CHAPTER 7

FACTORS THAT INFLUENCE A STRATEGY FOR TOTAL QUALITY REHABILITATION MANAGEMENT ACCOUNTING

7.1 INTRODUCTION

In previous chapters the situation pertaining to rehabilitation management in South Africa in the mining sector was investigated. In addition to the literature study, the opinions of rehabilitation and environmental managers were obtained on a wide spectrum of factors influencing management accounting strategies. Although high standards of rehabilitation management with the accompanying management accounting procedures are occasionally found, various aspects should still be addressed to a greater or lesser extent.

In an attempt to find alternative strategies to improve the present situation in this country, and in an endeavour to prevent failures, rehabilitation management approaches and policies in the most developed countries of the world as well as in Africa were researched. After investigating rehabilitation management policies in both South Africa and other countries, various factors were chosen for inclusion in a comprehensive management accounting strategy for rehabilitation management in the mining sector in South Africa.

This management accounting strategy includes major sub-strategy groups of factors which have an influence on and provide information for the decision-making process. These major sub-strategy influencing factors are internal as well as external background knowledge, a holistic approach in several respects, cost improvement policies, the role of authorities, a total quality environmental management approach, and research and development with the object of continuous improvement. These sub-strategy factors culminate in the strategy followed in terms of adequate management policies, evaluation of rehabilitation performances, reporting to interested and affected parties, and the final arrival at a balancing position between financial implications and the natural environment. The final stages of the management strategy follow in the next chapter.

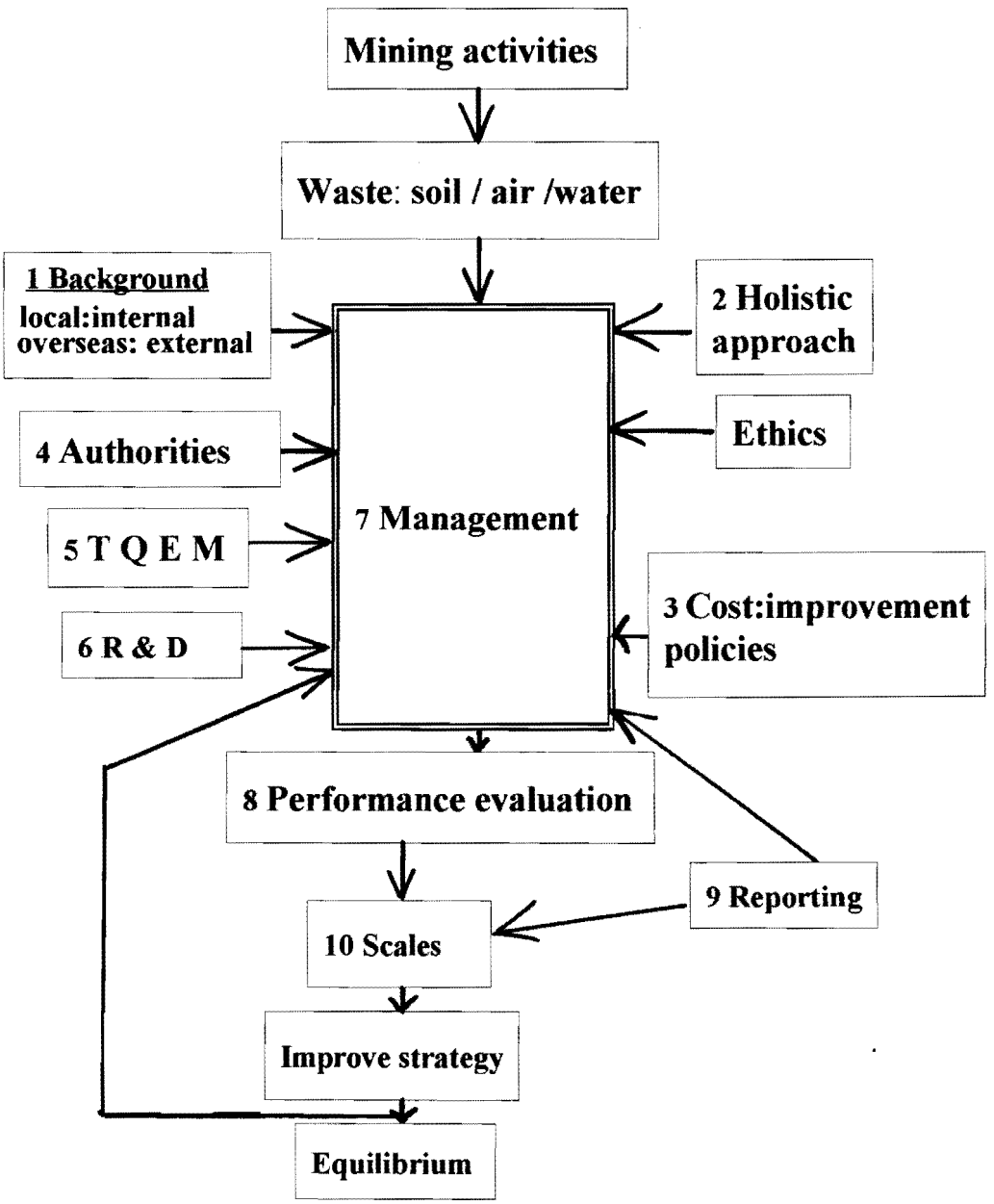
The objectives of this chapter are to analyse these strategies and the factors which they comprise, and to advance reasons for including each one of them in the model.

7.2 TOTAL REHABILITATION MANAGEMENT

The major flowchart for the rehabilitation management accounting model is presented in Figure 7.1. The numbered blocks representing the various branches of the total strategy are discussed in the sections that follow. Each one of these substrategies has its own flowchart. Each one of these various branches of the comprehensive strategy forms an integral part of the central focus of total quality rehabilitation management.

- Waste to soil, air and water. One of the inevitable side effects of mining operations is the production of pollution products that damage the geosphere (soil), atmosphere (air) and hydrosphere (water). These pollutants are a major cause for concern and should be adequately managed in the comprehensive management accounting rehabilitation strategy. Basically, rehabilitation costs are incurred to prevent, minimise, assess, control and remediate damage resulting from mining activities.
- Background. Background information about local attitudes towards environmental and rehabilitation management eventually prevent costs from being allocated in an environmentally unacceptable manner. Applicable experience from both developed and developing countries could improve local rehabilitation practices. South African rehabilitation management teams, which include management accountants, could also benefit from knowledge about failures in these countries, especially in the African context. Further discussions on background information and influences follow in Paragraph 7.3.
- Holistic approach. A holistic approach should be followed in order to obtain maximum benefits from the various management accounting strategies incorporated in the comprehensive strategy. This approach includes aspects such as cost management from impact assessments to aftercare, flexibility regarding the needs of communities surrounding mining areas, the extended enterprise, and both financial and non-financial assessments. The holistic approach towards rehabilitation management is discussed in detail in Paragraph 7.4.

Figure 7.1 Total quality rehabilitation management



(Source: empirically developed)

- Cost: improvement policies. Improvement policies are included in the aspect of continuous improvement inherent in quality management. Various and new procedures should continually be investigated and evaluated for the purposes of improving existing cost management policies. Feedback on both successful projects and failures forms an integral part of the improvement of cost management policies. More detailed analyses on cost improvement policies follow in Paragraph 7.5.
- Authorities. Knowledge as to the role and attitudes of both local and central authorities regarding laws and regulations on rehabilitation issues should be available for overall decision-making purposes. Legal costs and fines, which are part of failure costs, should be kept to the minimum. The role of authorities in rehabilitation management accounting is discussed in greater detail in Paragraph 7.6.
- Total quality environmental management (TQEM). TQEM occurs within a quality milieu. This means that rehabilitation management endeavours to reach maximum quality levels, commencing with the mission statement and finally including maintenance management. Quality management processes, including asset and cost management, are analysed in more detail in Paragraph 7.7.
- Research and development. Both money and time should be set aside for research and development among other things to assist the management accountant to provide adequate information and advice on rehabilitation management issues. Investment in research and development includes crucial aspects such as education and training towards an increased awareness of environmental matters, and contingency planning for unplanned environmental accidents and disasters. The supporting role of research and development for the operation of the rehabilitation management strategy is discussed in Paragraph 7.8.
- Ethics. The ethical views of people involved in mining activities largely determine the decisions taken and the outcomes of rehabilitation management policies. To what degree would each of the interested and affected parties allow the others to share in the gains from mining and rehabilitation operations? The influence of the ethical perspectives of the broad spectrum of rehabilitation managers on investment decisions is described in more detail in Paragraph 7.9.
- Management. Strategic quality rehabilitation management forms the focal point of this model. Relevant information and influences emanating from the other sub-strategies, collectively culminate in rehabilitation management decisions. These

contributing factors are discussed in Paragraph 8.2.

