi-sector review of research on the relationship between HRM and organizational performance which reported that more than 30 studies carried out in the UK and US since the early 1990s leave no room to doubt that there is a correlation between Human Resource Management (HRM) and business performance, that the relationship is positive, and that it is cumulative: the more and the more effective the practices, the better the result. A similar, if more qualified, finding was
reported by Richardson and Thompson (1999:1009) who noted that there are in the region of 30 empirical studies that have sought to address the relationship between people practices and business performance. They conclude that the published research generally reports a positive statistical relationship between HRM and business performance.

Ulrich and Creelman (2006:586) contend that there is a wide array of data from various academics showing that people management really does make a difference to business outcomes. They add that a wide array of academic studies show that whether you are looking at auto manufacturing, the survival of companies that have just gone public or high-tech silicon chip fabricators, people matters to business results. Further, they hold that evidence of a positive correlation between organizational performance and people management is not only found in academic studies but is also backed up by the work of consultancies like Ernst & Young, Gallup, Deloitte & Touche and Watson Wyatt—all of which have shown that good people management pays off in both financial and non-financial results. Therefore a key lesson from these reviews is that investment in developing and maintaining effective HRM policy and practice can make a significant and measurable positive contribution to organizational performance.

2.6 **ULRICH’S 1997 MODEL AND ITS CRITICS**

David Ulrich in 1997 developed a conceptual people oriented resource model, from a US perspective, which redefined and transformed the role of people management. According to Ulrich (1997:12) in order to become a business partner, the management of people (in any field including research) must play the following roles:

- Design and deliver efficient human resource processes for staffing, training, appraising, rewarding, promoting and otherwise managing the flow of employees through the organization. The metaphor for this role is *administrative expert.*
Focus on aligning human resource strategies and practices with business strategy and thereby help to ensure the success of business strategy. The metaphor for this role is *strategic partner*.

Become active and aggressive in developing intellectual capital that is a critical source of the organization’s value and link employee contribution to the organization’s success. The metaphor for this role is *employee champion*.

Manage transformation and change through the identification and framing of problems, building relationships of trust, solving problems and creating action plans. The metaphor for this role is *change agent*.

Ulrich (1997:24) believed that to create value and deliver results, people managers must begin not by focusing on the activities or work but by defining the deliverables of that work. Therefore once the deliverables have been defined, the roles and activities of business partners may be stipulated. The deliverable from the management of the organization infrastructure role is administrative efficiency. People managers achieve administrative efficiency in two ways. First, they ensure efficiency in human resource processes. Secondly, by hiring, training and rewarding people who increase productivity and reduce waste. To be effective as administrative experts, people managers need to undertake activities leading to continual reengineering of the work processes they administer (Ulrich, 1997:28). The deliverable from the postgraduate students champion role is increased student commitment and competence. In this role, the managers personally spend time with students and train and encourage senior students to do the same (Ulrich, 1997:29). The deliverable from the strategic partner role is strategy execution, which is achieved through translating business strategies into MPTRG priorities. The deliverable from the change agent role is capacity for change. Change agents help organizations identify a process for managing change, which eliminates resistance to the implementation of change necessary to enable the organization to achieve its strategic objectives. Linking people management roles with organizational performance, Ulrich’s model suggests that all four roles should be carried out simultaneously to improve firm performance.
Langbert and Friedman (2002:783) contend that Ulrich's four deliverables capture the competing values that HR departments have targeted over time. By using Ulrich's model, people managers have successfully designed systems that have achieved better balance in targeting and exceeding the expectations of the organizations' constituencies: employees, management and external constituencies (Langbert and Friedman, 2002:782). Caldwell (2003:1002) disagrees and describes Ulrich's model as a prescriptive model and argues that there is currently a scarcity of empirical evidence of how these roles are carried out.

Caldwell (2003:1003) maintains that, the ideal of people managers redirecting their energy and effort towards aligning human resource management strategy with business strategy, and consequently away from postgraduate students and research staff to resolve role conflict, should be questioned. As a consequence of the adoption of increasingly strategic roles for HR, much responsibility for people-focused human resource management — such as the postgraduate students champion and change agent roles — is being devolved to line management, senior students and the manager of the MPTRG. Existing empirical research suggests, however, that there are also significant barriers preventing these managers from doing this work effectively, including the need to deliver short-term research business results, a lack of time and training, and a lack of incentives given to them for fulfilment of this additional work (Hanley et al, 2005:51).

2.7 CONCLUSIONS

The literature regarding the status and structure of research at the University of Johannesburg was presented in this chapter. The chapter commenced with a review of the link between academic research, its sustainability and collaboration with industry before indicating the challenges brought by the requirement of quality of the process. The above was followed by a presentation of the role that people management in research group plays in achieving its strategic objectives. The literature review was completed by reviewing
conceptual people management models and its roles in enabling the MPTRG to achieve its strategic goals and ensure its sustainability.

In the next chapter the methodology of this research shall be discussed.
CHAPTER 3: RESEARCH METHODOLOGY AND DESIGN

3.1 INTRODUCTION

This chapter will focus on the research methodology. The following will be discussed: rationale of the study, research design, the research instrument used, the research process, and limitations of the study. The researcher adopted a mixed approach that draws on both the phenomenology (qualitative) and positivism (quantitative) research methods. The use of multiple research methods will enable the researcher to increase the reliability and validity of the findings. The weaknesses of one method are balanced by the strengths of the other methods incorporated in the study.

3.2. RESEARCH DESIGN

3.2.1. Type of Research

As described by Welman and Kruger (2004:69) the two main approaches to research are namely positivist (i.e quantitative) and phenomenological (i.e. qualitative). These two types of research approaches are actually two ends of a continuum with a combination of the two models occurring in varying shades of emphasis along the continuum (Welman and Kruger, 2004:68). While the quantitative approach emphasizes a highly structured methodology to facilitate replication and quantifiable observations that lead themselves to statistical analysis, phenomenological approach lends itself to an inquiry process of understanding, based on distinct methodological traditions of inquiry that explore a social or human problem. A complex and holistic picture is built by the researcher who analyses words, reports detailed views of informants, and conducts the study in natural setting (Creswell, 1998:15). Additionally it is argued that a phenomenological research design aims to determine what an experience means for the persons who have had the experience and are able to provide a
description of it. Therefore as advanced in Creswell (1998:54), from the individual descriptors, general or universal meanings are derived.

3.2.2. Rationale for the Methodology

Since description and understanding, rather than measurement and interpretation directed the research questions of this study, a phenomenological approach was relevant.

Exploratory research and meta-triangulation was used for this study involving the Mineral Processing and Technology Research Group of the University of Johannesburg. The research would therefore be mainly qualitative providing an in-depth description and understanding of the studied research group. This implies that the study used primarily qualitative information derived from the questionnaires used as research instrument. The questionnaire targeted the demographic information as well as the respondents’ (current) capacity to do research including his/her experience, skills and training.

Structured and non-structured interviews were avoided to eliminate or reduce the level of biasness on the end results as the researcher is known to the research staff at the Faculty of Engineering and the Built Environment, especially at the Doornfontein Campus of the University of Johannesburg. Respondents might feel intimidated or would tend to please him. It was assumed that by filling in a questionnaire it would at least reduce the above. As the establishment of new educational institutions through the merger of existing ones, and the types of newly “merged institutions” constitute a first experience on its own for the country, the most viable external sources of information found was the World Wide Web, studies of merger of local and international organizations, discussion documents, academic journals and research publications, publically reported findings on the study of the theory of merger of businesses with specific reference to sustainability, alignment of specific business units to the organizational strategies, vision and mission, etc.
The researcher felt that the qualitative approach enabled the study to achieve its aim of investigating the appropriate strategies for the sustainability of the University of Johannesburg's Minerals Processing and Technology Research Group within its current environment so that it achieves its strategic objectives of higher levels of customer service, quality and productivity.

3.2.3. Target Population

The target population is the group to which the researcher would like to apply conclusions observed and information obtained from only a reduced sample (Welman and Kruger, 2004: 46). As a result, the degree to which the sample represents the target population has an impact on the degree to which results obtained on the sample could be generalized to the target population.

The target population for this study was the cohort of human resource i.e. staff and postgraduate students involved in research. A non-random sampling strategy was therefore employed because it provides a quicker and cheaper method of doing an evaluation of a single object. This could be called a judgemental sampling (Saunders et al., 2003:486) as it is a non-probability sampling procedure using the judgement of the researcher within the practical and technical constraints in the selection of individuals to make up the representative sample. In purposive sampling, as it was the case for this study, researchers use their special knowledge or expertise about some group to select subjects who represents the population. Although the MPTRG, dealing with industry problem solving projects and to a smaller extent “academic” types of projects, is the first organized and structured research niche area approved by the NRF where research projects pertaining to the minerals industry are studied, problems solved and service rendered at the University of Johannesburg, similar or associated research groups (e.g. Mintek, at University of Pretoria, at university of the Witwatersrand, University of Stellenbosch, University of Cape Town etc…) exist.
3.2.4. Sampling

There are two categories of sampling techniques, that is, probability or representative sampling and non-probability or judgmental sampling (Saunders et al., 2003:152). According to Saunders et al., (2003:152) with probability sampling the chance, or probability, of each case being selected from the population is known and is usually equal for all cases. This means that it is possible to answer research questions and to achieve objectives that require the statistical estimation of the characteristics of the population from the sample. Consequently, probability sampling is often associated with survey and to a lesser extent experimental research. With non-probability sampling the probability of each case being selected from the total population is not known and it is impossible to answer research questions or to address objectives that require the researcher to make statistical inferences about the characteristics of the population.

According to Saunders et al., (2003:170) with business research it is impossible to statistically select the research sample at random. As a result, the sample must be selected some other way. Non-probability sampling provides a range of alternative techniques based on the researcher's subjective judgment. One of the non-probability sampling techniques is the purposive or judgmental sampling. This sampling technique enables the researcher to use his/her judgment to select cases that will best enable the study to meet its objectives (Welman and Kruger, 2004:188). The purposeful selection of participants represents a key decision point in a phenomenological study (Welman and Kruger, 2001:188). This was the sampling type used in this study.

From a combined population of almost 55 staff and postgraduate students from the Faculty of Engineering of the University of Johannesburg, a sample sizing to more than 50% (i.e. 31 respondents) was targeted. The above mentioned sample was composed of Head of Departments, senior lecturers, lecturers, graduated postgraduate students, graduating postgraduate students i.e. those who are close to completion, starting postgraduate students, and support staff.
3.2.5. The research instrument

The choice of a measuring instrument to effectively enable collection of data relevant to the research aims and objectives was critical in this study. Since the study utilizes an exploratory approach qualitative data was collected through a self administered questionnaire. The researcher decided that the structured questionnaire survey data collection method would be the most suitable data collection instrument, given the research aims, the size of the sample and the fact some targeted respondents being in managerial positions would not either feel comfortable or not have time to reply the questionnaires. Therefore the researcher developed a questionnaire which formed the basis of the interview. The researcher paid personal visits to respondents in order to conduct personal one-to-one interviews.

Questionnaires were hand distributed by the researcher to each one of the targeted sample members. This made the collection relatively easier as on the spot the respond would have to reply to the questionnaire as it is handed.

3.2.6. Pilot study

As a result of the time and logistical constraints that are associated with establishing a research group, reaching the required critical mass in terms of research staff and students, no pilot study was conducted.
3.3. RESEARCH PROCESS

3.3.1. Administration of questionnaires

To enable the potential participants to be sensitized about the aim and objectives of the study, Management of the Faculty of Engineering and the Built Environment of the University of Johannesburg was approached so that their buy-in was obtained. This process was followed so that the study enjoys their support and credibility amongst potential participants. The researcher further used his own knowledge of the University of Johannesburg and its employees to facilitate voluntary participation in the study.

Once voluntary participation was given, the researcher approached the respondent, handed the questionnaire and waited for the questionnaire to be completed. This process made collection of the questionnaire easier. Potential respondents from the industry were e-mailed and follow-up telephone calls were made.

Prior to the actual administration of the questionnaire, a brief overview of the purpose of the survey as well as the manner in which data will be used and reported was explained to participants. Once all the questions were answered and the survey schedule completed, the researcher concluded the survey.

3.3.2 DATA ANALYSIS, THEORY AND MODEL DEVELOPMENT

Although the data obtained from the questionnaire survey was mainly qualitative, some quantification of the findings was done. As elaborated by Mair and Marti (2005:13) qualitative research methods are used in the case where little is known about a particular domain, and when the research questions pertain to understanding, describing, planning or setting some strategies as it is the case in this study. Triangulation defined as a process by which theory or model is built by the application of multiple paradigm lenses to the literature
or to data collected about a given phenomenon (Cronk and Fitzgerald 2002:13), was used for the analysis of the data collected. Pattern matching which requires using past experience, logic, or theory before the study begins to specify what is expected to be found was an added analysis tool. By comparing and contrasting the findings from this case study to the findings from the theory a series of propositions are then formulated that form the basis of a framework which focuses specifically on relevant strategies to implement for the Minerals Processing and Technology Research Group be sustainable in short and long terms.

3.3.3. Reliability and Validity

3.3.3.1 Reliability

Kirk and Miller (1987:86) as cited in (Mouton and Marais, 1992:69) defined reliability as the extent to which a measurement procedure yields a similar answer however and whenever it is carried out. Integral to the concept of reliability is checking the strength of the data (Kirk and Miller, 1987:87). In other words, reliability refers to the issue of validity central to the data collection process. These authors have however emphasized that reliability, particularly external reliability, is not a central concern of a phenomenological study, given the nature of the study, and that alternative ways of thinking about reliability and reproducibility need to be used. Confirmability, (when another researcher may have arrived at a comparable conclusion using the same data, perspective and situation) is an example of an alternative to reliability applicable to qualitative research (Saunders et al., 2003: 101).

Mouton and Marais (1992:72) reported that four variables influence a study’s reliability – the researcher, the participants, the measuring instrument and the context in which the research is conducted:
(i) The researcher

Mouton and Marais (1992:73) stressed that the researcher's image and affiliation may impact on the reliability of a study. In this study, the researcher was aware of the importance of presenting himself professionally, and of ensuring that the participants were aware that they were participating in a research study for a masters' dissertation at an accredited business school. This ensured that the subjects respond with depth and authenticity.

(ii) The participants

The participants' perception of their need to play a certain role or respond in a certain way was avoided in this research study through the use of closed questions and non open-ended questions in the questionnaire. The use of leading questions was restricted in that subjects were given an opportunity to select responses based on the propositions derived from literature.

(iii) The measuring instrument

The reliability of the measuring instrument was enhanced in the use of closed questions solely derived from literature. The questionnaire was used as a primary data collecting tool during the survey. This ensured that respondents responded to similar questions. As a result, leading questions, mid-position, "don't know" responses, sequencing and item sensitivity, which impact on reliability, were reduced.

(iv) The context

To ensure that issues of reliability were met with regards to the research context, the researcher personally handed the questionnaire to participants or emailed it to them. Meetings with the respondents were held at times convenient to the participants, and the venues chosen by the participants, at their place of employment, in accordance with the requirements of privacy, confidentiality and quietness stipulated by the researcher.
(a) Theoretical validity of the measuring instrument

Since no information existed on the validity of the measuring instrument, its theoretical validity was assessed. A presentation of the literature in Chapter 2 of this research study, conceptualizing the impact of the role of the research group in minerals processing and technology at the University of Johannesburg and its sustainability, was used as a basis for the development of the measuring instrument.

3.3.3.2 Validity

Validity in qualitative research refers to the extent to which the research study provides an accurate account (Saunders et al., 2003:101). Therefore, a qualitative study is valid if it really examines the topic which it claims to have examined. The researcher was aware of the requirement that the study should present a detailed and accurate understanding of the construct being explored, that is, the role of the Minerals Processing and Technology Research Group and its sustainability.

3.4. Assumptions

The study used a questionnaire as research instrument. It was based on the assumption that the respondents freely provided the correct information requested.

3.5. Limitations of the Study

The uniqueness of the study may also be viewed as a limitation since limited information and research is available for a minerals processing research laboratory from a previously career based institution being part of a merger process leading to the formation of a new university
and this means that there is little opportunity to offer a comparative analysis of the results of the study.

In addition, limited published information on the sustainability of an organization in a changing and very dynamic environment (as it is the case for the Minerals Processing and Technology Research Group, UJ) complicated the study.

### 3.6. Ethical Considerations

The study adhered to strict research ethical standards and norms. The research was conducted in a manner that ensured a high level of academic integrity and scientific validity. The principles of ethical propriety applied in this study included considerations of fairness, honesty, openness of intent, disclosure of methods, the ends for which the research was executed, a respect for the integrity of the individual, the obligation to guarantee unequivocally individual privacy, and an informed willingness on the part of the respondent to participate in the research. Ethics clearance for this study was applied for and obtained from the University of Johannesburg.

### 3.7. Conclusions

The aim of this chapter was to present the research design and methodology used in the study. The chapter began with the presentation of the research design which was followed by a discussion of the research process and limitations of the study. The chapter was completed by a discussion of the ethical considerations. The next chapter will present a statement of findings and analysis of data.
CHAPTER 4: PRESENTATION AND ANALYSIS OF RESULTS

4.1 INTRODUCTION

The aim of this chapter is to present results as well as to provide a detailed analysis of the results of the study. Sustainability of the MPTRG will subsequently be analysed using cause-effect diagram, and the chapter will end with the presentation of a high level strategic model for the sustainability of the MPTRG.

4.2 ANALYSIS OF RESULTS

In order to derive a relevant strategy for the sustainability of the MPTRG, the current and the wished or expected status of business was analysed. The researcher investigated the current main responsibilities of the MPTRG as well as the responsibilities that respondents viewed as essential for the MPTRG to conduct activities. The MPTRG is currently spending time on those they should be spending time on, and those they should be involved in. Related results are presented in Tables ann. 5.3.1 - 5.3.16.

A very important conclusion from Table ann. 5.3.1 to Table ann. 5.3.16. is that with respect to A, B, C, D, and E, the MPTRG is not fulfilling the role that it should be. From Table ann.5.3.1 and Table ann.5.3.2, it is noticed that only 26.9% of respondents believed that MPTRG strategies are aligned with the business strategy of the Faculty of Engineering and the Built Environment while 88.5% thought that the MPTRG should spend more time on training postgraduate students so that a higher postgraduate student's throughput is achieved.

From Table ann. 5.3.1, A: It appeared that MPTRG strategies are aligned with the business strategy of the FEBE hence that of the University of Johannesburg, B: The MPTRG procedures and practices are efficiently administered, C: The MPTRG research policies and programs promote the training of postgraduate students and address industry challenges, D: The MPTRG processes and programs increase the Faculty's ability to implement required
changes in the manner in that the University of Johannesburg remains up to date with respect to its changing environment, and E: All of the above. Whilst only 30.76% of respondents believed that the MPTRG was not fulfilling all the above roles (from Table ann.5.3.1), 53.84% of respondents were of the opinion that the MPTRG should improve the alignment of its strategies with those of the UJ and improve the administration of procedures. From Table ann.5.3.3 and Table ann.5.3.4, it is noticed that only 38.46% of the respondents believed that the MPTRG was fulfilling its role in increasing the number of postgraduate students, increasing the research output produced by postgraduate students, and increasing the number of postdoctoral researchers. 57.69% of respondents believed that MPTRG should spend more time in: A: training postgraduate students so that a higher student throughput is achieved, B: training postgraduate students to produce enhanced research outputs (i.e. journal articles, conference papers, dissertations/thesis, C: hiring postdoctoral researchers to boost research outputs, D: training postgraduate students and taking on board postdoctoral researchers to address challenges faced by the industry and made apparent by the changing environment. From Table ann. 5.3.5 and Table ann. 5.3.6, it is concluded that only 46.15% of respondent believed that the MPTRG is an active participant in A: formulating extraction metallurgy departmental business and operational research strategies, B: designing extraction metallurgy departmental human resources strategies for staffing, training, appraising with emphasis on research. C: designing motivational and incentive practices to encourage and improve employee morale and research related job satisfaction, D: formulating change strategies to ensure that Faculty /University new research strategies are supported by research staff, postdoctoral researchers and postgraduates students. 65.39% of respondents were of the opinion that the MPTRG should improve on all of the above issues. From Table ann. 5.3.7 and Table ann. 5.3.8, it is noticed that only 30.77% of respondents believed that the MPTRG was working to: A: ensure postgraduate students’ recruitment, training and completion of their studies, B: ensure that postgraduate students are given adequate research exposure and supervision for them to deliver, C: ensure the recruitment of postdoctoral researchers and research assistants, D: ensure that postdoctoral researchers and research assistants are given adequate research exposure and supervision for them to deliver. 53.84% were of the opinion that the MPTRG
has to improve on the above. Tables ann.5.3.9 and ann.5.3.10 informed that 69.23% of respondents were satisfied with the research and development programs and projects carried out by the MPTRG while only 7.69% were not. 61.45% of respondents said that the above programmes were effective. As evidenced by Table ann. 5.3.11 and Table ann. 5.3.12, 57.69% of respondents believed that the credibility of the MPTRG comes from: A: helping industry solve their process related problems, B: training extraction metallurgists at postgraduate levels who are ready to be absorbed into the industry, C: assisting the community as in outreach programs in the field of minerals processing, beneficiation and process, D: maintaining international standards as evidenced by the high quality of research output. 65.39% of respondents thought the credibility of the MPTRG should emanate from the above. Table ann.5.3.13 and Table ann. 5.3.14 show that 57.69% of respondents agree that the effectiveness of the MPTRG is measured by its ability to A: Increase postgraduate student throughput in the Extraction Metallurgy Department of the University of Johannesburg, B: Increase number of research output in terms of journal articles, conference papers, chapter in books, patents, etc…, C: Built adequate research laboratory facilities so as to accommodate research in the field of mineral processing, beneficiation and process at the FEBE, D: Efficiently address industry and community related challenges in the field of minerals processing, beneficiation and process.

The following factors are deciding elements on the sustainability of the MPTRG. Its ability to: A: recruit and maintain at least four active researchers in the group, B: recruit and maintain a minimum of five postgraduate student each year, C: graduate at least two postgraduate student every year, and D: keep operational, maintain operations, acquire new and modern research facilities, and update regularly. Table ann. 5.3.15 and Table ann. 5.3.16 show that 61.53% of the respondents are supportive of these views while 65.39% of the respondents have views that the above factors should be strongly applied to measure the sustainability of the MPTRG.

Information extracted from data in Tables ann. 5.3.1 - 5.3.16, is captured in a high level and deductive diagram the cause-effect diagram. A cause-effect diagram [i.e. Ishikawa diagram or fish-bone diagram] (Slack et al., 2001:624) as related to the sustainability of the MPTRG is
presented in Figure 4.1. Pertinent issues raised in the self-administered questionnaires are identified as contributing factors to the sustainability of the MPTRG. They are embodied in following factors: research equipment, existence of relevant research policies and legislations, impact of external environment, existence of relevant marketing strategy, flexibility and easy to adapt to changes in the minerals industry, people and finances.

Figure 4.1: Fish-bone analysis of the sustainability of the MPTRG
4.4.1. Research equipment and infrastructure

73.07% of the respondents believed that the MPTRG should spend most of its time on training postgraduate students, to produce research output, and hiring postdoctoral researchers to conduct research projects. All of the above can not be achieved if there are no relevant research facility nor appropriate research infrastructure.

Currently the only research pieces of equipment that the MPTRG possesses are the microwave facility. The Mossbauer spectrometer is still to be ordered while research staff only have access to undergraduate student teaching equipment (i.e. mineral processing laboratory, analytical techniques laboratory, coal laboratory etc.). Except from the cohort of equipment at Spectrau (XRD and XRF) on the Kingsway campus of the UJ, access to equipment from neighboring institutions example University of the Witwatersrand requires payment. Sometimes, the above access is very expensive, e.g. R1500.00 per sample for a room temperature measurement. Equipment from the Kingsway campus must be booked in advance (i.e. an average of three months for the XRD) while the Minerals Liberation Analyzer still remains inaccessible. It is recommended that the purchase of the Mossbauer spectrometer is expedited while non paying access to research equipment will be multiplied through collaboration leading to sharing of information and joint publications.

4.4.2. Institutional Research policies and legislations

Management of the UJ have drafted research policies and policies for the Higher Degrees Committees. Mutual responsibilities and expectations of supervisors and postgraduate students are clearly spelled out therein. This is an useful working document for the day to day monitoring and evaluation of research activities and performances. A continued use of the above research policies and legislations will contribute to the sustainability of the MPTRG. 76.92% of respondents believed that the MPTRG is currently re-enforcing the existing UJ’s research policies, hence they are of the opinion that the above role constitutes the most
dominant activities of the MPTRG. This is especially important during the transition period of the merger. The MPTRG management had to set up and implement managerial and operations rules and regulations to keep the MPTRG competitive locally as well as internationally. Most of these rules and regulations have been incorporated into the institutional research policies as championed by the FEBE and by the UJ. As an example of this it was decreed that every postgraduate student at Masters degree level should, by the completion of his/her studies, produce at least two journal articles and present two papers at local and/or international conferences. Maintaining this standard will guarantee at least two refereed research outputs every year. 7.69% of respondents were of the opinion that the MPTRG should not actively embark into research policy monitoring. The researcher is of the opinion that the MPTRG management should implement the existing research policies, rules and regulations so that it (i.e. MPTRG) remains compliant to the institutional research strategy.

4.4.3. External and internal environments impacting on research activities of the MPTRG

Although 61.54% of respondents believed that the MPTRG's processes and programs increase the Faculty's ability to implement changes imposed by the environments in a manner which the UJ remains up to date with respect to its changing environment, 65.38% of the respondents still believe that the MPTRG should do more. The suggestion is to expand in formulating the extraction metallurgy departmental business and operational research strategies, and it should also design extraction metallurgy departmental human resources strategies for staffing, training and appraising with emphasis on research.

Internally to the FEBE, and internally to the UJ, the MPTRG is in competition with other research groups. Its performance is measured relatively. For example for the year 2006, the MPTRG produced more than 60% of peer reviewed journal articles published by the FEBE. In comparison with other faculties, complications raise when for example one has to compare challenges faced by research staff from applied sciences faculty (where equipment
are involved) to those from researchers from humanities and law. Externally, the changing minerals industry environment, government requirements and industry legislations in terms of the use of clean and environment friendly processes increase the technological challenges faced by the MPTRG. To survive and remain sustainable, the MPTRG staff have to be innovative.

4.4.4. People

People involved in the MPTRG activities remain one of the most valuable assets of the group. 61.54% of respondents showed that designing motivational and incentive practices to encourage and improve employee’s morale. They stated also that research related job satisfaction to be the one of the main activities of the MPTRG. 69.23% of respondent strongly recommend that the MPTRG participle in the decision making and the designing of human resource strategies for staffing and training where MPTRG representative will put emphasis on the requirement on the research component. Currently, the group has only one supervisor of projects. There is a strong need to hire additional members of the team with supervisory ability. Postgraduate fellows should be targeted while a research capacity building strategy should be implemented in the rejuvenation of the academic staff of the department of Extraction Metallurgy. New staff to be recruited should preferably hold a doctorate degree. A Masters degree holder would be recruited only if there is commitment to further his/her studies with the view of strengthening the MPTRG. Time allocated to lecturing should be reduced to two lectures of contact time per week. The management of the department of extraction metallurgy should honestly be supportive of research so that departmental students and technicians develop an appropriate research ethos.

4.4.5. Change Management

Building the above research ethos within the department of extraction metallurgy is possible only if a 360° turnaround change of direction is implemented. The above change will be informed by the dynamism in the minerals industry and by the change in the landscape of the South African Higher education sector. 69.23% of the respondents are of the opinion
that following the change imposed by the minerals industry to institutions of higher learning the MPTRG should increase its postgraduate students' throughput. The researcher suggests the target of an increase of 10% per year. To date the staff recruitment and retention at the Department of Extraction Metallurgy is decided by the Head of Department alone. No collegial decision/consultation with the departmental staff is made. As respectively recommended by 61.54% and 65.38% of respondents, MPTRG manager should participate and contribute to the recruitment and retention process of at least four active researchers at the department, and should recruit and retain a minimum of three postdoctoral researchers and five postgraduate students bi-annually.

4.4.6. Marketing

As more than 65.39% of respondents believed that the sustainability of the MPTRG should be measured from its ability to: A: recruit and maintain at least four active researchers in the group, B: recruit and maintain a minimum of five postgraduate student each year, C: graduate at least two postgraduate student every year, and D: keep operational, maintain and acquire new research facilities and develop regularly. It is recommended that aggressive marketing of the research activities within the MPTRG is conducted via local and international media (newspapers, magazines, billboard, television, professional magazines, etc.). Management of the department of Extraction Metallurgy should be supportive of this in terms of covering the advertising costs.

For a comparison with results from the actual activities column in part C questions 1 to 8, Table 4.1 was created as follows:
Table 4.1: Cross-tabulated results to the actual activities column.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Strategic partner</th>
<th>Administrative</th>
<th>Expert</th>
<th>Champion for Students</th>
<th>Change agent</th>
<th>All Category</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Count</td>
<td>%</td>
<td>Count</td>
<td>%</td>
<td>Count</td>
<td>%</td>
</tr>
<tr>
<td>MD</td>
<td>47</td>
<td>22.60</td>
<td>43</td>
<td>20.67</td>
<td>34</td>
<td>16.35</td>
</tr>
<tr>
<td>NMD</td>
<td>82</td>
<td>39.42</td>
<td>89</td>
<td>42.79</td>
<td>69</td>
<td>33.17</td>
</tr>
<tr>
<td>3rd MD</td>
<td>44</td>
<td>21.15</td>
<td>37</td>
<td>17.79</td>
<td>65</td>
<td>31.25</td>
</tr>
<tr>
<td>LMD</td>
<td>20</td>
<td>9.62</td>
<td>22</td>
<td>10.58</td>
<td>18</td>
<td>8.65</td>
</tr>
<tr>
<td>NSD</td>
<td>15</td>
<td>7.21</td>
<td>17</td>
<td>8.17</td>
<td>22</td>
<td>10.58</td>
</tr>
<tr>
<td>TOTAL</td>
<td>208</td>
<td>100</td>
<td>208</td>
<td>100</td>
<td>208</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4.1 is a cross-tabulation of data from Table ann.5.3.1, Table ann.5.3.3, Table ann.5.3.5, Table ann.5.3.7, Table ann.5.3.9, Table ann.5.3.11, Table ann.5.3.13 and Table ann.5.3.15. It is a combination of all counts and results of answers to the first part of questions 1 to 8 of part C. The first part of the question C aimed at establishing the nature of the current activities of the MPTRG.

As implied by Ulrich (1997), all the questions that fall into category A represented the strategic partner role. The questions that were categorized as B related to the administrative expert role, the ones that were categorized as C related in this study to champion/
postgraduate student advocate, and the ones that were categorized as D represented the change agent role. The questions categorized as E were termed “all categories” to denote the business partner’s role as elaborated by Ulrich (1997).

The results in Table 4.1 describe the current role of the MPTRG within the FEBE in line with the role description detailed in Ulrich’s model (1997). The pattern may be elaborated as the following:

42.79% of respondents believed that the administrative expert activities of the MPTRG were the next most dominating. This was supported by 20.67% of respondents who stated that this was the most dominant activity for the MPTRG while only 10.58% of the respondents were of the opinion that it was the least dominant.

17% of respondents indicated that the second most current activities of the MPTRG fall within the postgraduate champion role. The activities that fall within that category were described by 16.35% of the respondents as most representative activities of the MPTRG. Only 8.65% of respondents felt that these activities represented the least activities of the MPTRG. 10.56% of respondents stated that these activities did not represent activities conducted by the MPTRG.

39.42% of respondents indicated that the activities of the MPTRG fall within the strategic partner role. 22.60 % of the respondents viewed it as the most dominant role of the MPTRG while only 7.21 % were of the negative opinion.

As advocated by the fish bone analysis, 38.94% of respondents viewed the activities of the MPTRG as a change agent role. This is supported by 19.23% who stated that this is the most dominant role of the MPTRG.

As with the change agent, strategic partner, administrative expert, champion roles, all categories are viewed by the majority of respondents (here 35.58%) as the next most dominant role. This indicated that the MPTRG is active in all the fronts where it is deemed
necessary for its survival. One of the reasons for this is the lack of expected support from service departments.