- Performance evaluations. Financial and non-financial rehabilitation performance evaluations, by management accountants, among others, follow after rehabilitation management decisions have been carried out. These include assessments of rehabilitation and remediation results, forfeited claims, water quality and time management. Performance evaluations are analysed in Paragraph 8.3.
- Reporting. These measured financial and non-financial inputs and results are reported by the accountant internally to management as well as externally to interested and affected parties. The disclosure of this information is discussed in Paragraph 8.4
- Mining rehabilitation equilibrium. These results are also weighed in terms of financial and non-financial inputs against the financial and non-financial benefits and losses. The degree to which the natural environment could benefit from all this previous rehabilitation efforts is compared with the long-term benefits to humans. The rehabilitation scales for determining this degree of balance are analysed in Paragraph 8.6.
- Feedback. Feedback on successes and failures is applied to improve overall rehabilitation strategies. Suggestions on improved rehabilitation policies are referred to management for evaluation and future decision-making purposes. Further discussions on feedback follow in Paragraph 8.5.
- Equilibrium. The objective of the whole strategy is to find an equilibrium position where the various interested and affected groups would be satisfied that each one has achieved the maximum benefit under the given set of circumstances. These groups vary from the owners of the mines to the surrounding communities, from the mineworkers to the surrounding natural environments.

7.3 THE ROLE OF BACKGROUND KNOWLEDGE

7.3.1 Introduction

The role of relevant internal and external background influences on management decision making for rehabilitation management is illustrated in Figure 7.2. An appropriate knowledge of background influences would assist the rehabilitation and environmental management accountant in providing a higher quality of information and advice to management. Knowledge of rehabilitation management policies and technologies from

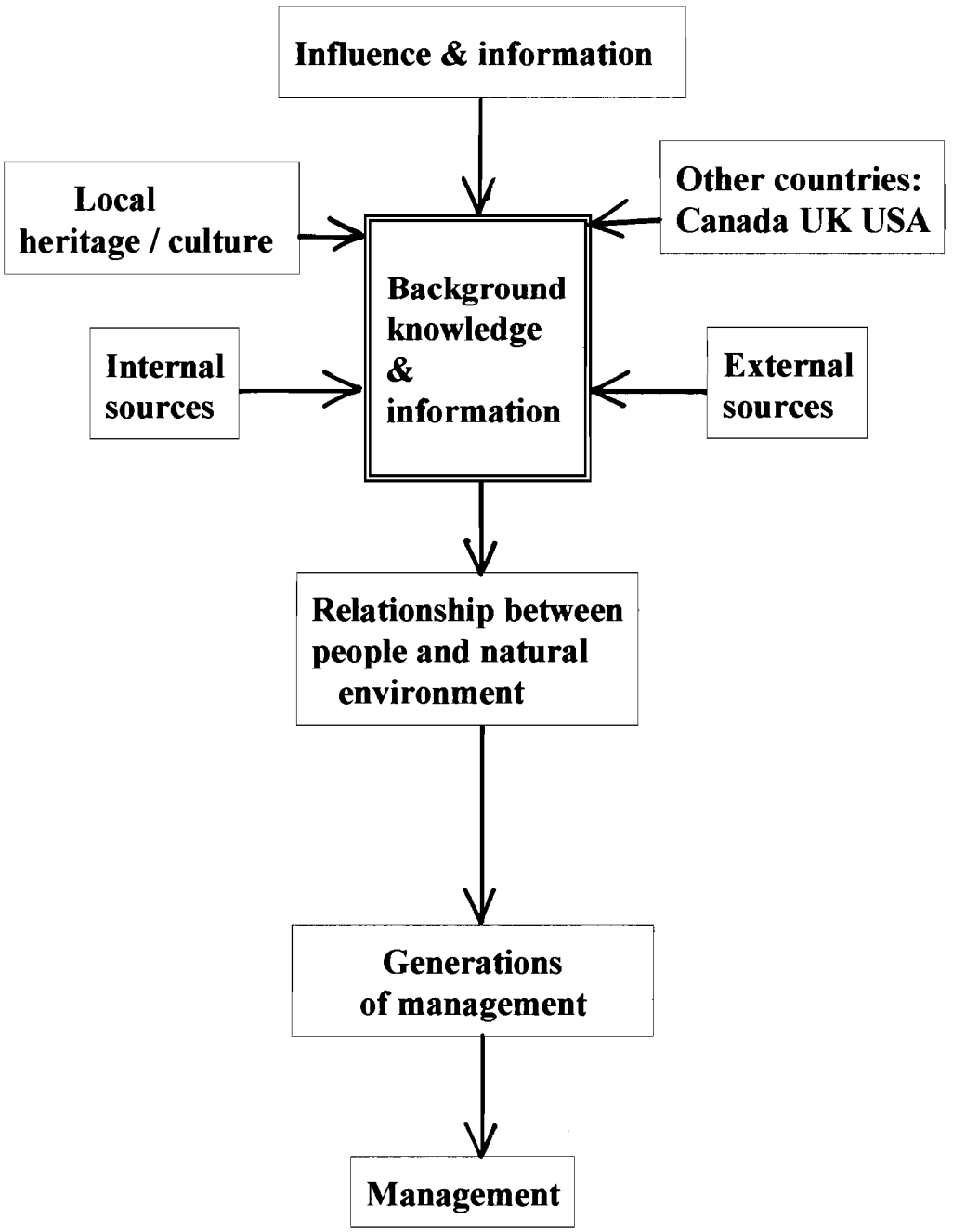
developed countries is combined with a knowledge of the influence of local heritage and cultures to form a comprehensive pool of background knowledge which can be utilised. This internal and external background information forms the basis for determining, among other things, the extent of the relationship between people and the natural environment. The development stage of management could then be decided on, on the basis of similar situations in other countries.

7.3.2 Local heritage and culture

Heritage and culture would dictate individual behaviour, organisational culture and creativity within a management team. Shared values, beliefs about reality and meanings would become the collective culture of the group. This culture might shape budgets according to a pattern of shared meanings, beliefs and values (Preston 1991:155). But it would also influence creativity and attitudes towards changed circumstances according to unstated rules which are continually produced and reproduced by participating individuals. Since creativity lies beyond acceptable current practice, only an evolving culture accepting new and innovative behaviour would allow new ideas to develop.

The majority of the responding environmental rehabilitation managers agree that local and internal attitudes towards rehabilitation management should be considered for decision-making purposes (Chapter 4, Statement 3.2.1:81,3%). Since these respondents also agree that cultural differences influence the process of rehabilitation management decision making (Statement 3.3.1:56,3%), it is evident that they are aware of the importance of various background behavioural impacts. Most of the respondents are of the opinion that positive behavioural attributes are indeed present in the management accounting systems that deal with rehabilitation management in South Africa (Diagram 4.10 and Diagram 4.11). The measuring of rehabilitation and environmental costs emphasises their existence and makes them visible. People would respond to these measures by positively changing their attitudes and behaviour, and therefore develop in terms of beliefs, values and mindsets.

Figure 7.2 1 Pool of background rehabilitation knowledge



(Source: Empirically developed)

The local South African background situation pertaining to rehabilitation management accounting is analysed in Chapter 2. Major factors that should influence the development of a comprehensive strategy are the following:

- Inherited ecological damage owing to mining operations in the past, as well as inadequate cleanup results, are reminders of mistakes in both financial and non-financial terms.
- A tendency is developing for more and more legislation to be promulgated to prevent and combat pollution in South Africa. These actions by authorities reflect the awareness of and increasingly positive attitude towards rehabilitation and environmental management. Since legal costs and the costs associated with failure to comply with laws and regulations could be prevented and avoided, this tendency should be noted.
- Visible efforts are being made to introduce international standards and accreditation for ISO14000 on rehabilitation management and for ISO9000 on total quality management.
- The importance of teams consisting of experts and consultants, as well as of contracting out and benchmarking, are being realised to some extent.
- There is a conflict of interests between the major interested and affected groups of money providers, labour and the natural environment.
- Although extensive environmental disclosure practices are not required by legislation, some major companies have already made a start with internal information disclosure and external reporting. Since this process of disclosing adequate information on rehabilitation and environmental input and gains will take many years, accounting and management accounting bodies should encourage organisations to take introductory steps at this stage.

Management accounting which tends towards full cost accounting with regard to rehabilitation and environmental management systems are in the initial stages of development in South Africa. Financial information and evaluations need to be supported by non-financial indicators in order to achieve total quality management by means of continuous improvement cycles.

Furthermore, the opinions of rehabilitation managers in the mining industry in South Africa were obtained and analysed in Chapters 3 and 4. Against the background of these

internal opinions (Chapter 4, Par. 4.7), the following important issues should, among others, be included in a strategy for rehabilitation management accounting:

- A long-term strategy ranging from impact assessment to aftercare should be encouraged. This would include benchmarking, feedback, ISO9000 and ISO14000, financial as well as non-financial provisions and factors such as quality, cost and time, together with a functional system of technology, behaviour and culture.
- People should become aware of the influence of a heritage of badly rehabilitated land and inadequately trained and educated people. There is agreement that expenses should be separated for rehabilitating inherited damaged land, and that money (as well as time) should be invested for improving education and training.
- Financial, environmental, leadership and implementation aspects should be considered in order to find a balancing position in respect of rehabilitation cost management.
- The experience of other countries should be taken into account.
- Background knowledge of local and national laws, regulations, fines and taxation conditions influences management accounting procedures, advice and decisions.
- Positive ethical views and awareness of responsibility will eventually support successful rehabilitation management as well as the accompanying management accounting policies.

Since South Africa is in a strategic position vis-à-vis the rest of Africa, the African heritage and influences form an integral part of the development of a comprehensive management accounting strategy. Influences from the rest of Africa add to both internal and external background information. The situation in respect of rehabilitation management and the accompanying management accounting procedures in Africa is analysed in Chapter 5. The following major background aspects pertaining to rehabilitation management accounting in the mining industry in Africa (Chapter 5, Par. 5) would have an influence on the development of local strategies:

- Rehabilitation management accounting practices in the rest of Africa are influenced by historically and culturally inadequate policies.
- A general lack of awareness exists regarding the objectives of rehabilitation management; that is, to provide a liveable natural environment for future generations.

- Polluted air, water and soil are the result of unacceptable mining methods which are aggravated by small-scale mining activities, illegal mining operations, a lack of law-enforcement procedures, state-owned mines run by unstable governments, international pressure and limiting trade agreements, and a cultural heritage that excludes futuristic thinking.
- Policies that aim to improve traditional practices and views are noticeable, however, and are encouraged by means of systems of awards and investments in education and training.

The presence of cultural influences in accounting and management accounting decision-making and activities relating to rehabilitation and environmental management should not be ignored. The broader spectrum of cultural influences dictates the management structures that are adopted, internal micro behaviour, the environment for accounting, as well as the cognitive functioning of people who are exposed to accounting procedures (Riahi-Belkaoui 1995:14). Working in tandem with the influence of cultural attitudes on accounting, this influence would also extend to the micro and macro economic spheres.

7.3.3 Other countries: Canada, the USA, the UK

The majority of the responding rehabilitation and environmental managers disagrees with the statement (3.1.4 in Chapter 4) that experience of other countries does not have a positive influence on local rehabilitation decisions. External background information from developed countries such as Canada, the United Kingdom and the United States of America would have a positive influence on the development of a local management accounting strategy for the rehabilitation of mining areas. Advanced forms of rehabilitation management which are found in these regions are analysed in Chapter 6. Various of these aspects (Chapter 6, Par. 5) which include these listed below, should form an integral part of local strategies.

- Precautionary and preventive costs are emphasised and included in long-term planning schedules and budgets.
- Multi-disciplinary teams of experts as well as benchmarking are utilised.
- The positive results of investments in both research and development, and in education and training, are recognised.
- Models have been designed for the assessment of rehabilitation inputs and gains,

as well as for accounting for natural assets.

- Although as yet there are no strict rules enforcing mining companies to disclose rehabilitation operations, an awareness is developing of the need to make provision for future contingencies and long-term rehabilitation and maintenance activities. The accountants are conscious that an eco-balance should be the eventual objective of reported inputs and gains in respect of natural resources, materials, energy and waste.
- More sophisticated systems of laws, taxation, regulations, guidelines and law-enforcement procedures are found than in most parts of the world. In addition, these developed countries are in a process of improving and consolidating these legislative systems.
- Concern by both the public and the authorities about environmental and rehabilitation management has a positive influence on the evolution of legislative issues.

7.3.4 Relationship between people and the natural environment

By combining the background information on and influences of rehabilitation management occurring in South Africa, African and developing countries, the local future relationship between people and the natural environment could be improved. The rehabilitation management team acts as a mediator between people and the natural environment from which mining commodities are extracted. In the process of mediation, people living around mines should be involved as well since they are mostly dependent on the natural environment (Chapter 4, Statement 3.3.2). About 74% of the environmental managers who responded to the questionnaire are in the age group between 31 and 50 (Table 4.4). In this age group people have sufficient maturity to realise the importance of an improved relationship between people and the natural environment.

There is a process of interaction between people and the natural environment, and an adjustment is achieved. People constantly act on their environment by means of positive or negative inputs, and then they alter these actions after responses by the environment. People and the environment reinforce each other by means of both positive and negative reactions. These boundaries of the relationship between people and the environment are not fixed and should be assessed by means of simulation on a continuous basis (Bonnicksen 1991:13). Owing to the high probability of uncertainty and the limited

information in this model, only short-term decisions based on human judgments could be formulated.

In this relationship between people and the natural environment, the rehabilitation management team, including the management accountant, need to develop a strategy where the following criteria (Guntram 1992:12) should simultaneously be satisfied:

- Effectiveness, by contributing to the improvement of the natural environment.
- Efficiency, by improving the natural environment at the minimum cost and expense.
- Equity, by being fair in the sharing of the financial and non-financial burdens among stakeholders.

Market forces alone cannot be allowed to determine the relationship between people and the natural environment. Failures and mistakes in respect of environmental problems would be exposed too slowly, while the market might demand rapid action (Kleiner 1991:38,47). Present economic gain should be compared with future quality of life in order to ensure economic growth and environmental quality. Part of the present improvement in quality of life should be transferred to the future in the form of investments in rehabilitation projects.

By including the natural environment as a stakeholder in an enterprise, we can arrive at a more realistic as well as a more complex perspective on the business milieu. In this regard Starrik (1995:216) expands the description of a stakeholder to include "any naturally occurring entity which affects or is affected by organisational performance". This integration between nature and business would provide a more complete and strategic approach towards stakeholder management.

By allowing us to form a better idea of the existing and projected relationship between people and the natural environment, this background information and influences could lead to improved rehabilitation policies. Management in terms of decisions and functioning would then serve the interests of all stakeholders more impartially.

7.3.5 Generations of management

After determining the degree of inclusion of the natural environment in decisions on rehabilitation management, the generations of management in similar situations should be considered. A choice should be made among various approaches and combinations of approaches in order to find a management system that would best suit the circumstances of the particular rehabilitation management needs. Joiner and Reynard (1994:9) divide ways to get work done into the following categories:

- The first generation of management is management by doing the work yourself.
- The second generation of management is management by directing others to do the work.
- The third generation of management is management by results.
- The fourth generation of management realises that better results can only be obtained through fundamental improvements, which include quality management, a scientific approach and regarding all the interested and affected parties as part of one team.

The fourth generation of management, or bottom-up empowerment, is in a process of being applied in developed countries. But given the varying levels of training and education of South Africans, this kind of management could not be implemented locally without adaptations. Knowledge of the influence of different management systems forms an integral part of recommendations and investments with a view to obtaining maximum benefits for all interested and affected parties. Resource-conserving methods of management in South Africa should be linked to the chosen combination of generations of management.

7.3.6 To management

Background influences and information form an integral part of the set of information and advice that the management accountant has to prepare for management decision making. Monetary rehabilitation policies are formulated against the background of time, money and the environmental perspectives of local inhabitants, other people from Africa and the people in the most developed countries in the world.