**Table 4.2: Cross-tabulated results to the effective activities column.**

<table>
<thead>
<tr>
<th>Rank</th>
<th>Strategic Partner</th>
<th>Administrative</th>
<th>Expert</th>
<th>Champion for Postgraduate Students</th>
<th>Change agent</th>
<th>All Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Count</td>
<td>%</td>
<td>Count</td>
<td>%</td>
<td>Count</td>
<td>%</td>
</tr>
<tr>
<td>MPO</td>
<td>92</td>
<td>44.23</td>
<td>99</td>
<td>47.60</td>
<td>77</td>
<td>30.02</td>
</tr>
<tr>
<td>NMPO</td>
<td>53</td>
<td>25.48</td>
<td>46</td>
<td>22.12</td>
<td>51</td>
<td>24.52</td>
</tr>
<tr>
<td>3rd MPO</td>
<td>31</td>
<td>14.90</td>
<td>34</td>
<td>16.35</td>
<td>47</td>
<td>22.60</td>
</tr>
<tr>
<td>LPO</td>
<td>17</td>
<td>8.17</td>
<td>14</td>
<td>6.73</td>
<td>18</td>
<td>8.65</td>
</tr>
<tr>
<td>NPO</td>
<td>15</td>
<td>7.21</td>
<td>15</td>
<td>7.21</td>
<td>15</td>
<td>7.21</td>
</tr>
<tr>
<td>TOTAL</td>
<td>208</td>
<td>100</td>
<td>208</td>
<td>100</td>
<td>208</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4.2 is a cross-tabulation of results to Table ann.5.3.2, Table ann.5.3.4, Table ann.5.3.6, Table ann.5.3.8, Table ann.5.3.10, Table ann.5.3.12, Table ann.5.3.14 and Table ann.5.3.16. Whereas the first part of all questions was aimed at establishing the nature of the current activities of the MPTRG; the second part required respondents to select activities that would enable the MPTRG to assist the FEBE to achieve its strategic objectives. The
pattern of the results in relation to the propositions derived from Ulrich's (1997) model may be interpreted as follows:

With regard to the role of the strategic partner, the proposition derived from the Ulrich's (1997) model was whether or not aligning the MPTRG strategies and practices with business strategy assists the FEBE to achieve higher levels of postgraduate students; community, industry and government service quality; productivity in research and in the efficient administration and application of procedures and practices.

In order to assist the FEBE to achieve its strategic objectives, 44.23% of respondents believed that the activities of the MPTRG should fall within this role. This was supported by another 25.48% of respondents who, though did not believe that the majority of MPTRG activities should fall within the most dominant role, did believe it should be the next most dominant role. With 25.48% of respondents indicating that the next most preferred activity of the MPTRG should fall within this role. This role also received the highest count in the next most preferred activity. It is important to note that only 7.21% of the respondents believed that activities within this role would not assist the FEBE to achieve its strategic objectives. Only 8.17% of respondents did not believe that this role would assist the FEBE to achieve its strategic objectives. It is quite alarming that more than 5% of respondents think that a university research group should not be a strategic partner of the institution. This shows the need to educate the stakeholders on the necessity of research activities at the University so that they possess and display an attitude conducive to research by supporting the above.

With regard to the role of the administrative expert, the proposition derived from Ulrich's (1997) model was whether or not training postgraduate students so that higher throughput and research outputs are achieved assist the FEBE to achieve higher levels of postgraduate students, community, industry and government service quality and productivity in research.
47.60% of respondents indicated that this role should be the most dominant and should contain the majority of activities to enable the MPTRG to assist the FEBE to achieve its strategic objectives. This opinion is supported by 22.12% of respondents who believed that even if the administrative role is not the most dominant, it should at least be the next most dominant activity for the MPTRG. 16.35% of the respondents believed that the majority of MPTRG activities should fall within this role to assist the FEBE to achieve its strategic objectives. Only 6.73% of respondents did not believe that activities in this role would enable the MPTRG to assist the FEBE to achieve its objectives.

With regard to the role of the administrative expert, the proposition derived from Ulrich's (1997) model was whether or not actively and aggressively developing intellectual and technical capital (critical source of the organization's value and link proper training, coaching and mentoring, and graduation of postgraduate students) will lead to a higher throughput and research outputs.

30.02% of respondents indicated that this role should be the most dominant to enable the MPTRG to assist the FEBE to achieve its strategic objectives. 7.21% of respondents do not believe that this role should be the most dominant.

With regard to the role of technical and operations partner, the proposition derived from Ulrich's (1997) model was whether or not actively and aggressively training postgraduate students was to lead to higher throughput and research outputs. 30.02% of respondents indicated that the most preferred activity for the MPTRG falls within the technical and operations partner which, in this case, is translated as a champion for postgraduate students. Only 7.21% of respondents were of the opinion that the least number of activities of the MPTRG should fall within this role to assist the FEBE to achieve its strategic objectives.

With regards to the role of the change agent, the proposition derived from Ulrich's (1997) model was whether or not managing transformation and change through problems identification, ensuring proper and smooth communication building trust, getting buy-in
solving problems, creating action plans assists the FEBE to achieve its strategic objectives of higher postgraduate students throughput, research output, quality and productivity.

41.35% of respondents believed that this role would enable the MPTRG to assist the FEBE to achieve its strategic objectives and a only 7.21 felt that the MPTRG should not be a change agent. This role was therefore classified as the most preferred option in so far as the sample counts are concerned.

With regards to this role, the proposition derived from Ulrich’s (1997) model was whether or nor undertaking all the above activities assists the FEBE to achieve its strategic objectives of higher postgraduate students throughputs, research output, quality and productivity. A majority of 35% of respondents believed that this role would enable the MPTRG to assist the FEBE to achieve its strategic objectives. These views were supported by 20.76% of respondent who indicated that it should be the next preferred option. 23.56% of the respondents did not share the above opinion.

One of the main conclusions derived from Table 4.1 and Table 4.2 is that the MPTRG is perceived as one of the main strategic partners for the UJ. Although 22.60% of respondents see that the MPTRG has already fulfilling this role, 44.23% prefer the MPTRG to increase its involvement has a strategic partner. Whilst 13.94% of respondents recommended a reduction in its role as administrative expert, more that 63% of respondents see the MPTRG as a relevant champion for postgraduate students and change management agent. In contrast, only 11.54% respondents who currently did not want the MPTRG to be involved in any of the roles, only 9.62% of the respondents would prefer that option in future.
4.3 DERIVATION OF THE MODEL

Data collected in the study, their analysis and discussion, and information derived therefrom lead the researcher to derive the following model, Figure 4.2, for the sustainability of the MPTRG.

As currently there is only one champion for the management and day to day running of MPTRG, it is recommended to increase the number of senior management staff to three. Two co-champions will be recruited. Together with the current champion, they will form the senior management of the MPTRG. The Board of directors would include the Head of the Department of Extraction Metallurgy, The Executive Dean of the FEBE and a representation of the University Research and Innovation Department. The senior management of the MPTRG would be responsible for the initiation of research projects, raising research funds, recruiting postgraduate students, retaining postgraduate students, training, coaching and mentoring postgraduate students, supervising and leading postgraduate students to graduation, ensuring that the MPTRG delivers journal and conference publications. It is expected that the existence of the MPTRG is assured by the senior management of the FEBE and that of the UJ. These are structures that put institutional research policies and research infrastructure in place. With the financial support of the Head of the Department of Extraction Metallurgy and the Executive Dean of the Faculty, senior management of the MPTRG will develop, properly equip and maintain at least one dedicated room for research activities in minerals processing and beneficiation. They will also strategize and ensure that postgraduate students and research associates of the MPTRG gain access to regional and international research facility. The existence of the MPTRG, milestones achieved by the group as well as research opportunities in the MPTRG will be aggressively advertised using the support of senior management of the UJ.
Initiation of research projects
Raising research funds
Hiring postgraduate students
Retaining postgraduate students
Training, coaching and mentoring postgraduate students
Leading postgraduate students to graduation

Support from Senior Management of UJ, support from Executive Management of the Faculty of Engineering and the Built Environment, and support from Middle Management of the Extraction Metallurgy department

Existence/setting of institutional research policies and infrastructure

Developing, properly equipping and maintaining at least one dedicated room for research
Access regional and international research facility

Figure 4.2: High level strategic Model for the sustainability of the MPTRG
4.4 CONCLUSION

The aim of this chapter was to present the results of the study as well as provide a detailed analysis of these results. The chapter began with a brief explanation of the data collection process and the structure of data. This was followed by detailed reporting of the results obtained. Using both qualitative and quantitative approaches, the results were analyzed to match the pattern. 22.60% of respondents believe that the most dominated activities of the MPTRG are of strategic nature while 42.79% were of the opinion that the second most dominated activities are related to research administration. The third most dominated activities of the group is establishment of champions for postgraduate students. This was the opinion of 31.25% respondents while 12.02% of the respondents are of the opinion that the MPTRG has been acting as a change agent. 15.87% think that most of the roles including (strategic partner, administrative expert, champion for students, and change agent) have been fulfilled.

The next chapter will present a discussion of findings of the study and linkage to literature review.
CHAPTER 5: FINDINGS AND LINKAGE TO LITERATURE REVIEW

5.1 INTRODUCTION

The aim of this chapter is to present a detailed discussion of the findings of the study and link them to the literature review. The chapter presents the results emanating from the qualitative and quantitative analysis with a linkage to the literature review presented in Chapter 2.

5.2 FINDINGS OF THE STUDY

5.2.1. Cross tabulated results in the actual activities and preferred activities column

The first part of the analysis entailed a presentation of the results relating to the current activities of the MPTRG within the FEBE. The activities were classified in terms of the roles definition according to Ulrich's (1997) model. The results of this part are presented in Tables ann.5.3. The second part of the analysis entailed a presentation of the results in Table 4.1 which presents the results of the preferred activities column in the questionnaire. The results in Table 4.2 describe the role of the MPTRG that would enable the FEBE to achieve its strategic objectives. In the next section, both sets of findings will be discussed.

5.2.1.1. Administrative Expert

In this role the MPTRG is predominantly involved in the designing and delivering of efficient postgraduate processes for hiring, recruiting, training, coaching, mentoring, assessing, promoting, graduating and otherwise managing the flow of postgraduate students through the research group (Ulrich, 1997:12).
In terms of the results presented, only 20.67% of respondents believed that the activities of the MPTRG were mostly dominated by administrative tasks. A further 33.94% of respondents indicated that this was also the next most dominant role within which the activities of the MPTRG fall. The findings support the researcher's feeling that enormous amount of the MPTRG manager’s time is wasted on un-called for administration related tasks which would have been avoided if support system or services (postgraduate students registration, procurement, research administration, research finances, etc...) where properly and adequately playing their roles.

When respondents were asked to indicate whether or not the administrative expert role would enable the MPTRG to assist the FEBE to achieve its strategic objectives, an impressing amount of 47.60 % of respondents interviewed felt that activities falling in this category would mostly enable the MPTRG to assist the FEBE achieve its strategic objectives with only 22.12 % indicating that this role should be next most dominant.

Despite the fact that only 16.35% of respondents believed that administrative expert role should fall within the third most dominated activities of the MPTRG, only 7.21% of the respondents were of the opinion that administrative expert role should not be dealt with by the MPTRG and they do not believe that activities in this category would enable the MPTRG to assist the FEBE to achieve its strategic objectives.

Although the majority of respondents suggest that the MPTRG maintains the administrative expert role, the researcher thinks that when support and service departments do no come forward performing their expected tasks, the situation forces the MPTRG’s manager to dedicate extra time to administrative chores which un-necessarily absorbs much of useful research time that the MPTRG manager would have put in his/her own research activities. On the other hand one would argue that the management position of the MPTRG’s head includes by its essence the strategic and high level administrative tasks.

Although the researcher is inclined to agree with Ulrich’s (2002:12) contention in the sense that some administrative role pertaining to the registration, monitoring and evaluation
of postgraduate students progress, raising required research funds etc. may reside in the MPTRG manager's portfolio for research, his main role should progress from an excessively administrative role and take on a more strategic role and help the MPTRG to build capacity and capabilities to grow the research activities, increase research output, continuously improve its image, and maintain sustainability of research output. The existence of a sound administrative role expert would help in establishing the appropriate structure required for a sustainable productivity.

5.2.1.2. Postgraduate Student and research staff champion

The activities that fall within this role require the MPTRG to actively and aggressively develop intellectual and staff capital that is a critical source of the organization's value and link postgraduate student contribution to the organization's success. As a student and staff champion, the MPTRG's activities include expertise on how to create a work environment in which people will choose to be motivated, contributing, and happy.

33.17% of respondents indicated that the second most current activities of the MPTRG fall within the postgraduate students and research staff champion role, with 31.25% of respondents stating that this role represented the third next most current activities of the MPTRG and only 16.35% think that it is the most current activity of the MPTRG. The postgraduate and research staff champion role was therefore ranked as the second most dominant category in which the activities of the MPTRG fall.

When respondents were asked to indicate whether or not this role would enable the MPTRG to assist the FEBE to achieve its strategic objectives, 30.02% of respondents interviewed felt that activities falling in this category would mostly enable the MPTRG to assist the FEBE achieve its strategic objectives with only 7.21% indicating that this role should not be dominant.
The results of the study indicate that the postgraduate student and research staff champion role is perceived by the respondents as a role that would enable the MPTRG to assist the company to achieve its strategic objectives. Although Sullivan (2003:18) believes that this role should be left to the Students Representation Council (SRC) and the trade union movement or similar entities, the researcher is of the opinion that making MPTRG a postgraduate student and research staff advocate creates an us-against-them situation which will cement the group. It will make research group managers, postgraduate students and research staff to work together as a team. Cementing the MPTRG is one of the contributing factors towards the increase of productivity. Despite the fact that MPTRG managers are paid by management and the university (not by students nor research staff) and therefore the MPTRG function might not appear credible to students and staff, current postgraduate student and research staff constitute marketing vehicles for the promotion of the research group. On the other hand any exceeded focus on workforce productivity and profitability can get blurred when MPTRG considered the postgraduate staff and research staff perspective because frequently, people self-interest is not necessarily consistent with increasing the research group productivity and profit. It is interesting to note that Ulrich (1997:12) believed that the MPTRG must perform all roles simultaneously but did not stress that they must be performed equally.

5.2.1.3. Strategic partner

As a strategic partner, MPTRG should be actively involved in aligning its strategies and practices with business strategy of the University of Johannesburg. The deliverable from the strategic partner role is strategy execution, which is achieved through translating business strategies into MPTRG priorities.

39.42% of respondents indicated that this role represented the second most dominant role. The activities that fell within this role were described by 22.60% and 21.15% of the respondents as the most representative and the third most representative activities of the
MPTRG, respectively. It is important to note that only 9.62% of respondents felt that the activities least represented the activities of the MPTRG with 7.21% stating that they did not. The conclusion to be derived from this analysis is that this role does overwhelmingly represent the current activities of the MPTRG.

In order to assist the FEBE to achieve its strategic objectives, 44.23% of respondents interviewed felt that activities falling in this category would mostly enable the MPTRG to assist the FEBE achieve its strategic objectives with 25.48% indicating that this role should be next most dominant and 7.21% think that this should not be on an activity at all. It is important to note that only 7.21% of respondents believed that the activities falling within this role would not assist the FEBE to achieve its strategic objectives. The conclusion to be derived from this analysis is that the majority of respondents believed that the strategic partner role should be the most dominant role for the MPTRG.

5.2.1.4. Change Agent

As a change agent the MPTRG is actively involved in managing transformation and change through the identification and framing of problems, solving metallurgy related industry problems, adapting to the changing industry demand in terms of the profile of student to absorb etc…

38.94% of respondents indicated that this role represented the second most dominant activities of the MPTRG. Only 19.23% and 18.75% of respondents ranked the change agent role as the most dominant role and the third most dominant role respectively.

When respondents were asked to indicate whether or not this role would enable the MPTRG to assist the FEBE to achieve its strategic objectives, 41.35% of respondents interviewed believed that this role would enable the MPTRG to assist the company to achieve its strategic objectives and a significant. This seems to indicate that implementation of appropriate demographic strategy in the recruitment hiring and training of postgraduate
students would assist the MPTRG to contribute to the address of the postgraduate student population in balances in terms of gender, demography as far as South African context is concerned, internationalization etc.... Only 7.21% of respondents felt that the MPTRG should not be a change agent.

The majority (i.e. 41.35%) of the respondents confirms the trend championed by Ulrich and Brockbank (2005:106) advocating that managers dealing with people should become a more proactive agent of change and renewal, and not merely the persons who react to developments. This should be one of the strategic attributions of the MPTRG managers. Here MPTRG managers should use positive aspects of the research culture of the FEBE at UJ to attract new prospects, motivate postgraduate students, recognize their contributions and achievements (progressive and global), and allocate additional tasks to stretch their capabilities. In agreement with Brown and Harvey (2006:374) the researcher cautions the necessity for the MPTRG managers to remain open-minded and provide leadership in adapting to universities and minerals industry new and changing conditions. One approach into remaining alert and flexibly working with the impact of these MPTRG environmental changing forces is the use and proper implementation of total quality management (TQM). TQM is an organizational strategy of commitment to improving customer satisfaction by developing procedures that carefully manage the quality of output and relies on teamwork and empowerment of individuals. One would look at the appropriate implementation of TQM as an aspect of reinventing corporate culture, that is a culture with a strong commitment to improving quality in the organizational processes (Brown and Harvey, 2006:375).

5.2.1.5. All categories

Linking the MPTRG roles with the Faculty of Engineering and the Built Environment performance, Ulrich’s (1997) model implies that all the four roles (above) be carried out simultaneously.
The researcher agrees with Lambert and Friedman (2002:783) in that Ulrich's (1997) four deliverables captures the competing values that MPTRG has targeted over time. By using Ulrich's (1997) model, MPTRG's managers have successfully designed systems that have better balance in targeting and exceeding the expectations of the organization's constituencies: postgraduate students, management, and external constituencies (Lambert and Friedman, 2002:782).

From this study it is noticed that 15.87% of respondents believed that the activities of the MPTRG did not represent the activities in terms of this role. Only 18.27% of respondents indicated that this was the most the most dominant role and actually 35.58% of respondents believed that this role represent the next most dominant role. In addition only 18.75% of respondents believed that this category represented the third most dominant role.

The results presented in Table 4.18 highlight the conflicting nature of the roles within the model. For example, Sullivan (2003:18) points out that being strategic means being a proponent of productivity not student advocacy. There seems to be an inherent conflict in the role of the strategic partner and that of student champion but the researcher is of the opinion that the two points of views are not mutually exclusive. The researcher argues that with a proper student hiring, coaching and mentoring system in place, the research productivity will increase, and a thought strategy will assist in maintaining it.

Caldwell (2003:1002) criticizes Ulrich (1997) to set out a vision of an unproblematic, collaborative partnership between the manager of the Minerals Processing and Technology research group managers, the middle management of the rank of Head of department, the Faculty of Engineering Senior Management and the Senior Management of the University of Johannesburg. Caldwell (2003) thinks that this is unrealistic and argues that the ideal of the MPTRG managers focusing their energy and effort towards aligning MPTRG strategy with business strategy, and consequently away from postgraduate students to resolve role conflict, should be questioned. He is of the opinion that Ulrich's (1997) model is a prescriptive model and argues that there is currently a scarcity of empirical evidence of the practical integration of these roles.
Hailey et al.; (2005:50) point out that a pluralist perspective of competing stakeholder groups, not all of whom are united behind the corporate aim of increased competitive advantage, is not considered. The increased importance of Ulrich’s (1997) model puts on the strategic roles, may insinuate a re-direction from people-focused attention, such as the students champion and change agent roles. The responsibility on people-focused issues is being devolved to senior students and line managers. On the other hand, the pressing requirement to deliver short-term business results and meet deadlines, a lack of time and training, and lack of incentives to be given to them for fulfilment of this additional work may constitute a barrier preventing senior students and line managers from doing this job effectively (Hailey et al., 2005:51). Additionally, in agreement with Shediac-Rizkallah and Bone (1998:89), it transpired that sustainability on quality and number of postgraduate student trained, quality and number of conference papers presented and journal article published by the MPTRG has to be regularly monitored over time. To assist the MPTRG to achieve its goals, it would be recommended that the Faculty of Engineering and the Built Environment continues its institutionalization of the MPTRG’s research plans and programs, while the MPTRG continues to build its research capacity in terms of equipments, collaboration, research staff and postgraduate students, postdoctoral researchers, visiting scientists etc…

5.3 CONCLUSION

The aim of this chapter was to present a detailed discussion of the findings of the study and link them to the literature review. The qualitative and quantitative results of the study were presented. This was followed by a discussion of the findings and linking the findings to the literature review in Chapter 2 of the study.

In the next chapter the conclusions and recommendations of the study as a whole will be presented.
CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

The aim of this chapter is to present the overall conclusions and recommendations of the study as a whole. The conclusions as they relate to the literature review will be presented; followed by a detailed presentation of conclusions of the study as they relate to the qualitative and quantitative analysis. The chapter is completed by a presentation of recommendations as they relate to the Minerals Processing and Technology Research Group and areas for future research work.

6.2 CONCLUSIONS OF THE STUDY

6.2.1. Conclusion drawn from the literature review

Sustainability is defined by the United Nations (1987:1) in terms of satisfying current needs while not compromising the ability of future generations to satisfy their needs implies long term actions and commitments. The sustainability of the MPTRG at UJ is looked at in terms of the mission of the University: “an internationally recognized South African University providing and expanding academic and technological knowledge and skills that promote growth and prosperity” (ww.uj.ac.za). Shedia-Rizkallah and Bone, (1998:89) stressed the necessity of planning and regularly monitoring the sustainability of projects carried out. This study suggests it to the MPTRG as well. While it is encouraged to maintain smooth and regular communication with postgraduate students, research staff, industry partners and other research collaborators, Baker et al., (1999:15) indicate that success and type of stake holder’s inputs and expectations are project specific. Basic research, strategic research, industry or applied research, and community outreach driven research are the main activities of the MPTRG; efficient conduction of projects pertaining to these research port folio, and their sustainability leading to the general sustainability of the MPTRG will depend among
other factors on the human resources attached to them. These include postgraduate students, postdoctoral researchers, research staff and support services. It is recommended that the Ulrich’s (1997) model be holistically applied.

6.2.2 Conclusions drawn from the quantitative and qualitative study

The Ulrich’s 1997 model was used in this study. The findings of the combined qualitative and quantitative study indicated that the current activities of the MPTRG are mainly administratively focused. In order to enable the MPTRG to assist the FEBE to achieve its strategic objectives, the MPTRG must transform itself and work towards aligning its activities with research business strategy of the Faculty.

It is therefore recommended that the MPTRG must gradually shift its focus away from administration in order to create scope and capacity to perform activities over and above administrative and transactional tasks. Complementary strategic research staff be recruited, appropriate research equipment be purchased, number of postgraduate students be increased, number of postdoctoral fellows be increased, attract visiting scientists be attracted, expand collaborative projects with industry be expanded, etc... This would require a well maintained assistance from support and service departments (postgraduate student registration, research office, administration, finances, procurement, transport, secretary, etc...).

The findings from the literature review revealed that the role of the MPTRG as a strategic partner, is central to the achievement of higher levels of postgraduate students service, research training quality and research productivity. It is therefore recommended that the MPTRG must fully align with the corporate strategy of the FEBE. The following sequential steps must be undertaken:

The MPTRG manager together with his team should conduct an organizational diagnosis of the group’s organizational architecture, which specifies systems that constitute the Faculty.
These include the organization's shared mindset and culture, research staff competency levels, systems and standards for progressive assessment and evaluation of postgraduate students' performance, assessment of the standards to use to benchmark progressive and final group research output etc... A formal integrated strategy including human capital, technology, relations (i.e. local and international collaborations with industry as well as other institutions) must be developed which shall provide alternative and or supplementary actions and practices for each of the factors that were identified in the organizational diagnosis.

6.3 RECOMMENDATIONS

The final objective of this study is to propose a strategy or strategies that would enhance the ability of the Minerals Processing and Technology Research Group to achieve higher levels of customer service, postgraduate student training, research quality and research productivity.

6.3.1 Recommendations pertaining to the Faculty of Engineering and the Built Environment, University of Johannesburg

Recommendation
In order to enable the MPTRG to take on a sustainable strategic role and help line management to build capabilities to grow the research business, senior management from the FEBE and that of the UJ must continue to allow for a consideration of human resources issues during the strategy formulation process. Active involvement in research should be one of the main requirements in any future job advertisement from the Department of Extraction Metallurgy.

Action Plan
- As the MPTRG is hosted in the Department of Extraction Metallurgy and its leader is Professor at the University of Johannesburg while the head of Department of Extraction Metallurgy does not even hold a masters degree and does not have
research experience nor exposure, it is recommended that an appropriate head of Department of Extraction Metallurgy with research experience and industry recognition be appointed so that (s)he strategically sets research ethos within the Department of Extraction Metallurgy.

- The MPTRG manager should be part of the FEBE research committee so that at Faculty level (s)he be like a transmitting line of Faculty strategic directives to and from the MPTRG.

- The manager of the MPTRG should remain hands on for the operations of the research group.

- The strategy formulation and implementation should follow the following bottom-up sequential steps with regards to MPTRG

First the MPTRG manager must be aware of all the various strategies the FEBE is considering. At this stage, the MPTRG manager must also be given an opportunity to suggest alternative strategies that would enhance the achievement of the strategic goals of the FEBE. Then the MPTRG manager must analyze the implications of the various strategies on the minerals processing and technology group and present conclusions and recommendations to the strategic planning team. Finally, after the strategic decisions has been made by top management team including the MPRTG manager, the relevant representative must develop programs such as training and development in research methodology and ethics, coaching and mentoring, technical report writing, dissertation/thesis writing, research papers and articles writing, publishing, etc... These steps must also be followed when operational strategies are formulated and implemented within the MPTRG.

6.3.2 Recommendations pertaining to the Minerals Processing and Technology Research Group at University of Johannesburg

Recommendations and action plans

For the sustainability of the Minerals Processing and Technology research at UJ, the study recommends that aggressive marketing through local and international newspapers,
university web site, advertising at conferences, advertising in professional magazines for research opportunities would help to attract postgraduate candidates, postdoctoral researchers and visiting scientists. Attraction of candidates should be followed by their retention, the presence of acceptable research infrastructure, and appealing subsistence means for the students and research staff. Postgraduate bursaries and postdoctoral fellowships should be made available until the end of the academic year. It is suggested that the limiting percentage of foreign students eligible for postgraduate bursaries should be increased mainly due to reason that local students seem not to be interested in research. They prefer to start a relatively well paying job and immediately start their career. UJ, NRF, SANPAD, TESP (ESKOM), THRIP, etc... are research sponsors for the MPTRG. This shows the administrative expert role of the MPTRG. Additionally the study suggests that the research component of the requirement for academic positions be more emphasized to the extent of getting not only indication of willingness to conduct research but commitment from the candidate to undertake research in one of the specific research portfolio of the MPTRG. Monitoring this commitment and its progress should be regularly done. Strengthening the MPTRG with visiting scientists, postdoctoral fellows and sabbatical visit including strong ties and collaboration with industry along with continued commitment of and support from senior management are further recommendations for the sustainability of the Minerals Processing and Technology research at UJ.

6.4 RECOMMENDATIONS FOR FUTURE WORK

Strategies suggested by this study should be implemented and a period of five years be used. A five year evaluation and monitoring program be conducted subsequent to yearly reports. Currently the Minerals Processing and Technology research includes also activities on Small Scale Mining. It is suggested to split the two in future as the effectiveness of staff and expertise permit. After the split research on small scale minerals beneficiation and related technology would still stay with the MPTRG while specific small scale mining activities per se would be integrated in the Department of Mining Engineering. It is further recommended
that the MPTRG evolves in future to a regional center of excellence in Minerals Processing and Technology research.

Finally, it is suggested that a similar study be conducted on other research groups within the Faculty of Engineering and the Built Environment so that the outcome from the above study informs the development of research strategy at the faculty and the University levels.

6.5 CHAPTER CONCLUSION

The aim of this chapter was to present the overall conclusions and recommendations of the study as a whole. The conclusions of the study as they relate to the literature review were presented; followed by the presentation of the conclusions of the study as they relate to the qualitative and quantitative analysis. The chapter was completed by a presentation of the recommendations of the study and areas for future research.

BIBLIOGRAPHY


Research and Innovation office (2006) survey questionnaire on research interests, private communication.


ANNEXURES
ANNEXURE 1: PERMISSION REQUEST LETTER TO CONDUCT THE RESEARCH WORK
May 07, 2007

Prof. T. Andrew  
Executive Dean: Faculty of Engineering and the Built Environment

Dear Sir,

RE: REQUEST FOR RESEARCH PERMISSION

I am an employee of the University of Johannesburg and currently pursuing a Masters of Business Administration (MBA) degree with the Faculty of Management of the University of Johannesburg. As part of my studies I have to carry out a research for the MBA dissertation. I have identified the Minerals Processing and Technology Research Group as a case to study with the following research topic: “Minerals Processing and Technology Research at the University of Johannesburg: Strategy for sustainability”. I believe that there is a lot that can be learnt from the proposed study as the University of Johannesburg is a newly established institution and the above mentioned research group (previously existing in one of the merging components) has to “re-invent” itself in order for it to be aligned with the mission and vision of the Faculty of Engineering and the Built Environment hence those of the University as a whole while remaining sustainable, efficient, and locally and internationally competitive. It is my strongest belief that the results of this study will be mutually beneficial. I herewith humbly request the permission to undertake this research within the Faculty. Copy of the research questionnaire is here enclosed for your perusal and information.

Sincerely,

Antoine F. Mulaba-Bafubiandi

1

Prof. Antoine F. Mulaba-Bafubiandi  
Head: Minerals Processing and Technology research group  
Extraction Metallurgy Department  
Faculty of Engineering and the Built Environment  
Tel.: + (011) 5596215  
Fax: (011) 5596194  
Email.: amulaba@uj.ac.za
May 07, 2007

Introducing the questionnaire - Covering letter

Staff and post-graduate Students
Faculty of Engineering and
the Built Environment
University of Johannesburg

Dear Sir / Madam,

Subject: "Minerals Processing and Technology Research at the University of Johannesburg: Strategy for sustainability".

Your valued responses are requested and will be very important in that they will provide the necessary information which the researcher would use to come up with recommendations. It will take less than 15 minutes to complete the questionnaire consisting of three subsections. Please answer freely to all the questions. You are assured that all the information will be kept and treated in the strictest confidence. The findings will part of a MBA dissertation with the University of Johannesburg, South Africa on Advanced Strategic Management. When you have completed the questionnaire please drop at your departmental secretary or hand it to Antoine Mulaba. If you want any clarification or have queries related to this project, please contact the researcher on amulaba@uj.ac.za or telephone: 011 5596215, Cell.: 082 2191 224.

Thank you very much in advance for your cooperation.

Antoine F. Mulaba-Bafubiandi
RESEARCH QUESTIONNAIRE

This questionnaire was adapted from the survey document of the Research and Innovation office, University of Johannesburg (Research and innovation, 2006:19). It contains three sections. Section A is about personal information on the respondent. Section B consists of open ended questions while section C is composed of scored questions.

SECTION A — BACKGROUND INFORMATION

This section of the questionnaire refers to background and biographical information. You may answers by ticking in the associated box.

1. Your gender?
   Male
   Female

2. Your race?
   Black
   Coloured
   Indian / Asian
   White

3. Your age category?
   Younger than 25
   25 to 34 years
   35 to 44 years
   45 to 54 years
   55 to 64 years
   65 or older
4. Are you (currently) a postgraduate student?

<table>
<thead>
<tr>
<th>Yes</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>No</td>
<td></td>
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</tbody>
</table>

5. If yes (to the question above) For which degree / qualification are you currently registered?

<table>
<thead>
<tr>
<th>Undergraduate degree or diploma</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Honours degree / B Tech / LLB / Higher Diploma</td>
<td></td>
</tr>
<tr>
<td>Masters degree</td>
<td></td>
</tr>
<tr>
<td>Doctorate</td>
<td></td>
</tr>
</tbody>
</table>

6. Excluding this year (2007), for how many complete years have you been registered for this degree / qualification (see question above)?