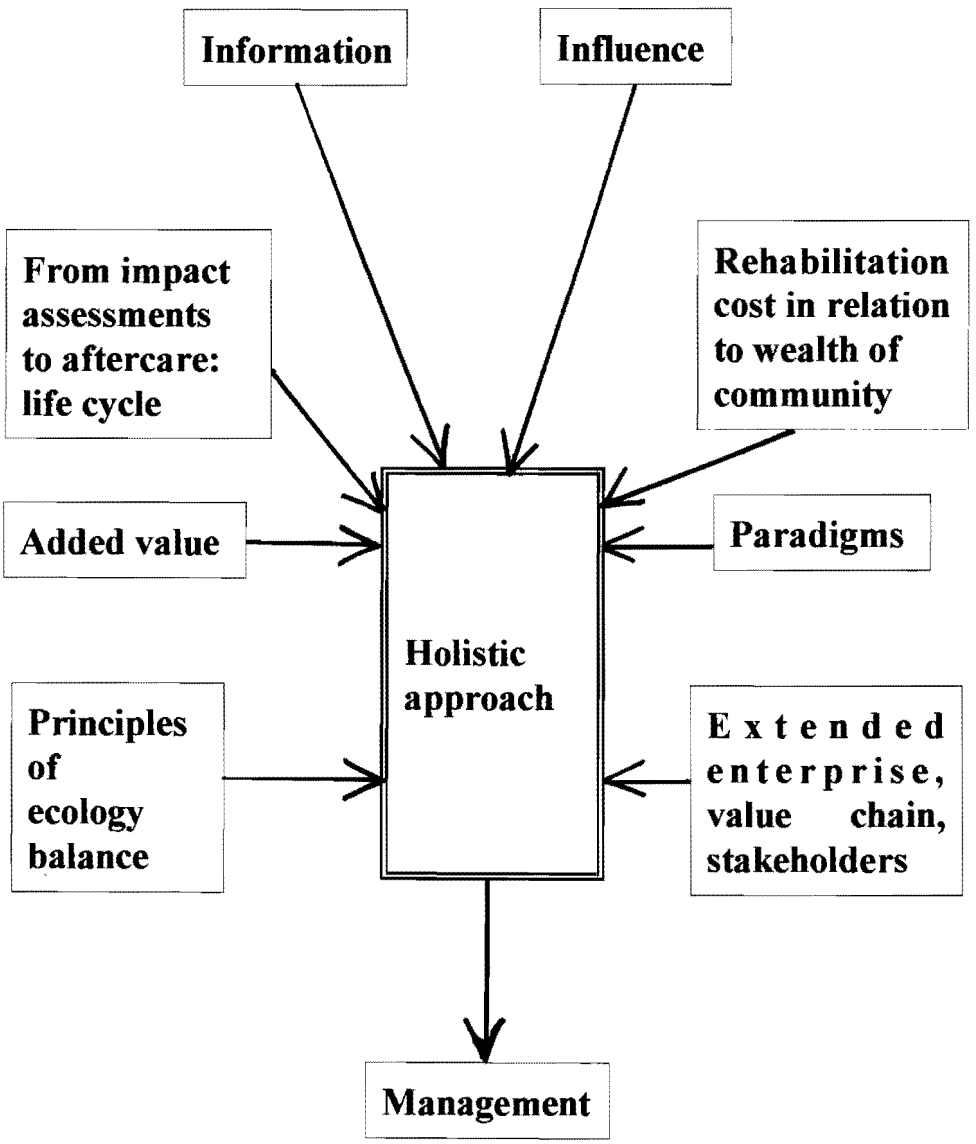
7.4 HOLISTIC APPROACH

7.4.1 Introduction

Holism, developed by Smuts in 1926, could be described as the tendency of entities to function interdependently as well as independently (Olivier 1987:100). Each part of the strategy has an influence on the other parts in one way or another in the sense that each one has an influence on the whole. Each part functions according to its specific character within its own field as well as within the broader field. Since rehabilitation management is a complex situation, a number of influences should be analysed in the context of this holistic approach.

Not only should all interested and affected parties be taken into consideration, but all aspects of rehabilitation management should be included in a comprehensive strategy for the management accountant. This holistic approach is illustrated in Figure 7.3. The whole spectrum of relevant management issues should be considered, from impact assessments to aftercare maintenance. The value added to land as a result of rehabilitation policies, or the value destroyed as a result of inadequate policies, as well as the principles of an ecological equilibrium, should not be ignored. Existing paradigms should be reevaluated to include the extended enterprise as well. Communities adjacent to mining activities should be consulted as to their future needs regarding rehabilitated areas. All interested and affected parties should be included in the extended enterprise and value chain. This would determine, among others, the amounts to be invested in rehabilitation operations. Flexibility should be built into this holistic approach to make provision for future changes and new developments.

Figure 7.3 2 Holistic approach



(Source: Empirically developed)

7.4.2 From impact assessment to aftercare

Provision should be made in this holistic submodel for the accumulation of rehabilitation costs for activities that occur over the entire life cycle of the process for extracting commodities, from impact assessment to aftercare. The majority (95,8%) of the responding rehabilitation managers also agree with this (Chapter 4, Statement 2.1.1). Life-cycle costs are monetary figures for every effect of a product and they could include disposal costs, potential legal penalties, degradation of air quality and aspects of public health (Kleiner 1991:40). Rehabilitation management accountants have to consider the whole spectrum of rehabilitation costs and expenditure involved in the mining of commodities. Since a degree of uncertainty is attached to projections on full life-cycle costs, provision should also be made for future adjustments owing to changing circumstances.

All costs associated with waste and rehabilitation should be adequately classified and recorded. The environment should not be treated as a free and common good that can be polluted with reducing rehabilitation costs to the enterprise (Bayou & Nachtman 1992:53). This would only result in transferring the burden to rehabilitate to other groups in society. Since environmental effects and costs are inclined to occur in the long term, costs to the successors of present managers should also be included in this category. This would eventually influence future rehabilitation performance evaluations.

This approach of life-cycle oriented environmental management (Sharfman et al 1997:17) would reduce the negative impact of mining operations on the environment at all stages of mining operations. One of the most important aspects of this life cycle approach is impact assessments at the commencement of mining operations. The majority (91,5%) of the responding rehabilitation managers support this fact (Statement 3.2.3).

This life cycle approach might be more costly in the short term, but as soon as sustainable development becomes the generally accepted norm, or becomes law, enterprises applying this strategy will be in a leading position.

7.4.3 Added value

Just as profits are returns earned by shareholders, "value-added" refers to the returns

earned by workers, capital providers and authorities (Riahi-Belkaoui 1992:1). The concept of added value is a measure of performance, indicating wealth and profits at the micro economic level, created over a period of time (Enthoven 1985:14). This non-earnings accounting information could be utilised to predict future changes in earnings and the content of information (Riahi-Belkaoui 1996:73). The calculation of added value is therefore a measure of increasing wealth for an ongoing enterprise.

Increased awareness of the natural environment causes people to re-evaluate values concerning the natural environment. This value consciousness could be manifested in various forms as value could directly or indirectly be added to assets by means of rehabilitation processes. In this regard value-added information is used as a basis for evaluating socio-economic operations (Enthoven 1985:15), such as in environmental and rehabilitation projects, as well as in education and training in the pursuit of environmentally sound attitudes.

If a mining company could convince its interested and affected parties through its financial and non-financial disclosures of its positive results in respect of rehabilitation investments, its value would increase indirectly for these parties. These disclosures should indicate the distribution of value added by employees and authorities (Enthoven 1985:16). A company could turn the cost of remediation into an opportunity by becoming an environmental leader in a specialist area of rehabilitation management (Denton 1994:16). By designing and implementing techniques to eliminate or minimise waste products, or to save energy, corrective rehabilitation costs could be reduced and additional income could even be earned. In this process leadership adds value to the enterprise.

The supporting role of the management accountant should be recognised in this need to create value and to add value, especially in respect of rehabilitation projects. These expanded supporting roles include the provision of expert advice, leadership in cross-functional teams, design and management information systems, and management accountants also serve as teachers, guides, consultants and interpreters of complex situations (Barbera 1996:72). Management accounting should form an integral part of management and operations, and the management accountant should be promoted from a member of staff to a partner in business teams. The added value as a result of the expanded role of the management accountant should add to the value of existing rehabilitation management standards. This would add value to the land being remediated.

Investments on a continuous basis to rehabilitate abandoned mining areas would mean higher land values if the mine property were to change hands. The new owners would not need to invest in the rehabilitation of inherited damaged land and contaminated water. They would be willing to negotiate for a higher price in order to decrease future rehabilitation expenses and environmental liabilities. In view of the time factor, more value could be added with rehabilitation as an ongoing practice of the mining enterprise than when rehabilitation is carried out at the end of the productive life of a particular mine. A distinction should also be made between internal and external value-added and non-value-added environmental cost categories, according to the majority of respondents to the questionnaire (Statements 2.2.9 & 2.2.10). Projections of future benefits in the form of value to be added to rehabilitated assets should be included.

As part of the strategy to determine the value added to the enterprise, the results should be disclosed to interested and affected parties. One of the benefits of value-added reporting (Riahi-Belkaoui 1992:9) is that it provides a better measure of the size and value of an enterprise.

Care should, however, be taken with the interpretation and management of value-added information (Riahi-Belkaoui 1992:14). All the members of the team might not agree on the degree of co-operation between them. Positive added value might be disclosed while earnings might be on the decrease. In order to reflect a positive picture of rehabilitation activities, management and the accountant might concentrate only on the maximising of value-added disclosures.

7.4.4 Principles of ecological equilibrium

In order to achieve a holistic approach to the development of a comprehensive strategy for rehabilitation cost management, the principles of an ecological balance should be determined. Rehabilitation and environmental managers responding to the questionnaire agree that financial as well as non-financial aspects, such as the natural environment, leadership factors and implementation procedures, are actually included in long-term strategies to find a balancing position in respect of rehabilitation cost management (Statements 2.1.14 to 2.1.17; Diagram 4.3).