<table>
<thead>
<tr>
<th>None (this is my first year)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td></td>
</tr>
<tr>
<td>Two</td>
<td></td>
</tr>
<tr>
<td>Three</td>
<td></td>
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<tr>
<td>Four or more</td>
<td></td>
</tr>
</tbody>
</table>

7. Are you (currently) an employee of the University of Johannesburg?

<table>
<thead>
<tr>
<th>Yes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td></td>
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</table>

8. For how many complete years have you been employed or studying?

<table>
<thead>
<tr>
<th>Less than 1 year</th>
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<tbody>
<tr>
<td>1 but less than 3 years</td>
<td></td>
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<tr>
<td>3 but less than 5 years</td>
<td></td>
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<tr>
<td>5 but less than 10 years</td>
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<tr>
<td>10 but less than 20 years</td>
<td></td>
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<tr>
<td>20 years or more</td>
<td></td>
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</table>

9. What is your highest academic qualification?

<table>
<thead>
<tr>
<th>Grade 12 / Matric</th>
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<tbody>
<tr>
<td>Post school certificate</td>
<td></td>
</tr>
<tr>
<td>Three-year degree or diploma</td>
<td></td>
</tr>
<tr>
<td>Four-year degree / diploma (e.g. Bing, B Tech, LLB, Higher Diploma or Honours degree)</td>
<td></td>
</tr>
<tr>
<td>Masters degree</td>
<td></td>
</tr>
<tr>
<td>Doctorate</td>
<td></td>
</tr>
<tr>
<td>Not applicable</td>
<td></td>
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</tbody>
</table>
10. In what year did you obtain your HIGHEST qualification (as indicated in question 8 above)?

<table>
<thead>
<tr>
<th>Option</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>In the period 2005 to 2006</td>
<td></td>
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<tr>
<td>In the period 2001 to 2004</td>
<td></td>
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<tr>
<td>In the period 1996 to 2000</td>
<td></td>
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<tr>
<td>In the period 1986 to 1995</td>
<td></td>
</tr>
<tr>
<td>Before 1986</td>
<td></td>
</tr>
<tr>
<td>Not applicable</td>
<td></td>
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</tbody>
</table>

11. Under which of the following conditions of service are you currently appointed at the UJ? Mark ALL applicable

<table>
<thead>
<tr>
<th>Condition</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Staff</td>
<td></td>
</tr>
<tr>
<td>Academic Staff (i.e., as a faculty member)</td>
<td></td>
</tr>
<tr>
<td>Technical Staff (inside a faculty)</td>
<td></td>
</tr>
<tr>
<td>Support Staff (i.e., as a member of a support department outside the faculties)</td>
<td></td>
</tr>
<tr>
<td>Not applicable</td>
<td></td>
</tr>
</tbody>
</table>

12. If you are appointed as an academic member of staff, What position do you currently hold in the faculty?

<table>
<thead>
<tr>
<th>Position</th>
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</thead>
<tbody>
<tr>
<td>Junior lecturer</td>
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<tr>
<td>Lecturer</td>
<td></td>
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<tr>
<td>Senior lecturer</td>
<td></td>
</tr>
<tr>
<td>Associate professor</td>
<td></td>
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<tr>
<td>Professor</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
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</tbody>
</table>

13. If you are currently not appointed as an academic member of staff, have you been involved in or associated with research whether at any institution of higher learning or at industry?

<table>
<thead>
<tr>
<th>Answer</th>
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<tbody>
<tr>
<td>No</td>
<td></td>
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<tr>
<td>Yes</td>
<td></td>
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</tbody>
</table>

14. For how many complete years have you been actively involved in research in industry?

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<thead>
<tr>
<th>Years</th>
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<tbody>
<tr>
<td>Less than 1 year</td>
<td></td>
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<tr>
<td>At least 1 but less than 3 years</td>
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<tr>
<td>At least 3 but less than 5 years</td>
<td></td>
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<tr>
<td>At least 5 but less than 10 years</td>
<td></td>
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</tbody>
</table>
At least 10 but less than 20 years
20 years or more
Not applicable

15. For how many complete years have you been actively involved in research at a tertiary education institution?

<table>
<thead>
<tr>
<th>Duration</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1 year</td>
<td></td>
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<tr>
<td>At least 1 but less than 3 years</td>
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<tr>
<td>At least 3 but less than 5 years</td>
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<td>At least 5 but less than 10 years</td>
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<td>At least 10 but less than 20 years</td>
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<tr>
<td>20 years or more</td>
<td></td>
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<tr>
<td>Not applicable</td>
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</table>

16. For how many complete years have you been involved in research supervision in industry?

<table>
<thead>
<tr>
<th>Duration</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1 year</td>
<td></td>
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<tr>
<td>At least 1 but less than 3 years</td>
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<tr>
<td>At least 3 but less than 5 years</td>
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<td>At least 5 but less than 10 years</td>
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<td>At least 10 but less than 20 years</td>
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<tr>
<td>20 years or more</td>
<td></td>
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<tr>
<td>Not applicable</td>
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</table>

17. For how many complete years have you been involved in research supervision at tertiary institution level?

<table>
<thead>
<tr>
<th>Duration</th>
<th>Answer</th>
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<tbody>
<tr>
<td>Less than 1 year</td>
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<tr>
<td>At least 1 but less than 3 years</td>
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<tr>
<td>At least 3 but less than 5 years</td>
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<td>At least 5 but less than 10 years</td>
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<td>At least 10 but less than 20 years</td>
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<tr>
<td>20 years or more</td>
<td></td>
</tr>
<tr>
<td>Not applicable</td>
<td></td>
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</table>

18. For how many complete years have you been involved in research management including generation/initiation of research topics and the design of research methodology in industry?
19. For how many complete years have you been involved in research management including generation/initiation of research topics and the design of the research methodology at a tertiary education institution?

<table>
<thead>
<tr>
<th>Option</th>
<th>Frequency</th>
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<tbody>
<tr>
<td>Less than 1 year</td>
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<tr>
<td>At least 1 but less than 3 years</td>
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<tr>
<td>At least 3 but less than 5 years</td>
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<td>At least 5 but less than 10 years</td>
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<td>At least 10 but less than 20 years</td>
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<tr>
<td>20 years or more</td>
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<tr>
<td>Not applicable</td>
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20. For how many complete years have you been involved in research management in terms of recruiting and hiring B-Tech, B-Sc(Hon.) or B-Eng (Hon.) students?

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<thead>
<tr>
<th>Option</th>
<th>Frequency</th>
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<tbody>
<tr>
<td>Less than 1 year</td>
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<tr>
<td>At least 1 but less than 3 years</td>
<td></td>
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<tr>
<td>At least 3 but less than 5 years</td>
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<td>At least 5 but less than 10 years</td>
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<tr>
<td>At least 10 but less than 20 years</td>
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<tr>
<td>20 years or more</td>
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<tr>
<td>Not applicable</td>
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</table>

21. For how many complete years have you been involved in research management in terms of recruiting and hiring postgraduate students (Masters and Doctorate)?

<table>
<thead>
<tr>
<th>Option</th>
<th>Frequency</th>
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</thead>
<tbody>
<tr>
<td>Less than 1 year</td>
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<td>At least 1 but less than 3 years</td>
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<td>At least 3 but less than 5 years</td>
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<td>At least 10 but less than 20 years</td>
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<tr>
<td>20 years or more</td>
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<tr>
<td>Not applicable</td>
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SECTION B –

The following set of questions contains OPINION RELATED questions. As there are no right or wrong answers, only your honest opinion is of importance to us.

1. What is your understanding of research at Universities in general and at the University of Johannesburg in particular?

2. What is your opinion on conducting research activities in the field of minerals processing and technology at the University of Johannesburg?

3. Give your opinion on the types of research activities to be conducted within the Minerals Processing and Technology Research Group?
4. Briefly share your idea on what sustainability of a research group is about.

5. Given that at the University of Johannesburg there is a research group dealing with minerals processing and technology in your opinion what strategy should it adopt / implement for it to be competitive nationally and internationally, and remain sustainable?

6. Raising funds for research activities, fellowship and bursaries for postgraduate students is an important enabler for research and is crucial to the establishment of a research conducive atmosphere within the research group. Share your views on challenges you faced on the above and give suggestions on possible improvements.

7. Recruitment of postgraduate students has been a real challenge to many research groups. While stringent quota limitations are imposed on the number of international students to be sponsored by usual sponsors (i.e. UJ, NRF, THRIP, locally based mining industries,
ESKOM, Telkom, etc...). Research group leaders and university professors are struggling to recruit prospective South African students willing to embark upon postgraduate studies. Share your views on the above local stand and give suggestions upon.

SECTION C
These scored questions are sub-divided into two parts.

In the "Actual Activities" column, rank each statement, from 1 to 5, where "5" is the phrase that you think would come closest to representing the current nature of activities performed by the Minerals Processing and Technology Research Group.

"1" indicate those activities which do not represent the activities of the research group at all.

Then go back and rank the statements again from 1 to 5, but this time according to activities you would like to see the Minerals Processing and Technology Research Group do and perform. Use the spaces in the "Effective Activities" column for these rankings with "5" to your most preferred option, and "1" your least preferred option.
**Actual Activity:** the mineral processing and technology research group’s main responsibility is to make sure that

**Effective Activity:** the mineral processing and technology research group’s main responsibility should be to make sure that

<table>
<thead>
<tr>
<th>Actual Activity</th>
<th>Effective Activity</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>A</td>
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<td>B</td>
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<td>C</td>
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<td></td>
<td></td>
<td>D</td>
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<tr>
<td></td>
<td></td>
<td>E</td>
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</table>

A. The MPTRG strategies are aligned with the business strategy of the Faculty of Engineering hence that of the University of Johannesburg

B. The MPTRG procedures and practices are efficiently administered

C. The MPTRG research policies and programs promote the training of postgraduate students and address industry challenges

D. The MPTRG processes and programs increase the Faculty’s ability to implement required changes in the manner in which the University of Johannesburg remains up to date with respect to its changing environment

E. All of the above
<table>
<thead>
<tr>
<th>Actual Activity</th>
<th>Effective Activity</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual Activity: the mineral processing and technology research group spends time on</td>
<td>Effective Activity: the mineral processing and technology research group should spend time on</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Actual Activity</th>
<th>Effective Activity</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Training postgraduate students so that higher student throughput is achieved</td>
<td>B Training postgraduate students to produce research output (i.e. journal articles, conference papers, dissertations/thesis)</td>
<td>C Hiring postdoctoral researchers to boost research outputs</td>
</tr>
<tr>
<td>D Training postgraduate students and taking on board postdoctoral researchers to address challenges faced by the industry and brought by the changing environment</td>
<td>E All of the above</td>
<td></td>
</tr>
<tr>
<td>Actual Activity</td>
<td>Effective Activity</td>
<td>Statement</td>
</tr>
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<td>-----------------</td>
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</tr>
<tr>
<td>Actual Activity: the mineral processing and technology research group is an active participant in</td>
<td>Effective Activity: the mineral processing and technology research group should be an active participant in</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Actual Activity</strong></td>
<td><strong>Effective Activity</strong></td>
<td><strong>Statement</strong></td>
</tr>
<tr>
<td>A</td>
<td>Formulating extraction metallurgy departmental business and operational research strategies</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Designing extraction metallurgy departmental human resources strategies for staffing, training, appraising with emphasis on research.</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Designing motivational and incentive practices to encourage and improve employee morale and research related job satisfaction</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Formulating change strategies to ensure that Faculty /University new research strategies are supported by research staff, postdoctoral researchers and postgraduates students.</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>All of the above</td>
<td></td>
</tr>
<tr>
<td>Actual Activity</td>
<td>Effective Activity</td>
<td>Statement</td>
</tr>
<tr>
<td>-----------------</td>
<td>--------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>the mineral processing and technology research group works to</td>
<td>the mineral processing and technology research group should work to</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Actual Activity</th>
<th>Effective Activity</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Ensure postgraduate students’ recruitment, training and completion of their studies.</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Ensure that postgraduate students are given adequate research exposure and supervision for them to deliver.</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Ensure the recruitment of postdoctoral researchers and research assistants.</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Ensure that postdoctoral researchers and research assistants are given adequate research exposure and supervision for them to deliver.</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>All of the above</td>
<td></td>
</tr>
</tbody>
</table>
5  

**Actual Activity:** The objectives of the research and development programs and projects carried out by the mineral processing and technology research group are

**Effective Activity:** The objectives of the research and development programs and projects carried out by the mineral processing and technology research group should be

<table>
<thead>
<tr>
<th>Actual Activity</th>
<th>Effective Activity</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td></td>
<td>To promote competencies that increase the ability of future employee of minerals industry to increase productivity and reduce defective output</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td></td>
<td>To promote competencies that ensure that managers and employees in the minerals industry understand industry production and process operations</td>
</tr>
<tr>
<td><strong>C</strong></td>
<td></td>
<td>To promote problem solving in the minerals industry</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td></td>
<td>To promote pro-activity in new processes and applications in the minerals industry</td>
</tr>
<tr>
<td><strong>E</strong></td>
<td></td>
<td>All of the above</td>
</tr>
</tbody>
</table>
6

**Actual Activity:** the mineral processing and technology research group's credibility comes from

**Effective Activity:**
the mineral processing and technology research group's credibility should come from

<table>
<thead>
<tr>
<th>Actual Activity</th>
<th>Effective Activity</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>Helping industry solve their process related problems</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>Training extraction metallurgists at postgraduate levels ready to be absorbed in the industry</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>Assisting the community, as outreach program, in the field of minerals processing, beneficiation and process.</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>Maintaining international standards as evidenced by the high quality of research output</td>
</tr>
<tr>
<td></td>
<td>E</td>
<td>All of the above</td>
</tr>
<tr>
<td>Actual Activity</td>
<td>Effective Activity</td>
<td>Statement</td>
</tr>
<tr>
<td>-----------------</td>
<td>--------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Actual Activity: the mineral processing and technology research group’s effectiveness is measured by its ability to</td>
<td>Effective Activity: the mineral processing and technology research group’s effectiveness should be measured by its ability to</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A Increase postgraduate students throughput in extraction metallurgy department of the University of Johannesburg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B Increase number of research output in terms of journal articles, conference papers, chapter in books, patents, etc...</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C Built adequate research laboratory to house research in the field of mineral processing, beneficiation and process at the Faculty of Engineering and the Built Environment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D Efficiently address industry and community related challenges in the field of minerals processing, beneficiation and process</td>
<td></td>
</tr>
<tr>
<td></td>
<td>E All of the above</td>
<td></td>
</tr>
</tbody>
</table>
**Actual Activity:** the mineral processing and technology research group’s sustainability is measured by its ability to

**Effective Activity:** the mineral processing and technology research group’s sustainability should be measured by its ability to

<table>
<thead>
<tr>
<th>Actual Activity</th>
<th>Effective Activity</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Recruit and maintain at least four active researchers in the group</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Recruit and maintain a minimum of five postgraduate student each year</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Graduate at least two postgraduate student every year</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Keep operational, maintain and acquire new research facility, develop regularly.</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>All of the above</td>
<td></td>
</tr>
</tbody>
</table>

Many thanks for your co-operation in completing this questionnaire

Please submit your completed questionnaire by ordinary mail, email or fax:

1. Antoine Mulaba  
   John Orr Building, Room 3161  
   DFC (for ordinary mails)

2. Send the completed questionnaire via e-mail as an attachment to Antoine Mulaba: amulaba@uj.ac.za.

3. Fax the completed questionnaire to: 011 5596194 (attention Antoine Mulaba)
Dear [Name],

I am currently pursuing a Masters of Business Administration (MBA) degree with the Faculty of Management of the University of Johannesburg. As part of my studies I have to carry out a research for the MBA dissertation. I have identified the Minerals Processing and Technology Research Group as a case to study with the following research topic: "Minerals Processing and Technology Research at the University of Johannesburg: Strategy for sustainability". No investigation will be conducted on human beings, living animals nor living vegetations. I herewith request the ethical clearance for the above mentioned research work.

Many thanks in advance

Antoine F. Mulaba-Bafubiandi
(Student No: 802025417)

---

*Prof. Antoine F. Mulaba-Bafubiandi  
Head: Minerals Processing and Technology research group  
Extraction Metallurgy Department  
Faculty of Engineering and the Built Environment  
Tel.: + (011) 5596215  
Fax.: (011) 5596194  
E:mulaba@uj.ac.za*
Annexure 5: Related results

Ann. 5.1.: QUESTIONNAIRE RETURN RATE AND SAMPLE DEMOGRAPHY

Table ann. 5.1.1: Questionnaire return rate

<table>
<thead>
<tr>
<th>Study Population</th>
<th>Scores Frequency</th>
<th>Fraction of study group (%)</th>
<th>Fraction of study population (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participants</td>
<td>27</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Respondents</td>
<td>26</td>
<td>100</td>
<td>96.30</td>
</tr>
<tr>
<td>Non-respondents</td>
<td>1</td>
<td>100</td>
<td>3.70</td>
</tr>
<tr>
<td>Management</td>
<td>2</td>
<td>100</td>
<td>7.41</td>
</tr>
<tr>
<td>Lecturer and senior lecturers</td>
<td>4</td>
<td>100</td>
<td>14.81</td>
</tr>
<tr>
<td>Postgraduate and B-Tech students</td>
<td>21</td>
<td>100</td>
<td>77.77</td>
</tr>
</tbody>
</table>

The demographic profile and the academic background of the sample is presented in Table ann.5.1.2.

It was noticed that majority of the respondents were males (81%). Female respondents constituted only 19% of the sample. This male domination of the sample could skew the results by imposing the known rationalization of the opinion as compared with the subjectivism characterizing the feminine world.
ANN. 5.1.2: Demographic profile and academic background of the sample

<table>
<thead>
<tr>
<th>Category</th>
<th>Females</th>
<th>Males</th>
<th>Bachelors degree</th>
<th>Masters degree</th>
<th>Doctorate degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graduate students</td>
<td>4</td>
<td>11</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Postgraduate students</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>UJ staff</td>
<td>0</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Non-UJ staff</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>5</td>
<td>21</td>
<td>6</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

ANN. 5.2. PRESENTATION OF RESULTS FROM QUESTIONS OF SECTION B

In the section B of the questionnaire respondents were required to reply opinion related questions.

While 10% of respondents chose to not reply opinion related questions, 63.33% of respondents generally defined research as intellectual and practical activities in which problems are addressed, elucidated and solved. They included also improvement and innovation on technologies and processes. They stressed that research at university departments is essential and has an impact on a better and further understanding of concepts.
taught in classes. 3.33% of the respondents, that the researcher thinks belong to the university management level, state that research is part of the academics job description. 3.33% of respondents defined research in terms of its expected output which principally include publishing papers in refereed journals and at conferences, training and graduating students at Masters and Doctorate degree levels, etc. While 23.33% of respondents are satisfied with the current status of research activities at the Mineral Processing and Technology Research Group in comparison with the general status of research activities at the University of Johannesburg and with that at other local universities (Wits, Pretoria, Tswane University of Technology, Stellenbosch and Cape Town, to name a few), the researcher agrees with 3.33% of respondents who stated that “at UJ research has been badly neglected in comparison with other universities”.

ANN.5.3. PRESENTATION OF RESULTS FROM QUESTIONS OF SECTION C

In this section, readers are referred to section C of the questionnaires (p. 90-98) for an explanation of the meaning of A, B, C, D and E in the tables in the next pages.

In the first part of question 1, respondents were required to rank the current main responsibilities of the MPTRG in line with the ranking order prescribed by the researcher. Responses to question 1 appear in Table Ann. 5.3.1. as follows:
Table Ann.5.3.1: Actual activities constituting the Minerals Processing and Technology Research Group responsibilities

<table>
<thead>
<tr>
<th>Rank</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Count</td>
<td>%</td>
<td>Count</td>
<td>%</td>
<td>Count</td>
</tr>
<tr>
<td>MD</td>
<td>7</td>
<td>26.92</td>
<td>5</td>
<td>19.23</td>
<td>7</td>
</tr>
<tr>
<td>NMD</td>
<td>14</td>
<td>53.85</td>
<td>15</td>
<td>57.69</td>
<td>10</td>
</tr>
<tr>
<td>3rd MD</td>
<td>1</td>
<td>3.85</td>
<td>3</td>
<td>11.54</td>
<td>7</td>
</tr>
<tr>
<td>LMD</td>
<td>2</td>
<td>7.69</td>
<td>2</td>
<td>7.69</td>
<td>1</td>
</tr>
<tr>
<td>NSD</td>
<td>2</td>
<td>7.69</td>
<td>1</td>
<td>3.85</td>
<td>1</td>
</tr>
<tr>
<td>TOTAL</td>
<td>26</td>
<td>100</td>
<td>26</td>
<td>100</td>
<td>26</td>
</tr>
</tbody>
</table>

The acronym MD represents the most dominant activity, NMD represents the next most dominant activity, 3<sup>rd</sup> MD represents the third most dominant activity, LMD represents the least most dominant activity and NSD of not so dominant activity.

In the second part of question 1, respondents were required to rank the responsibilities of the MPTRG which in their view, would ensure that MPTRG assists the Faculty of Engineering and the Built Environment, University of Johannesburg, to achieve its goals of higher levels of customer service, quality and productivity. Responses to question 1 appear in Table ann. 5.3.2 as follows:
Table ann. 5.3.2.: Effective activities which should constitute the Minerals Processing and Technology Research Group responsibilities

<table>
<thead>
<tr>
<th>Rank</th>
<th>A</th>
<th>%</th>
<th>B</th>
<th>%</th>
<th>C</th>
<th>%</th>
<th>D</th>
<th>%</th>
<th>E</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPO</td>
<td>11</td>
<td>42</td>
<td>11</td>
<td>42</td>
<td>13</td>
<td>50</td>
<td>10</td>
<td>38</td>
<td>7</td>
<td>26</td>
</tr>
<tr>
<td>NMPO</td>
<td>9</td>
<td>34</td>
<td>7</td>
<td>26</td>
<td>6</td>
<td>23</td>
<td>7</td>
<td>26</td>
<td>5</td>
<td>19</td>
</tr>
<tr>
<td>3rd MPO</td>
<td>3</td>
<td>11</td>
<td>4</td>
<td>15</td>
<td>4</td>
<td>15</td>
<td>6</td>
<td>23</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>LPO</td>
<td>2</td>
<td>7.6</td>
<td>2</td>
<td>7.6</td>
<td>2</td>
<td>7.6</td>
<td>2</td>
<td>7.6</td>
<td>3</td>
<td>11.54</td>
</tr>
<tr>
<td>NPO</td>
<td>1</td>
<td>3.85</td>
<td>2</td>
<td>7.69</td>
<td>1</td>
<td>3.85</td>
<td>1</td>
<td>3.85</td>
<td>9</td>
<td>34.62</td>
</tr>
<tr>
<td>TOTAL</td>
<td>26</td>
<td>100</td>
<td>26</td>
<td>100</td>
<td>26</td>
<td>100</td>
<td>26</td>
<td>100</td>
<td>26</td>
<td>100</td>
</tr>
</tbody>
</table>

The acronym MPO represents the most preferred option, NMPO represents the next most preferred option, 3rd MPO represents the third most preferred option, LPO represents the least preferred option and NPO the non-preferred option.

In terms of the results presented in Table ann. 5.3.1. and Table ann.5.3.2. responses to question 1 of section C could be described as follows:
A. The Minerals Processing and Technology Research Group (MPTRG) strategies are aligned with the business strategy of the Faculty of Engineering hence that of the University of Johannesburg

In terms of the responses provided, 26.92% of respondents believed that this was the MPTRG's most dominant activity and 53.85% indicated that this was the MPTRG's next dominant activity. 3.85% of respondents indicated that this was the MPTRG's 3rd most dominant activity and 7.69% indicated that this was the least dominant activity. 7.69% of respondents believed that this was not the MPTRG's dominant activity.

When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 42.31% of respondents indicated that this would be the most effective activity and 34.62% of respondents stated that this would be the next most effective activity. Only 11.54% of respondents believed that this would be the third most effective activity and 7.69% of respondents stated that this would be the least effective activity. 3.85% of the respondents stated that this would not be an effective activity.

B. The MPTRG procedures and practices are efficiently administered

In terms of the responses provided, 19.23% of respondents believed that this was the MPTRG's most dominant activity and 57.69% indicated that this was the MPTRG's next dominant activity. 11.54% of respondents indicated that this was the MPTRG's 3rd most dominant activity and 7.69% indicated that this was the least dominant activity. 3.85% of respondents believed that this was not the MPTRG's dominant activity.

When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 42.31% of respondents indicated that this would be the most effective activity and 26.92% of respondents stated that this would be the next most effective activity. Only 15.38% of
respondents believed that this would be the third most effective activity and 7.69% of respondents stated that this would be the least effective activity. 7.69% of the respondents stated that this would not be an effective activity.

C. The MPTRG research policies and programs promote the training of postgraduate students and address industry challenges

In terms of the responses provided, 26.92 % of respondents believed that this was the MPTRG’s most dominant activity and 38.46 % indicated that this was the MPTRG’s next dominant activity. 26.92% of respondents indicated that this was the MPTRG’s 3rd most dominant activity and 3.85% indicated that this was the least dominant activity. 3.85% of respondents believed that this was not the MPTRG’s dominant activity.

When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 50.00% of respondents indicated that this would be the most effective activity and 23.08% of respondents stated that this would be the next most effective activity. Only 115.38% of respondents believed that this would be the third most effective activity and 7.69% of respondents stated that this would be the least effective activity. 3.85% of the respondents stated that this would not be an effective activity.

D. The MPTRG processes and programs increase the Faculty’s ability to implement required changes in the manner in which the University of Johannesburg remains up to date with respect to its changing environment

In terms of the responses provided, 30.77% of respondents believed that this was the MPTRG’s most dominant activity and 30.77 % indicated that this was the MPTRG’s next dominant activity. 23.08% of respondents indicated that this was the MPTRG ‘s 3rd most
dominant activity and 11.54% indicated that this was the least dominant activity. 3.85% of respondents believed that this was not the MPTRG's dominant activity.

When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 38.46% of respondents indicated that this would be the most effective activity and 26.92% of respondents stated that this would be the next most effective activity. Only 23.08% of respondents believed that this would be the third most effective activity and 7.69% of respondents stated that this would be the least effective activity. 3.85% of the respondents stated that this would not be an effective activity.

**E. Combination of the above roles**

In terms of the responses provided, 34.62% of respondents believed that this was the MPTRG's most dominant activity and 34.62% indicated that this was the MPTRG's next dominant activity. 7.69% of respondents indicated that this was the MPTRG's 3rd most dominant activity and 7.69% indicated that this was the least dominant activity. 15.38% of respondents believed that this was not the MPTRG's dominant activity.

When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 26.92% of respondents indicated that this would be the most effective activity and 19.23% of respondents stated that this would be the next most effective activity. Only 7.69% of respondents believed that this would be the third most effective activity and 11.54% of respondents stated that this would be the least effective activity. 34.62% of the respondents stated that this would not be an effective activity.
A very important conclusion from Table ann. 5.3.1 to Table ann. 5.3.16. is that with respect to A, B, C, D, and E, the MPTRG is not fulfilling the role as it should be.

From Table ann.5.3.1 and Table ann.5.3.2, it is noticed that only 26.92% of respondents believed that MPTRG strategies are aligned with the business strategy of the Faculty of Engineering and the Built Environment while 88.47% thought that the MPTRG should spend more time on training postgraduate students so that a higher postgraduate student’s throughput is achieved.

For Table ann. 5.3.1, A: The MPTRG strategies are aligned with the business strategy of the Faculty of Engineering hence that of the University of Johannesburg, B: The MPTRG procedures and practices are efficiently administered, C: The MPTRG research policies and programs promote the training of postgraduate students and address industry challenges, D: The MPTRG processes and programs increase the Faculty’s ability to implement required changes in the manner in which the University of Johannesburg remains up to date with respect to its changing environment, and E: All of the above. while only 30.76% of respondents believed that the MPTRG was not fulfilling all the above roles (from Table ann.5.3.1), 53.84% of respondents were of the opinion that the MPTRG should improve the alignment of its strategies with those of the UJ and improve the administration of procedures.

In the first part of question 2, respondents were required to describe activities that the MPTRG spends time on in line with the ranking order prescribed by the researcher. Responses to question 2 appear in Table ann.5.3.3. as follows:
Table ann.5.3.3.: Actual activities that the Minerals Processing and Technology Research Group spends time on

<table>
<thead>
<tr>
<th>Rank</th>
<th>A</th>
<th>Count</th>
<th>%</th>
<th>B</th>
<th>Count</th>
<th>%</th>
<th>C</th>
<th>Count</th>
<th>%</th>
<th>D</th>
<th>Count</th>
<th>%</th>
<th>E</th>
<th>Count</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD</td>
<td>4</td>
<td>15.38</td>
<td>1</td>
<td>3.85</td>
<td>2</td>
<td>7.69</td>
<td>4</td>
<td>15.38</td>
<td>6</td>
<td>23.08</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NMD</td>
<td>8</td>
<td>30.77</td>
<td>12</td>
<td>46.15</td>
<td>7</td>
<td>26.92</td>
<td>9</td>
<td>34.62</td>
<td>4</td>
<td>15.38</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd MD</td>
<td>8</td>
<td>30.77</td>
<td>6</td>
<td>23.08</td>
<td>10</td>
<td>28.46</td>
<td>7</td>
<td>26.92</td>
<td>8</td>
<td>30.77</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LMD</td>
<td>5</td>
<td>19.23</td>
<td>4</td>
<td>15.38</td>
<td>2</td>
<td>7.69</td>
<td>1</td>
<td>3.85</td>
<td>2</td>
<td>7.69</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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In the second part of question C respondents were required to select activities that the MPTRG should spend time on to assist the Faculty of Engineering and the Built Environment of the University of Johannesburg to achieve higher levels of postgraduate students, community, industry and government service quality, and productivity in research. Responses to the second part of question C appear in Table ann.5.3.4. as follow:
Table ann. 5.3.4.: Effective activities that the Minerals Processing and Technology Research Group should spend time on

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In terms of the results presented in Table ann. 5.3.3. and Table ann.5.3.4. responses to question 2 of section C could be described as follows:

**A. MPTRG spends time on assisting training postgraduate students so that higher student throughput is achieved**

In terms of the responses provided, 15.38 % of respondents believed that this was the MPTRG’s most dominant activity and 30.77 % indicated that this was the MPTRG’s next dominant activity. 30.77% of respondents indicated that this was the MPTRG’s 3rd most dominant activity and 19.23% indicated that this was the least dominant activity. 3.85% of respondents believed that this was not the MPTRG’s dominant activity.
When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 38.46% of respondents indicated that this would be the most effective activity and 30.77% of respondents stated that this would be the next most effective activity. Only 15.38% of respondents believed that this would be the third most effective activity and 7.69% of respondents stated that this would be the least effective activity. 15.38% of the respondents stated that this would not be an effective activity.

**B. MPTRG spends time on assisting training postgraduate students to produce research output (i.e. journal articles, conference papers, dissertations/thesis)**

In terms of the responses provided, 3.85% of respondents believed that this was the MPTRG's most dominant activity and 46.15% indicated that this was the MPTRG's next dominant activity. 23.08% of respondents indicated that this was the MPTRG's 3rd most dominant activity and 15.38% indicated that this was the least dominant activity. 11.54% of respondents believed that this was not the MPTRG's dominant activity.

When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 50.00% of respondents indicated that this would be the most effective activity and 15.38% of respondents stated that this would be the next most effective activity. Only 19.23% of respondents believed that this would be the third most effective activity and 11.54% of respondents stated that this would be the least effective activity. 3.85% of the respondents stated that this would not be an effective activity.

**C. MPTRG spends time assisting hiring postdoctoral researchers to boost research outputs**
In terms of the responses provided, 7.69% of respondents believed that this was the MPTRG's most dominant activity and 26.92% indicated that this was the MPTRG's next dominant activity. 28.46% of respondents indicated that this was the MPTRG's 3rd most dominant activity and 7.69% indicated that this was the least dominant activity. 19.23% of respondents believed that this was not the MPTRG's dominant activity.

When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 34.62% of respondents indicated that this would be the most effective activity and 11.54% of respondents stated that this would be the next most effective activity. Only 30.77% of respondents believed that this would be the third most effective activity and 15.38% of respondents stated that this would be the least effective activity. 7.69% of the respondents stated that this would not be an effective activity.

**D. MPTRG spends time assisting training postgraduate students and taking on board postdoctoral researchers to address challenges faced by the industry and brought by the changing environment**

In terms of the responses provided, 15.38% of respondents believed that this was the MPTRG's most dominant activity and 34.62% indicated that this was the MPTRG's next dominant activity. 26.92% of respondents indicated that this was the MPTRG's 3rd most dominant activity and 3.85% indicated that this was the least dominant activity. 19.23% of respondents believed that this was not the MPTRG's dominant activity.

When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 42.31% of respondents indicated that this would be the most effective activity and 19.23% of respondents stated that this would be the next most effective activity. Only 23.07% of respondents believed that this would be the third most effective activity and 7.69% of
respondents stated that this would be the least effective activity. 7.69% of the respondents stated that this would not be an effective activity.

E. Combination of the above roles

In terms of the responses provided, 23.08% of respondents believed that this was the MPTRG's most dominant activity and 15.38% indicated that this was the MPTRG's next dominant activity. 30.77% of respondents indicated that this was the MPTRG's 3rd most dominant activity and 7.69% indicated that this was the least dominant activity. 23.08% of respondents believed that this was not the MPTRG's dominant activity.