Competitiveness is encouraged, especially to gain a better position in terms of

international trading. In order to accomplish this goal, national institutions, social programmes and environmental protection are neglected (Poff 1994:444). Without these programmes to protect natural resources, promote social upliftment and expand infrastructure, no future international trading would be possible in any case after ten to twenty years. It is therefore necessary to strike a balance between ecological, social, national and overseas valuta interests. For each individual rehabilitation project a balancing or ideal position should be found between monetary human interests in the short term and the non-monetary long-term interests of nature. Before the commencement of excavations, during impact assessments and continuously during mining operations, the objective should be to cause minimum ultimate disturbances to the natural environment. At any given time this ecological equilibrium should be one of the major aims of management decision making. If it is not possible to reach this goal on a continuous basis, a projection should be made as to the point in time when this equilibrium is likely to be affected.

When determining inputs and gains in respect of rehabilitation policies, the management accounting team should also find a balancing ecological position in terms of varying time intervals. In the short term the negative impacts of mining operations on nature would be insignificant in comparison with positive economic growth tendencies (Meadows et al 1983:156). But the negative impacts on nature will dominate the positive growth results in the long term if the necessary precautionary steps are not implemented.

7.4.5 Rehabilitation cost in relation to the wealth of the community

There appear to be conflicting views on the subject of the rehabilitation costs that should be incurred in poorer and richer surrounding communities.

Quality management as well as ethical principles require best available techniques not entailing excessive costs (BATNEEC), without including such issues as wealth of people or their stage of development. This view is supported by rehabilitation and environmental managers in South Africa who responded to the questionnaire (Statement 3.3.3). People living in communities adjacent to mining areas have the right to clean air and water as well as to usable or productive land, irrespective of their social status. Adopting this option would entail incurring higher rehabilitation costs throughout the whole process of mining and aftercare.

According to the other view, people in poorer and less educated communities have lesser needs. They need land for agricultural purposes in a subsistence economic system. To take one instance, in the more developed communities rehabilitation projects should have to provide land stable enough for the building of highways. More people and animals would be exposed to the negative impacts of polluted air and water, and this would result in increasing claims and fines. Deciding on this option would mean both incurring lower rehabilitation costs in poorer and disadvantaged communities, and also relatively higher rehabilitation costs in more developed areas. This approach could be interpreted as espousing double standards, that is discriminating against people who cannot defend themselves, and should be introduced with great caution.

The rehabilitation management team has to decide to what extent they should combine these views when working out a strategy to suit their particular circumstances. Rehabilitation costs should preferably be managed as an integral part of strategic planning, and not with the aim of avoiding expenditure.

7.4.6 Paradigms

Since markets are undergoing fundamental paradigm shifts, the rehabilitation management sector is not likely to be excluded from this tendency. Paradigm shifts are observed from product-based to product-plus strategies (Chapman 1996:22) that focus on additional services such as the environmental impacts of goods and services. This would include more than merely closing opencast mines with a mixuture of infertile soil. The achievement of these higher requirements for operational excellence places pressure on enterprises to minimise costs. This can only be achieved by means of improved operational planning.

As part of the holistic approach in the preparation of a rehabilitation management strategy, existing paradigms (or models or patterns: McLeod & Makins1993:825) should be re-evaluated in the light of changed and changing criteria. The challenge to management accountants is to make the best choice among alternatives asa well-defined model would assist them in reaching decisions.

Various groups of paradigms for accounting and management accounting have been identified. One particular group, described by Riahi-Belkaoui (1996), consists of internal

and external patterns. The external behaviour is determined by market forces and individual user preferences. The internal component includes patterns from the past, the present true income interpretation, and a predictive model for the future. Previously Belkaoui (1980:80) identified models for stockholder wealth maximisation, managerial welfare, and social welfare.

The development of paradigms is described by Drury and McWatters (1998:38) as including the feedback framework, the adaptive framework, the strategic framework, the value chain framework and the kinetic framework. The comprehensive kinetic model combines the properties of the other models and also emphasises and accommodates the decision-making role of accountants and management accountants, which includes futuristic projections, to meet the needs of present organisations,.

As part of the procedure for re-evaluating the rehabilitation paradigm which is currently being used, other systems should also be considered. In order to find the best alternative, management accountants should not confine themselves to a single paradigm. A combination of characteristics of various models could be included that best suit the particular limitations and circumstances of the mining enterprise. After the introduction of the chosen paradigm, further corrections and paradigm shifts might possibly be needed once feedback on successes and failures is received.

7.4.7 Extended enterprise, value chain, stakeholders

As part of the development of a strategy for rehabilitation management, the management accountant should define the boundaries of the extended enterprise. Most (87,2% to Statement 2.2.7) of the responding rehabilitation and environmental managers agree that the cost of the extended enterprise should be determined. This would allow accountants to come out of isolation, function in the broader environment and obtain a more holistic approach when compiling strategies.

According to Ansari et al (1997b:MMEC-20), the extended enterprise, or value chain, comprises all the customers, suppliers, dealers and recyclers who form an interdependent group together with the main enterprise. The costs of the extended enterprise in respect of rehabilitation management would therefore include expenditure on aftercare, consultants, research and development programmes, contractors, suppliers, security and

the natural environment. Not only are the own interests of the mining company taken into account, but so is expenditure in respect of accountability to society (Parker, Ferris & Otley 1989:169). Costs, time and risk assessments in respect of diminishing quality of life owing to pollution are difficult to determine. Both financial and non-financial impacts upon society, including the local community, environmental and national interests, should be determined.

After determining the boundaries of the extended enterprise, the accountant and management accountant should decide to what extent information on inputs and gains would be disclosed in respect of the value chain to these interested and affected parties. The people included in the extended enterprise would then have the opportunity to evaluate both the negative and the positive impacts of its performance.

7.4.8 To management

A holistic approach towards management accounting and rehabilitation management would support the factors of continuous improvement as well as of development and research. Various cost categories should be included in the management accounting model, which would include life-cycle costs from impact assessment to aftercare, value-added concepts, the costs involved in finding an ecological balance between humans and nature, rehabilitation costs in relation to the needs of the surrounding community, paradigm shifts for cost assessments, and the cost of the extended enterprise.

7.5 COST: IMPROVEMENT POLICIES

7.5.1 Introduction

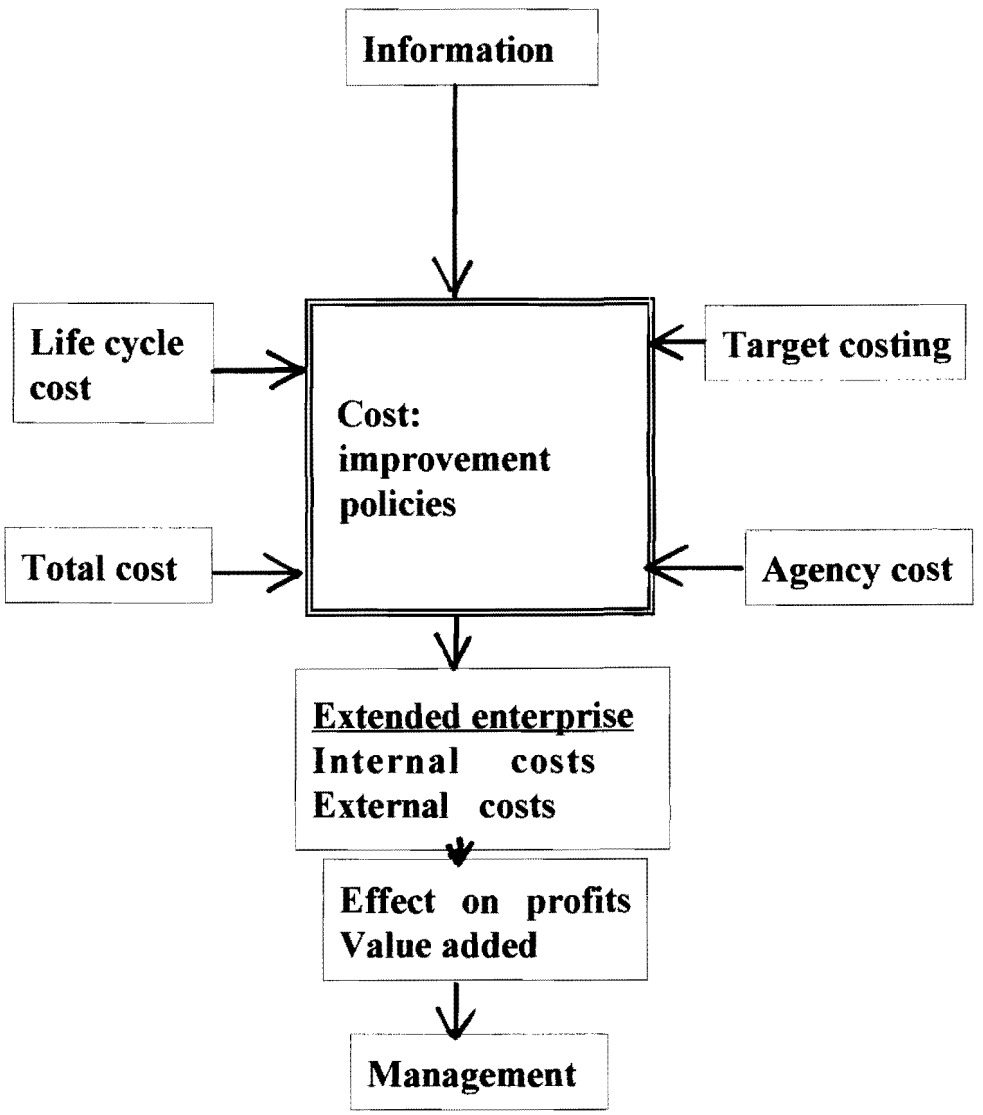
All management accounting information is not necessarily useful and relevant for rehabilitation management planning and decision-making purposes. Within the organisational environment this information is often produced too late to reduce costs, it may not provide sufficient cost detail, and it may ignore long-term and future gains (Johnson & Kaplan 1987b:22). Environmental and rehabilitation costs are high and they are growing, they are scattered across a variety of activities, and they are not allocated equally to all products (Ranganathan & Ditz 1996:38). Outdated and inefficient accounting and management accounting techniques need to be recognised and updated,

or replaced, in accordance with the circumstances of particular rehabilitation projects. This fact is confirmed by the environmental managers responding to the quenstionnaire (Diagram 4.5 and Diagram 4.6). They agreed that environmental costs should be integrated routinely into management decision making (Statement 2.2.1:95,8%), and that monetary provision should be made for long-term rehabilitation management and aftercare (Statement 2.2.4:95,8%). These relatively high percentages indicate that policies to improve rehabilitation cost management could be implemented without resistance from the environmental and rehabilitation managers in the mining industry in South Africa.

In order to be able to improve existing rehabilitation cost management policies, the management accountant needs information on various costing systems, especially those that would reduce long-term environmental costs (Denton 1994:29). A better knowledge and understanding of rehabilitation costs could help management to increase profits, use materials more effectively and improve rehabilitation activities. These costing systems include life-cycle costing, the total cost approach, target costing and agency costing. Feedback on the effect of these changed and improved policies on profits and gains would lead to a chain reaction of improved policies regarding quality, cost and time. The component of cost improvement policies which forms an integral part of the comprehensive strategy aimed at rehabilitation management is illustrated in Figure 7.4.

Since rehabilitation and reclamation procedures are becoming highly complex and technical, cost calculations have to be a major consideration in the design and operation of a mine. Rehabilitation costs which form an integral part of the total operating costs of a mine should be methodically evaluated to determine whether they add value or reduce value.

Figure 7.4 3 Cost: improvement policies



(Source: Empirically developed)

7.5.2 Life-cycle costing

The principles of life cycle costing were briefly discussed in Paragraph 7.4.2 from the perspective of the holistic approach from impact assessment to aftercare. Effective life cycle cost management consists of the following components (Shields & Young 1991:39):

- Life cycle costing. 80-85% of life cycle costs are committed by decisions made early in the production life cycle. The implication for rehabilitation management would be that additional money spent during impact assessments could save up to eight times that amount on later rehabilitation activities and maintenance. This view on preventive costs is supported by the majority (85,4% to Statement 2.1.2) of the respondents to the questionnaire. The importance of the designing out of rehabilitation costs in the design phase was given a higher percentage (97,9% to Statement 2.2.2) by these respondents. Whole life cycle costs would also include the cost of maintenance after the closure of mines, or the rehabilitation cost of future owners with inherited damaged.
- Product life cycle management. This would involve costs incurred in the management and marketing during all the stages of the product or production process, including disposal costs, maintenance costs and health claims as a result of pollution.
- Organisational structure. Various forms could be considered, such as vertical and horizontally differentiated groups which would fragment activities during the life cycle. With multi functional teams each team would be responsible for better management through the whole life cycle.
- Responsible cost reduction methods. Reducing rehabilitation costs over the entire life cycle of the operational life of a mine would increase its competitive advantage. During periods of low market prices for commodities, this would ensure the survival of the mining enterprise.

Rehabilitation life cycle costing includes not only processing and maintenance costs, but also the life cycle costs of labour. The categories of employments cost, operational cost and work environment cost are distinguished (Dahlén & Bolmsjö 1996:460). For the purposes of a life cycle approach towards improved policies on rehabilitation costs, this life cycle of labour expenses should also be added.

When assessing the life cycle costs of a rehabilitation project, the stages of the life cycle (Hirsch 1988:398) should be distinguished. During the embryonic stage basic research and development are completed, whereas in the growth stage emphasis is placed on marketing or disclosure together with continuing research to improve technology. These are followed by the maturity stage of maintenance and control, and the aging stage when the rehabilitated land could be abandoned. Puri (1996:23) identifies the life- cycle stages as raw material acquisition, fabrication or processing, manufacturing, service, use, and waste management. Each stage has its own costs associated with the relevant operations.

In addition to the assessment of rehabilitation costs during the life cycle of excavating operations on an area of land, changes and potential changes in the life cycle or order of the life cycle (Czyzewski & Hull 1991:20) should also be budgeted for. For improved cost management the optimum sequence of events (Levitt 1965: 93) in the life cycle should be determined in the planning stage. Complementary life cycles could also exist when rehabilitation projects are at different stages of their life (Hirsch 1988:399). These planning strategies would prevent the inefficient allocation of resources which might result in lower profits.

In order to improve cost management policies, management accounting systems should be developed that support the planning and control of life-cycle costs at all stages of the life cycle, especially in the early stages of the life cycle. The benefits and gains of rehabilitation should then be compared with all the costs incurred over the entire life cycle of mining activities from impact assessment to aftercare.

7.5.3 Total cost

Inputs of materials and energy yield outputs of products and harmful emissions during mining operations. The total cost of pollution and the accompanying rehabilitation costs involve aspects such as solid waste, recyclable materials, trade waste, hazardous waste, polluted water and air, heat, noise and radiation (Birkin 1996a:36). Both short-term and long-term rehabilitation costs should be included in total cost calculations to improve existing cost policies.

A distinction can also be made between various categories of environmental costs on the basis of the nature of these costs (Ansari et al 1997b:MMEC-4). We can distinguish

between legal costs, social costs and costs related to consumer matters. From these categories arise costs related to environmental activities, such as pollution prevention, assessments of sources of waste, control of produced waste elements, and failure costs for remediating accidental pollution (Lawrence & Butler 1995:104). According to the survey among rehabilitation managers, these cost categories of prevention, assessment, control and failure costs are indeed separated from other environmental cost categories. The responses, however, were not much in agreement with the relevant statements (2.2.11:45,8%; 2.2.12:50%; 2.2.13: 58,3% and 2.2.14:56,3%). In order to improve cost management policies, this separation of environmental cost categories would emphasise the contribution of each one to the total rehabilitation cost to the enterprise. From this analysis of total rehabilitation costs the deduction can be made that the extended enterprise, or groups involved in the value chain, could reduce total rehabilitation costs in a joint effort to improve cost policies.

Depending on the type of accounting and management accounting system being used as well as the tradition of the mining enterprise, various further smaller rehabilitation cost categories could be distinguished. They are costs associated with depreciable capital and operating costs in the receiving area, storage of materials, the processing area, solid and hazardous wastes, and controls over water and air emissions (Hamner & Stinson 1995:6). The supervision components of these rehabilitation costs are related to the departments of purchasing, engineering, processing, management, finance and accounting. Other sources of information on total rehabilitation costs (Ranganathan & Ditz 1996:40) would be permitting fees, fines and penalties, maintenance of equipment, emissions output, depreciation, monitoring, training and costs of outsourcing and contracting out.

It is necessary to correctly identify and allocate all relevant costs, and previously hidden costs, pertaining to rehabilitation for purposes of budgeting, recording and projections, and to determine cost relationships for management decision-making purposes.

7.5.4 Target costing

Target costing is closely linked to cost leadership and business planning from the onset of operations. It is an activity which is aimed at reducing the life cycle costs of products or operations, while ensuring quality, reliability and community satisfaction (Carr & Ng 1995:347; Kato 1993: 33). The purpose of target costing is to anticipate costs, to improve

processes, to consider community requirements, and to integrate all interested and affected parties with the ultimate aim of earning profits (Ansari et al 1997d:TC-3).

Rehabilitation costs could largely be determined during the planning stage, and the benefits of cost reductions could be incorporated in the budget. In this regard the rehabilitation managers who responded to the questionnaire agree that designing costs out in respect of rehabilitation costs should form an integral part of strategic management (Statement 2.2.2: 97,9%). Possible methods of reducing costs are examined during all the phases from planning to research and development. In Japan target costing activities have reached a level where over 80% of all costs are determined before actual production commences. This allows Japanese companies to pay more attention to planning, design, and research and development (Carr & Ng 1995:347), which support target costing activities. Financial departments coordinate and set targets, for both internal and external parties (Carr & Ng 1995:363). A team approach is followed where experts ranging from designers to engineers and marketers together with the management accountant concentrate on developing processes that are in accordance with the required target costs. In order to reach the set targets, benchmarking activities take place under the leadership of accountants and management accountants.