When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 30.77% of respondents indicated that this would be the most effective activity and 15.38% of respondents stated that this would be the next most effective activity. Only 11.54% of respondents believed that this would be the third most effective activity and 11.54% of respondents stated that this would be the least effective activity. 30.77% of the respondents stated that this would not be an effective activity.

A very important conclusion from Table ann. 5.3.3 and Table ann. 5.3.4. is that with respect to A, B, C, D, and E, the MPTRG is not fulfilling the role as it should be.

From Table ann.5.3.3 and Table ann.5.3.4, it is noticed that only 38.46% of the respondents believed that the MPTRG was fulfilling its role in increasing the number of postgraduate students trained, increasing the research output produced by postgraduate students, and increasing the number of postdoctoral researchers while 57.69% of respondents believed that MPTRG should spend more time in: A: training postgraduate students so that higher student throughput is achieved, B: training postgraduate students to produce research output (i.e.
journal articles, conference papers, dissertations/thesis, C: hiring postdoctoral researchers to boost research outputs, D: training postgraduate students and taking on board postdoctoral researchers to address challenges faced by the industry and brought by the changing environment.

In the first part of question 3, respondents were required to describe activities in respect of which the MPTRG is an active participant. Responses to first part of question 3 appear in Table ann.5.3.5. as follows:

**Table ann.5.3.5. : Actual activities in which MPTRG is an active participant**

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In the second part of question 3 respondents were required to identify in which activities the MPTRG should be an active participant to be in a position to assist the Faculty of Engineering to achieve its goals of higher levels of postgraduate students, community, industry and government service quality, and productivity in research. Responses to the second part of question 3 appear in Table ann. 5.3.6. as follow:

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In terms of the results presented in Table ann.5.3.5 and Table ann.5.3.6, responses to question 3 of section C could be described as follows:
A. **MPTRG is an active participant in formulating extraction metallurgy departmental business and operational research strategies**

In terms of the responses provided, 26.92% of respondents believed that this was the MPTRG's most dominant activity and 46.15% indicated that this was the MPTRG's next dominant activity. 15.38% of respondents indicated that this was the MPTRG's 3rd most dominant activity and 3.85% indicated that this was the least dominant activity. 7.69% of respondents believed that this was not the MPTRG's dominant activity.

When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 50.00% of respondents indicated that this would be the most effective activity and 15.38% of respondents stated that this would be the next most effective activity. Only 19.23% of respondents believed that this would be the third most effective activity and 7.69% of respondents stated that this would be the least effective activity. 7.69% of the respondents stated that this would not be an effective activity.

B. **MPTRG is an active participant in designing extraction metallurgy departmental human resources strategies for staffing, training, appraising with emphasis on research.**

In terms of the responses provided, 15.38% of respondents believed that this was the MPTRG's most dominant activity and 38.46% indicated that this was the MPTRG's next dominant activity. 23.08% of respondents indicated that this was the MPTRG's 3rd most dominant activity and 7.69% indicated that this was the least dominant activity. 15.38% of respondents believed that this was not the MPTRG's dominant activity.

When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 38.46% of respondents indicated that this would be the most effective activity and 30.77% of
respondents stated that this would be the next most effective activity. Only 19.23% of respondents believed that this would be the third most effective activity and 3.85% of respondents stated that this would be the least effective activity. 7.69% of the respondents stated that this would not be an effective activity.

_C. MPTRG is an active participant in designing motivational and incentive practices to encourage and improve employee morale and research related job satisfaction_

In terms of the responses provided, 7.69% of respondents believed that this was the MPTRG’s most dominant activity and 30.77% indicated that this was the MPTRG’s next dominant activity. 30.77% of respondents indicated that this was the MPTRG’s 3rd most dominant activity and 11.54% indicated that this was the least dominant activity. 19.23% of respondents believed that this was not the MPTRG’s dominant activity.

When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 30.77% of respondents indicated that this would be the most effective activity and 26.92% of respondents stated that this would be the next most effective activity. Only 19.23% of respondents believed that this would be the third most effective activity and 11.54% of respondents stated that this would be the least effective activity. 11.54% of the respondents stated that this would not be an effective activity.

_D. MPTRG is an active participant in formulating change strategies to ensure that Faculty /University new research strategies are supported by research staff, postdoctoral researchers and postgraduates students._

In terms of the responses provided, 11.54% of respondents believed that this was the MPTRG’s most dominant activity and 30.77% indicated that this was the MPTRG’s next
dominant activity. 26.92% of respondents indicated that this was the MPTRG's 3rd most dominant activity and 19.23% indicated that this was the least dominant activity. 11.54% of respondents believed that this was not the MPTRG's dominant activity.

When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 42.31% of respondents indicated that this would be the most effective activity and 15.38% of respondents stated that this would be the next most effective activity. Only 26.92% of respondents believed that this would be the third most effective activity and 3.85% of respondents stated that this would be the least effective activity. 11.54% of the respondents stated that this would not be an effective activity.

E. Combination of the above roles

In terms of the responses provided, 7.69% of respondents believed that this was the MPTRG's most dominant activity and 38.46% indicated that this was the MPTRG's next dominant activity. 19.23% of respondents indicated that this was the MPTRG's 3rd most dominant activity and 15.38% indicated that this was the least dominant activity. 19.23% of respondents believed that this was not the MPTRG's dominant activity.

When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 30.77% of respondents indicated that this would be the most effective activity and 23.08% of respondents stated that this would be the next most effective activity. Only 11.54% of respondents believed that this would be the third most effective activity and 7.69% of respondents stated that this would be the least effective activity. 26.92% of the respondents stated that this would not be an effective activity.
A very important conclusion from Table ann. 5.3.5 and Table ann. 5.3.6. is that with respect to A, B, C, D, and E, the MPTRG is not fulfilling the role as it should be.

From Table ann. 5.3.5 and Table ann. 5.3.6, it is concluded that only 46.15% of respondent believed that the MPTRG is an active participant in: A: formulating extraction metallurgy departmental business and operational research strategies, B: designing extraction metallurgy departmental human resources strategies for staffing, training, appraising with emphasis on research, C: designing motivational and incentive practices to encourage and improve employee morale and research related job satisfaction, D: Formulating change strategies to ensure that Faculty /University new research strategies are supported by research staff, postdoctoral researchers and postgraduates students while 65.39% of respondents were of the opinion that the MPTRG should improve on all of the above issues. In the first part of question 4, respondents were required to describe activities in respect of which the MPTRG works towards. Responses to question 4 appear in Table ann.5.3.7, as follows:

Table ann.5.3.7.: Actual activities that MPTRG works towards

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In the second part of question 4 respondents were required to identify effective activities that the MPTRG should work towards to be in a position to assist the Faculty of Engineering to achieve its goals of higher levels of postgraduate students, community, industry and government service quality, and productivity in research. Responses to the second part of question 4 appear in Table ann.5.3.8 as follow:

Table ann.5.3.8: Effective activities that MPTRG should work towards

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In terms of the results presented in Table ann.5.3.7 and Table ann.5.3.8, the MPTRG should work towards:

A. Ensuring postgraduate students’ recruitment, training and completion of their studies.
In terms of the responses provided, 23.08% of respondents believed that this was the MPTRG's most dominant activity and 38.46% indicated that this was the MPTRG's next dominant activity. 19.23% of respondents indicated that this was the MPTRG's 3rd most dominant activity and 11.54% indicated that this was the least dominant activity. 7.69% of respondents believed that this was not the MPTRG's dominant activity.

When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 46.15% of respondents indicated that this would be the most effective activity and 26.92% of respondents stated that this would be the next most effective activity. Only 11.54% of respondents believed that this would be the third most effective activity and 11.54% of respondents stated that this would be the least effective activity. 3.85% of the respondents stated that this would not be an effective activity.

B. Ensuring that postgraduate students are given adequate research exposure and supervision for them to deliver.

In terms of the responses provided, 19.23% of respondents believed that this was the MPTRG's most dominant activity and 34.62% indicated that this was the MPTRG's next dominant activity. 26.92% of respondents indicated that this was the MPTRG's 3rd most dominant activity and 11.54% indicated that this was the least dominant activity. 7.69% of respondents believed that this was not the MPTRG's dominant activity.

When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 46.15% of respondents indicated that this would be the most effective activity and 30.77% of respondents stated that this would be the next most effective activity. Only 7.69% of respondents believed that this would be the third most effective activity and 11.54% of respondents believed that this would be the third most effective activity and 11.54% of
respondents stated that this would be the least effective activity. 3.85% of the respondents stated that this would not be an effective activity.

C. Ensuring the recruitment of postdoctoral researchers and research assistants

In terms of the responses provided, 7.69% of respondents believed that this was the MPTRG’s most dominant activity and 30.77% indicated that this was the MPTRG’s next dominant activity. 38.46% of respondents indicated that this was the MPTRG’s 3rd most dominant activity and 15.38% indicated that this was the least dominant activity. 7.69% of respondents believed that this was not the MPTRG’s dominant activity.

When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 38.46% of respondents indicated that this would be the most effective activity and 23.07% of respondents stated that this would be the next most effective activity. Only 19.23% of respondents believed that this would be the third most effective activity and 11.54% of respondents stated that this would be the least effective activity. 7.69% of the respondents stated that this would not be an effective activity.

D. Ensuring that postdoctoral researchers and research assistants are given adequate research exposure and supervision for them to deliver

In terms of the responses provided, 11.54% of respondents believed that this was the MPTRG’s most dominant activity and 46.15% indicated that this was the MPTRG’s next dominant activity. 15.38% of respondents indicated that this was the MPTRG’s 3rd most dominant activity and 15.38% indicated that this was the least dominant activity. 11.54% of respondents believed that this was not the MPTRG’s dominant activity.
When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 34.62% of respondents indicated that this would be the most effective activity and 23.07% of respondents stated that this would be the next most effective activity. Only 19.23% of respondents believed that this would be the third most effective activity and 15.38% of respondents stated that this would be the least effective activity. 7.69% of the respondents stated that this would not be an effective activity.

E. Combination of the above roles

In terms of the responses provided, 7.69% of respondents believed that this was the MPTRG’s most dominant activity and 23.08% indicated that this was the MPTRG’s next dominant activity. 38.46% of respondents indicated that this was the MPTRG’s 3rd most dominant activity and 7.69% indicated that this was the least dominant activity. 23.08% of respondents believed that this was not the MPTRG’s dominant activity.

When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 26.92% of respondents indicated that this would be the most effective activity and 26.92% of respondents stated that this would be the next most effective activity. Only 15.38% of respondents believed that this would be the third most effective activity and 7.69% of respondents stated that this would be the least effective activity. 13.07% of the respondents stated that this would not be an effective activity.

A very important conclusion from Table ann. 5.3.7 and Table ann. 5.3.8. is that with respect to A, B, C, D, and E, the MPTRG is not fulfilling the role as it should be.

From Table ann. 5.3.7 and Table ann. 5.3.8, it is noticed that only 30.77% of respondents believed that the MPTRG was working to: A: ensure postgraduate students’ recruitment, training and completion of their studies, B: ensure that postgraduate students are given
adequate research exposure and supervision for them to deliver, C: ensure the recruitment of postdoctoral researchers and research assistants, D: ensure that postdoctoral researchers and research assistants are given adequate research exposure and supervision for them to deliver while 53.84% were of the opinion that the MPTRG has to improve on the above.

In the first part of question 5, respondents were required to describe objectives of the MPTRG’s research and development programs. Responses to the first part of question 5 appear in Table ann.5.3.9. as follows:

Table ann.5.3.9: Actual activities constituting objectives of MPTRG’s research and development programs and projects carried out

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In the second part of question 5 respondents were required to identify effective activities that should constitute the objectives of the MPTRG so that it is in a position to assist the Faculty of Engineering to achieve its goals of higher levels of postgraduate students, community, industry and government service quality, and productivity in research. Responses to the second part of question 5 appear in Table ann.5.3.10. as follow:

Table ann.5.3.10: Effective activities that should constitute the objectives of MPTRG's research and development programs and projects carried out

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In terms of the results presented in Table ann.5.3.9 and Table ann.5.3.10. Objectives of the MPTRG could be described as follows:
A. To promote competencies that increase the ability of future employee of minerals industry to increase productivity and reduce defective output

In terms of the responses provided, 30.77% of respondents believed that this was the MPTRG's most dominant activity and 42.31% indicated that this was the MPTRG's next dominant activity. 7.69% of respondents indicated that this was the MPTRG's 3rd most dominant activity and 15.38% indicated that this was the least dominant activity. 3.85% of respondents believed that this was not the MPTRG's dominant activity.

When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 42.31% of respondents indicated that this would be the most effective activity and 23.08% of respondents stated that this would be the next most effective activity. Only 19.23% of respondents believed that this would be the third most effective activity and 7.69% of respondents stated that this would be the least effective activity. 7.69% of the respondents stated that this would not be an effective activity.

B. To promote competencies that ensure that managers and employees in the minerals industry know industry production and process operations

In terms of the responses provided, 23.08% of respondents believed that this was the MPTRG's most dominant activity and 46.15% indicated that this was the MPTRG's next dominant activity. 7.69% of respondents indicated that this was the MPTRG's 3rd most dominant activity and 15.38% indicated that this was the least dominant activity. 7.69% of respondents believed that this was not the MPTRG's dominant activity.

When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 46.15% of respondents indicated that this would be the most effective activity and 26.92% of respondents stated that this would be the next most effective activity. Only 11.54% of
respondents believed that this would be the third most effective activity and 7.69% of respondents stated that this would be the least effective activity. 7.69% of the respondents stated that this would not be an effective activity.

C. To promote problem solving in the minerals industry

In terms of the responses provided, 26.92% of respondents believed that this was the MPTRG’s most dominant activity and 34.62% indicated that this was the MPTRG’s next dominant activity. 26.92% of respondents indicated that this was the MPTRG’s 3rd most dominant activity and 7.69% indicated that this was the least dominant activity. 3.85% of respondents believed that this was not the MPTRG’s dominant activity.

When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 42.31% of respondents indicated that this would be the most effective activity and 38.46% of respondents stated that this would be the next most effective activity. Only 11.54% of respondents believed that this would be the third most effective activity and 3.85% of respondents stated that this would be the least effective activity. 3.85% of the respondents stated that this would not be an effective activity.

D. To promote pro-activity in new processes and applications in the minerals industry

In terms of the responses provided, 15.38% of respondents believed that this was the MPTRG’s most dominant activity and 46.15% indicated that this was the MPTRG’s next dominant activity. 15.38% of respondents indicated that this was the MPTRG’s 3rd most dominant activity and 11.54% indicated that this was the least dominant activity. 11.54% of respondents believed that this was not the MPTRG’s dominant activity.
When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 46.15% of respondents indicated that this would be the most effective activity and 30.77% of respondents stated that this would be the next most effective activity. Only 7.69% of respondents believed that this would be the third most effective activity and 7.69% of respondents stated that this would be the least effective activity. 7.69% of the respondents stated that this would not be an effective activity.

**E. Combination of the above roles**

In terms of the responses provided, 26.92% of respondents believed that this was the MPTRG’s most dominant activity and 42.31% indicated that this was the MPTRG’s next dominant activity. 11.54% of respondents indicated that this was the MPTRG’s 3rd most dominant activity and 11.54% indicated that this was the least dominant activity. 7.69% of respondents believed that this was not the MPTRG’s dominant activity.

When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 42.31% of respondents indicated that this would be the most effective activity and 19.23% of respondents stated that this would be the next most effective activity. Only 7.69% of respondents believed that this would be the third most effective activity and 11.54% of respondents stated that this would be the least effective activity. 19.23% of the respondents stated that this would not be an effective activity.

A very important conclusion from Table ann. 5.3.9 and Table ann. 5.3.10. is that with respect to A, B, C, D, and E, the research and development programme, and projects of the MPTRG are appropriate and may lead to its the sustainability.
Tables ann.5.3.9 and ann.5.3.10 informed that 69.23% of respondents were satisfied with the research and development programs and projects carried out by the MPTRG while only 7.69% were not. 61.45% of respondents said that the above programmes were effective.

In the first part of question 6, respondents were required to describe activities where credibility of the MPTRG comes from. Responses to the first part of question 6 appear in Table ann.5.3.11 as follows:

Table ann.5.3.11: Actual activities where the credibility of MPTRG comes from

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In the second part of question 6 respondents were required to identify effective activities where the credibility of MPTRG should come from for it to be in a position to assist the
Faculty of Engineering to achieve its goals of higher levels of postgraduate students, community, industry and government service quality, and productivity in research. Responses to the second part of question 6 appear in Table ann.5.3.12 as follow:

**Table ann.5.3.12: Effective activities where the credibility of the MPTRG should come from**

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In terms of the results presented in Table ann.5.3.11 and Table ann.5.3.12 responses to question 6 of section C could be described as follows:

**A. To ensure its credibility the MPTRG has to help industry solve their process related problems**
In terms of the responses provided, 23.08% of respondents believed that this was the MPTRG's most dominant activity and 26.92% indicated that this was the MPTRG's next dominant activity. 34.62% of respondents indicated that this was the MPTRG's third most dominant activity and 7.69% indicated that this was the least dominant activity. 7.69% of respondents believed that this was not the MPTRG's dominant activity.

When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 46.15% of respondents indicated that this would be the most effective activity and 30.77% of respondents stated that this would be the next most effective activity. Only 11.54% of respondents believed that this would be the third most effective activity and 7.69% of respondents stated that this would be the least effective activity. 3.85% of the respondents stated that this would not be an effective activity.

**B. To ensure its credibility the MPTRG has to train extraction metallurgist at postgraduate levels ready to be absorbed in the industry**

In terms of the responses provided, 38.46% of respondents believed that this was the MPTRG's most dominant activity and 42.31% indicated that this was the MPTRG's next dominant activity. 11.54% of respondents indicated that this was the MPTRG's third most dominant activity and 3.85% indicated that this was the least dominant activity. 3.85% of respondents believed that this was not the MPTRG's dominant activity.

When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 61.54% of respondents indicated that this would be the most effective activity and 11.54% of respondents stated that this would be the next most effective activity. Only 19.23% of respondents believed that this would be the third most effective activity and 3.85% of
respondents stated that this would be the least effective activity. 3.85% of the respondents stated that this would not be an effective activity.

C. To ensure its credibility the MPTRG has to assist the community, as outreach program, in the field of minerals processing, beneficiation and process.

In terms of the responses provided, 11.54% of respondents believed that this was the MPTRG's most dominant activity and 34.62% indicated that this was the MPTRG's next dominant activity. 34.62% of respondents indicated that this was the MPTRG's 3rd most dominant activity and 7.69% indicated that this was the least dominant activity. 11.54% of respondents believed that this was not the MPTRG's dominant activity.

When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 23.08% of respondents indicated that this would be the most effective activity and 26.92% of respondents stated that this would be the next most effective activity. Only 34.62% of respondents believed that this would be the third most effective activity and 7.69% of respondents stated that this would be the least effective activity. 7.69% of the respondents stated that this would not be an effective activity.

D. To ensure its credibility the MPTRG has to maintain an international standard as evidenced by the high quality of research output

In terms of the responses provided, 19.23% of respondents believed that this was the MPTRG's most dominant activity and 50.00% indicated that this was the MPTRG's next dominant activity. 7.69% of respondents indicated that this was the MPTRG's 3rd most dominant activity and 11.54% indicated that this was the least dominant activity. 11.54% of respondents believed that this was not the MPTRG's dominant activity.
When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 42.31% of respondents indicated that this would be the most effective activity and 30.77% of respondents stated that this would be the next most effective activity. Only 3.85% of respondents believed that this would be the third most effective activity and 15.38% of respondents stated that this would be the least effective activity. 7.69% of the respondents stated that this would not be an effective activity.

E. Combination of the above roles

In terms of the responses provided, 15.38% of respondents believed that this was the MPTRG’s most dominant activity and 42.31% indicated that this was the MPTRG’s next dominant activity. 11.54% of respondents indicated that this was the MPTRG’s 3rd most dominant activity and 19.23% indicated that this was the least dominant activity. 11.54% of respondents believed that this was not the MPTRG’s dominant activity.

When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 42.31% of respondents indicated that this would be the most effective activity and 23.08% of respondents stated that this would be the next most effective activity. Only 11.54% of respondents believed that this would be the third most effective activity and 11.54% of respondents stated that this would be the least effective activity. 11.54% of the respondents stated that this would not be an effective activity.

As evidenced by Table ann. 5.3.11 and Table ann. 5.3.12, 57.69% of respondents believed that the credibility of the MPTRG comes from: A: helping industry solve their process related problems, B: training extraction metallurgists at postgraduate levels ready to be absorbed in the industry, C: assisting the community, as outreach program, in the field of
minerals processing, beneficiation and process, D: maintaining international standards as evidenced by the high quality of research output. 65.39% of respondent thought the credibility of the MPTRG should come from the above.

In the first part of question 7, respondents were required to describe activities where the effectiveness of the MPTRG is measured from. Responses to the first part of question 7 appear in Table ann.5.3.13 as follows:

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In the second part of question 7 respondents were required to identify effective activities where effectiveness of the MPTRG should be measured from in order it to be in a position to assist the Faculty of Engineering to achieve its goals of higher levels of postgraduate
students, community, industry and government service quality, and productivity in research. Responses to the second part of question 7 appear in Table ann.5.3.14 as follow:

Table ann.5.3.14: Effective activities where the effectiveness of the MPTRG should be measured from

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In terms of the results presented in Table ann.5.3.13 and Table ann.5.3.14 responses to question 7 of section C could be described as follows:

A. *To ensure its effectiveness the MPTRG has to improve postgraduate students throughput in extraction metallurgy department of the University of Johannesburg*
In terms of the responses provided, 19.23% of respondents believed that this was the MPTRG’s most dominant activity and 50.00% indicated that this was the MPTRG’s next dominant activity. 11.54% of respondents indicated that this was the MPTRG’s 3rd most dominant activity and 7.69% indicated that this was the least dominant activity. 11.54% of respondents believed that this was not the MPTRG’s dominant activity.

When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 46.15% of respondents indicated that this would be the most effective activity and 23.08% of respondents stated that this would be the next most effective activity. Only 7.69% of respondents believed that this would be the third most effective activity and 7.69% of respondents stated that this would be the least effective activity. 15.38% of the respondents stated that this would not be an effective activity.

B. To ensure its effectiveness the MPTRG has to increase number of research output in terms of journal articles, conference papers, chapter in books, patents, etc...

In terms of the responses provided, 26.92% of respondents believed that this was the MPTRG’s most dominant activity and 23.08% indicated that this was the MPTRG’s next dominant activity. 26.92% of respondents indicated that this was the MPTRG’s 3rd most dominant activity and 15.38% indicated that this was the least dominant activity. 7.69% of respondents believed that this was not the MPTRG’s dominant activity.

When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 50.00% of respondents indicated that this would be the most effective activity and 15.38% of respondents stated that this would be the next most effective activity. Only 15.38% of respondents believed that this would be the third most effective activity and 3.85% of
respondents stated that this would be the least effective activity. 15.38% of the respondents stated that this would not be an effective activity.

C. To ensure its effectiveness the MPTRG has to build adequate research laboratory to house research in the field of mineral processing, beneficiation and process at the faculty of engineering and the built environment

In terms of the responses provided, 26.92% of respondents believed that this was the MPTRG's most dominant activity and 38.46% indicated that this was the MPTRG's next dominant activity. 15.38% of respondents indicated that this was the MPTRG's 3rd most dominant activity and 7.69% indicated that this was the least dominant activity. 11.54% of respondents believed that this was not the MPTRG's dominant activity.

When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 46.15% of respondents indicated that this would be the most effective activity and 26.92% of respondents stated that this would be the next most effective activity. Only 19.23% of respondents believed that this would be the third most effective activity and 3.85% of respondents stated that this would be the least effective activity. 3.85% of the respondents stated that this would not be an effective activity.

D. To ensure its effectiveness the MPTRG has to efficiently address industry and community related challenges in the field of minerals processing, beneficiation and process

In terms of the responses provided, 30.77% of respondents believed that this was the MPTRG's most dominant activity and 23.08% indicated that this was the MPTRG's next dominant activity. 26.92% of respondents indicated that this was the MPTRG's 3rd most
dominant activity and 11.54% indicated that this was the least dominant activity. 7.69% of respondents believed that this was not the MPTRG's dominant activity.

When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 46.15% of respondents indicated that this would be the most effective activity and 23.08% of respondents stated that this would be the next most effective activity. Only 7.69% of respondents believed that this would be the third most effective activity and 19.23% of respondents stated that this would be the least effective activity. 3.85% of the respondents stated that this would not be an effective activity.

E. Combination of the above roles

In terms of the responses provided, 15.38 % of respondents believed that this was the MPTRG’s most dominant activity and 42.31 % indicated that this was the MPTRG’s next dominant activity. 15.38% of respondents indicated that this was the MPTRG ‘s 3rd most dominant activity and 11.54% indicated that this was the least dominant activity. 15.38% of respondents believed that this was not the MPTRG’s dominant activity.

When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 38.46% of respondents indicated that this would be the most effective activity and 15.38% of respondents stated that this would be the next most effective activity. Only 11.54% of respondents believed that this would be the third most effective activity and 7.69% of respondents stated that this would be the least effective activity. 26.92% of the respondents stated that this would not be an effective activity.
As conclusion from Table ann. 5.3.13 and Table ann. 5.3.14, factors to be used to measure the effectiveness of the MPTRG are well established.

Table ann.5.3.13 and Table ann. 5.3.14 show that 57.69% of respondents agree that the effectiveness of the MPTRG is measured by its ability to: A: Increase postgraduate students throughput in extraction metallurgy department of the University of Johannesburg, B: Increase number of research output in terms of journal articles, conference papers, chapter in books, patents, etc., C: Built adequate research laboratory to house research in the field of mineral processing, beneficiation and process at the Faculty of Engineering and the Built Environment, D: Efficiently address industry and community related challenges in the field of minerals processing, beneficiation and process.

Following factors are deciding elements on the sustainability of the MPTRG. Its ability to: A: recruit and maintain at least four active researchers in the group, B: recruit and maintain a minimum of five postgraduate student each year, C: graduate at least two postgraduate student every year, and D: keep operational, maintain and acquire new research facility, develop regularly.

In the first part of question 8, respondents were required to describe activities where the sustainability of the MPTRG is measured from. Responses to the first part of question 8 appear in Table ann.5.3.15 as follows:
Table ann.5.3.15: Actual activities where the sustainability of the MPTRG is measured from

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In the second part of question 8 respondents were required to identify effective activities where the sustainability of the MPTRG should be measured from for it to be in a position to assist the Faculty of Engineering to achieve its goals of higher levels of postgraduate students, community, industry and government service quality, and productivity in research. Responses to the second part of question 8 appear in Table ann.5.3.16 as follow:
Table ann.5.3.16: Effective activities where the sustainability of the MPTRG should be measured from

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In terms of the results presented in Table ann.5.3.15 and Table ann.5.3.16 responses to question 8 of section C could be described as follows:

A. To ensure its sustainability the MPTRG has to recruit and maintain at least four active researchers in the group

In terms of the responses provided, 15.38% of respondents believed that this was the MPTRG’s most dominant activity and 26.92% indicated that this was the MPTRG’s next dominant activity. 46.15% of respondents indicated that this was the MPTRG’s 3rd most dominant activity and 3.85% indicated that this was the least dominant activity. 7.69% of respondents believed that this was not the MPTRG’s dominant activity.
When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 42.31% of respondents indicated that this would be the most effective activity and 19.23% of respondents stated that this would be the next most effective activity. Only 23.08% of respondents believed that this would be the third most effective activity and 7.69% of respondents stated that this would be the least effective activity. 7.69% of the respondents stated that this would not be an effective activity.

B. To ensure its sustainability the MPTRG has to recruit and maintain a minimum of five postgraduate student each year

In terms of the responses provided, 19.23% of respondents believed that this was the MPTRG’s most dominant activity and 53.85% indicated that this was the MPTRG’s next dominant activity. 11.54% of respondents indicated that this was the MPTRG’s 3rd most dominant activity and 7.69% indicated that this was the least dominant activity. 7.69% of respondents believed that this was not the MPTRG’s dominant activity.

When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 46.15% of respondents indicated that this would be the most effective activity and 19.23% of respondents stated that this would be the next most effective activity. Only 23.08% of respondents believed that this would be the third most effective activity and 3.85% of respondents stated that this would be the least effective activity. 7.69% of the respondents stated that this would not be an effective activity.
C. To ensure its sustainability the MPTRG has to graduate at least two postgraduate students every year

In terms of the responses provided, 15.38% of respondents believed that this was the MPTRG’s most dominant activity and 30.77% indicated that this was the MPTRG’s next dominant activity. 38.46% of respondents indicated that this was the MPTRG’s 3rd most dominant activity and 7.69% indicated that this was the least dominant activity. 7.69% of respondents believed that this was not the MPTRG’s dominant activity.

When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 30.77% of respondents indicated that this would be the most effective activity and 19.23% of respondents stated that this would be the next most effective activity. Only 30.77% of respondents believed that this would be the third most effective activity and 7.69% of respondents stated that this would be the least effective activity. 11.54% of the respondents stated that this would not be an effective activity.

D. To ensure its sustainability the MPTRG has to keep operational, maintain and acquire new research facility develop regularly.

In terms of the responses provided, 19.23% of respondents believed that this was the MPTRG’s most dominant activity and 50.00% indicated that this was the MPTRG’s next dominant activity. 7.69% of respondents indicated that this was the MPTRG’s 3rd most dominant activity and 11.54% indicated that this was the least dominant activity. 11.54% of respondents believed that this was not the MPTRG’s dominant activity.

When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 38.46% of respondents indicated that this would be the most effective activity and 26.92% of respondents stated that this would be the next most effective activity. Only 11.54% of
respondents believed that this would be the third most effective activity and 15.38% of respondents stated that this would be the least effective activity. 7.69% of the respondents stated that this would not be an effective activity.

**E. Combination of the above roles**

In terms of the responses provided, 15.38% of respondents believed that this was the MPTRG's most dominant activity and 46.15% indicated that this was the MPTRG's next dominant activity. 15.38% of respondents indicated that this was the MPTRG's 3rd most dominant activity and 11.54% indicated that this was the least dominant activity. 11.54% of respondents believed that this was not the MPTRG's dominant activity.

When asked whether or not this activity would enable the MPTRG to assist the Faculty of Engineering and the Built Environment to achieve its strategic objectives, 42.31% of respondents indicated that this would be the most effective activity and 23.08% of respondents stated that this would be the next most effective activity. Only 11.54% of respondents believed that this would be the third most effective activity and 7.69% of respondents stated that this would be the least effective activity. 15.38% of the respondents stated that this would not be an effective activity.

As conclusion from Table ann. 5.3.15 and Table ann. 5.3.16, factors to be used to measure the sustainability of the MPTRG are well established.

Following factors are deciding elements on the sustainability of the MPTRG. Its ability to: A: recruit and maintain at least four active researchers in the group, B: recruit and maintain a minimum of five postgraduate student each year, C: graduate at least two postgraduate student every year, and D: keep operational, maintain and acquire new research facility, develop regularly.
Table ann. 5.3.15 and Table ann. 5.3.16 show that 61.53% of the respondents are supportive of these views while 65.39% of the respondents are of the views the above factors should be strongly applied to measure the sustainability of the MPTRG.
Figure Ann.2: Actual activities MPTRG responsibilities

Figure Ann.3.: Effective responsibilities activities of MPTRG
Figure Ann.4: Actual activities MPTRG spending time on

Figure Ann.5: Effective activities the MPTRG should spend time on
Figure Ann. 6: Actual activities MPTRG is as active participant

Figure Ann. 7: Effective activities MPTRG should actively participate in
Figure Ann.8.: Activities that MPTRG works towards.

Figure Ann.9: Effective activities MPTRG should work towards.
Figure Ann. 10: Actual activities and projects carried out

Figure Ann. 11: Effective activities that should constitute the objectives of MPTRG
Figure Ann.12: Actual activities where the credibility of MPTRG derives from

Figure Ann.13: Effective activities where credibility should come from
Figure Ann.14: Actual activities where MPTRG's effectiveness is measured
Figure Ann. 15: Effective activities the MPTRG's effectiveness should be measured from.
Figure Ann. 16: Actual activities where sustainability of MPTRG is measured from
Figure Ann. 17: Effective activities where MPTRG sustainability should be measured from

Figure Ann. 18: Cross-tabulated results on actual activities
Please return this item on or before the last date stamped. NO RENEWALS ALLOWED. Fines are charged on overdue items.