The focus of target costing is to reduce rehabilitation costs, and not to control costs. It is a comprehensive programme for reducing costs even before there are any mining activities on a farm. In view of the new and more advanced techniques and processes that are developing, there should be continual improvement in target costing. Target costing is future-oriented and therefore provides a better basis for decision making.

Various types of cost data from management accounting systems are provided for purposes of target costing. These are life-cycle costing, value-chain costing, feature or function costing, design driven costing, operations costing and activity-based costing (Ansari et al 1997d:TC-24). When targets for expenditure on rehabilitation projects are set, decision making is enhanced. The structure of target costing (Kato 1993:38) is based on the idea of

Target cost (allowed) = Expected sales price - Target profit

Each one of the variables in the equation is determined at the planning stage. Since the

expected sales of mining commodities are to a large extent determined by fluctuating national and international market forces, the accountant has to decide how much of the target profits should be forfeited for rehabilitation purposes at varying price levels.

Not only financial targets, but also non-financial targets in terms of time and people management could be incorporated into this approach of target costing for rehabilitation conditions. The waste elimination philosophy of just-in-time processing (Kato 1993:34), or rehabilitation during the extraction of commodities, could do a great deal to reduce both costs and production time.

The objectives of target costing could be incorporated into those of lean processing. Lean processing largely coincides with rehabilitation processes, where sophisticated technology, multi-skilled labour and a high capital outlay (Ansari et al 1997a:MALP-5) for long-term projects are found. Lean techniques involve constant elimination of waste from an operation and could be broken down into the following activities (Womack & Jones 1996:141):

- Determining the precise value in terms of the end product or result.
- Identifying the total value stream and eliminating waste.
- Effecting continuous flow between steps with no waiting time, downtime and waste.
- Designing and providing rehabilitation only to the extent that is required.
- Pursuing perfection by means of feedback, development and a virtuous circle.

A successful target costing system, like a lean costing system, must be based on sound long-term planning before commencement of activities. This would be supported by mechanisms for continuous improvement.

7.5.5 Agency cost

The agency theory is based on the relationship between principal and agent. The principal or superior delegates decision-making responsibilities to the agent or subordinate according to a mutually agreed contract. While the principal wants the maximum utility from both the contract and the information system as a whole, the agent only has to take action according to the contract (Drury 1996:853).

Managers as agents, acting in the interests of their stakeholders, the principals (Jensen & Meckling 1976:309), are faced with constraints in the markets for goods and services, for financing, control and managerial services (Parker et al 1989:174). Social accounting information, such as financial and non-financial inputs and gains from the rehabilitation of damaged mine areas, is now regarded as substitute positive information to principals to lessen the negative effect of constraints.

According to some authors the agency theory has the potential to provide a conceptual framework on which a comprehensive strategy for management accounting could be constructed (Scapens 1991:146). But this theory of agency costing is still in the process of developing, and has some limitations (Johnson & Kaplan 1987a:174; Drury 1996:854) that should be phased out. Inaccurate cost allocation schemes prescribed by the principal could lead to a chain reaction of inaccurate information and decision making (Wagenhofer 1996:380). Rehabilitation management accounting is far too complex to accommodate this simplified model. In rehabilitation management many interlinked contracts exist, such as those between stakeholders and a management team, each of which would have a hierarchical structure (Ashton 1991: 124). It would be virtually impossible for management accountants, who are responsible for the provision of information which would form the basis of these one-to-one contracts, to perform their duty.

But its development should be closely followed, since the theory might have some merit. Conflicts of interest between management and interested and affected parties, as well as the influence of accounting information on management and stakeholders, serve to shed fresh light on management accounting.

7.5.6 Feedback

After cost improvement policies have been considered and implemented, feedback adjustments should be made in response to both positive and negative influences and results. Feedback mechanisms have the ability to continuously respond to discrepancies between actual and ideal situations, and to adapt in the long term to fluctuations (Simon 1990:172). Feedback adjustments are made in response to changes, in whatever direction such changes may take, but they are in a responsive position and do not make projections for the future.

By comparing planned and actual outcomes, it is possible to detect rehabilitation activities that do not conform to the plans. In the process of self-renewal both successful and failed attempts are followed up (Pascale 1991:21). This applies to failures of new ideas as well, and these are often more easily abandoned. When actual operations yield better than planned results, the reasons behind these should also be investigated. Improved cost policies should be analysed and considered for application to alternative projects as well.

The importance to management of feedback on both successful and failed rehabilitation operations, is reflected in the responses of rehabilitation managers. They indicate that feedback on successes (2.1.9:100%) and failures (2.1.10:93,8%) is important for management decision-making purposes.

Feedback mechanisms can be used to gather information on changing activities as well as the changing circumstances in the working environment. Evaluations on feedback information should also include the appropriateness of the original plans (Drury 1996:12). Activities could then be modified to suit the plans or plans modified according to the activities. Feedback has dynamic characteristics as it creates feedback loops in an otherwise one-way policy illustration. The interdependencies between the various activities are emphasised and provision is made for regular reviews of existing cost policies.

7.5.7 To management (internal and external costs, effect on profits)

Policies to improve cost management would include measures to reduce costs, to shift costs and to take non-financial indicators into consideration. Life cycle costs, total costs and target costs in respect of rehabilitation management should be determined and adjusted during the planning stages, even before impact studies, which are required by law, have been conducted. Developments to cost systems such as agency costing should be followed in order to select aspects that could have a positive influence on existing rehabilitation management accounting procedures. A distinction between internal and external costs and gains would also reveal and emphasise possible problem areas that could be improved.

Management has to decide to what extent profits have to be forfeited in order to improve cost policies. The effect of existing rehabilitation approaches on profits has to be

determined before adjustments can be made. A distinction should be made between profits and an increase in wealth when these accounting figures are presented (Birkin 1996b:236). Profits should be compared with residual pollution to the air, water and soil after the completion of rehabilitation activities. These residual pollution effects would contribute directly and indirectly to a general degradation of the quality of life for all stakeholders. To increase efficiency in respect of these decisions, a system of feedback should be in place. Management could then be continuously informed about positive as well as negative influences of changes in rehabilitation cost management.

Management has the task of enquiring into both existing and developing cost improvement mechanisms in order to make a choice for the benefit of all affected and interested parties. As part of the rehabilitation management team, the management accountant has a crucial role in obtaining and providing adequate information which could be applied to improve existing cost policies.

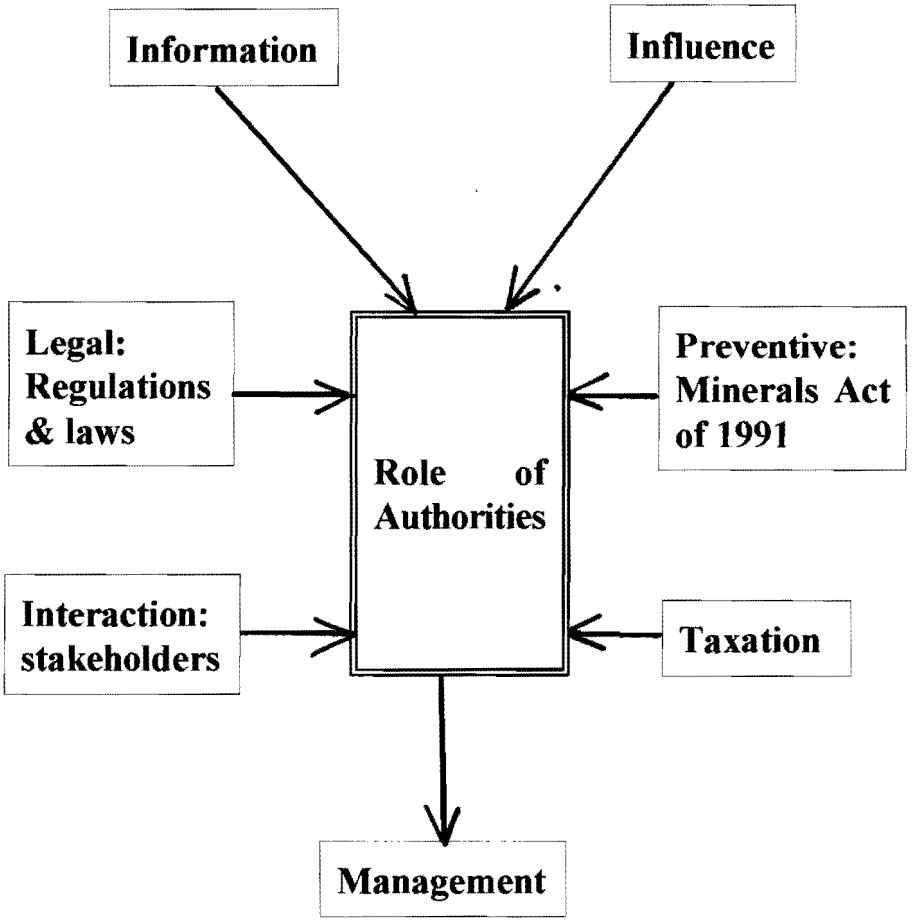
7.6 THE ROLE OF AUTHORITIES

7.6.1 Introduction

Since the real costs of pollution and the control of pollution from mining activities cannot be avoided, someone has to bear the costs in the end. If the mining enterprise does not control pollution at the source of pollution, the environment or the taxpayer would have to bear the costs (Torrens 1982:27). It is the responsibility of the local and national authorities to determine and supervise the share of rehabilitation costs which should be paid by each interested and affected party. The principle of "the polluter pays" is widely accepted and applied in this regard.

It is therefore necessary that the management team involved in rehabilitation projects should have some knowledge of and access to expert advice on local regulations and national Acts in connection with pollution control. Trends in the influence interested and affected parties are likely to exert on future legislation as well as the taxation implications of rehabilitation expenditure should be noted. Figure 7.5 shows both the influence of and the information generated by authorities in rehabilitation decision making.

Figure 7.5 4 The role of authorities



(Source: Empirically developed)

7.6.2 Legal: regulations and laws

Traditionally environmental and rehabilitation costs have been relatively low and the cost of identifying them relatively high. In these circumstances it was possible to allocate these costs to general overheads (Hamner & Stinson 1995:5). Owing to the increased costs of compliance with the greater volume of environmental regulations that are now applicable, these traditional allocations have become inappropriate. New local and national pollution control regulations and laws compel rehabilitation management accountants to re-evaluate existing cost accounting systems.

In this regard the rehabilitation and environmental managers who responded to the questionnaire agree that a thorough knowledge of present local and national regulations, laws and fines applicable to rehabilitation issues is an attribute of good management policy (Statement 3.1.5:95,7%).

If companies are conversant with penalties and fines, pollution levels could be decreased and failure expenditure reduced or avoided. Fines, penalties, law suits and health claims could add up to large amounts for mining enterprises that do not comply with environmental laws and regulations. More accurate information on environmental and rehabilitation costs could be obtained by correctly identifying and allocating costs by means of cost drivers, for example, and cause-and effect relationships between budgeted and allocated costs (Hamner & Stinson 1995:10). Processes that might lead to pollution and future penalties, fines and lawsuits could be identified and adjusted. The possession of more accurate information on preventable as well as unavoidable environmental costs would lead in turn to more successful financing, better decisions on rehabilitation investments, and a competitive advantage.

7.6.3 Interaction with stakeholders

The influence of people on actions taken by authorities and the influence of authorities in compelling people to reduce waste production, should be considered when determining the role of authorities in rehabilitation cost management strategies. Both the public and the private sector have a variety of options when responding to new pollution rules. These options range from relatively simple to complex, and from relatively inexpensive to very expensive. Both groups should be aware of the impact of mining operations on the natural

environment as well as of the future financial and non-financial implications of adequate or inadequate rehabilitation policies.

The degree of positive reaction by authorities to requests by public groups, for example to improve the present situation by imposing higher fines on transgressors, should be investigated. Both financial and non-financial factors should be considered. Financial aspects would include more expensive rehabilitation equipment or processes, and non-financial aspects would be the time lag between draft documents and the enforcement of new laws and regulations. The effect of these new regulations, increased fines and penalties should be determined in terms of improved rehabilitation management policies and higher investments towards these goals.

In developing countries such as in South Africa, the management team should follow certain guidelines in the negotiation process for arriving at environmental and rehabilitation policies. Banks, donor organisations and authorities should act with responsibility by attaching conditions to the provision of credit facilities and technical assistance (Warhurst 1994:158). The following relevant issues should form the basis for these negotiations (Dias 1992:124):

- A balance should be found between confidentiality and the public's right to know (public disclosure).
- Provision should be made for environmental costs in terms of long-term pollution and short-term remediation costs being met by mining companies, authorities and the community.
- Arrangements should be made for the monitoring and implementation of impact assessment guidelines.
- Conflicting national and global priorities should be reconciled in cases where national and local authorities are more concerned about exchange and revenue earnings and employment than about the rehabilitation of abandoned mines.
- Early participation by interested and affected groups would diminish problems arising from health and safety considerations and natural environmental problems.

The ideal situation would be a state of affairs where eventually both authorities and rehabilitation and public groups could work together towards quality environmental and rehabilitation management. The influence of politics of the day, the economic situation

in the mining industry, and the degree of dependency of rehabilitation management on these fluctuating external factors should be included in a rehabilitation management accounting strategy.

7.6.4 Preventive actions: Minerals Act of 1991

In order to prevent damage to the environment or human health from illegal discharge, failure to report such pollution, as well as repeated violations of pollution control regulations, authorities have to take action. One of the major objectives of the Minerals Act (50 of 1991, amended by 103 of 1993) is to prevent, by means of an extensive system of impact assessments, damaged land left in an unrehabilitated condition in future. According to the rehabilitation and environmental managers responding to the questionnaire, this Act significantly influenced rehabiliation management for land disturbed by mining (Statement 4.3:65,9%). A response of 34,1% in respect of uncertainty, however, indicates that they are not sure whether the effect of the Act could be determined at this early stage. The required funds now have to be available at the right times to accomplish rehabilitation activities (KPMG 1993:48). Large sums of money are involved in these preliminary investigations, but this expenditure could eventually lead to decreased damage and consequently lower remediation costs.

The Minerals Act (50/1991 as amended) is discussed in detail in Chapter 2, which deals with the situation in respect of rehabilitation management in South Africa.

7.6.5 Taxation

One of the major control mechanisms used by local and central authorities could be to manipulate taxes to encourage rehabilitation projects. Capital as well as current expenditure is involved. Expenditure of a capital nature is not deductible for purposes of income taxation, but current expenditure could be deducted from income before taxation liabilities are calculated.

The influence of income taxation on rehabilitation costs and expenditure, as well as recommendations for improving the existing taxation policies, could form the subject of a comprehensive study on its own. This section only touches on the importance of being informed about taxation policies as they affect rehabilitation management.

The following distinction (Smith 1997:22) could be made between various environmental taxes, and could serve as the basis for categorising taxation-related expenditure and decisions.

- Measured emission taxes. They are directly related to measured pollution effluent.
- Taxes to approximate a tax on emissions. Changes in indirect taxes such as value-added tax might be applied as an alternative to measured emission taxes. Goods and services associated with higher pollution effects (such as coal) would be taxed more heavily than products that might benefit the natural environment (such as lead-free fuel).
- Non-incentive taxes. They are collected for the purpose of procuring funds for particular public expenditures related to environmental protection and rehabilitation. These taxes are not imposed to provide incentives to reduce pollution emissions.

Responding environmental and rehabilitation managers in the mining industry indicated in their reply to the questionnaire (Statement 3.1.6: 80,4%) that a sound knowledge of present taxation policies supports decisions on rehabilitation costs and expenses. They also agreed (Statement 2.2.8:77,1%) that expenditure to rehabilitate on an ongoing basis as part of the operating process should be separated from expenditure to rehabilitate damage from the past. This would imply that expenditure to rehabilitate inherited damage from previous years should be considered for taxation reductions from income for those years. Rehabilitation expenditure incurred as part of the ongoing process during the current year should be compared with income of the current year for taxation purposes.

The influence on profits of current and future taxation policies imposed by authorities would determine the amounts and periods of expenditure on rehabilitation projects in the mining industry. It is therefore necessary for the management team to have a sound knowledge of taxation trends both in South Africa and in developed countries. Successful policies in other countries might be linked in future to put pressure on national authorities to introduce similar taxation in order to obtain foreign investments in the local mining sector.

7.6.6 To management

Management teams, including the management accountant, need to be informed about the attitudes of authorities when preparing a comprehensive strategy for rehabilitation management. A thorough knowledge of present local and national regulations, laws, fines and penalties regarding rehabilitation and pollution issues would contribute towards good management policy. Failure costs could be avoided or reduced. A distinction should be made between rehabilitation costs allocated to repairing the damage of previous years and to repairing the environmental damage of the current financial year.

The interaction of authorities with the private sector could lead to increased investments in improved rehabilitation equipment and processes. A more understanding attitude and support by authorities if complying mining companies should happen to suffer accidental spills or floods would reduce contingency or failure costs. Preventive actions by authorities such as the impact assessments required by law (Act 50/1991) are a means of compelling mining companies to provide funds for rehabilitation on an ongoing basis during excavations, as well as for closure costs.

The traditional role of the accountant and management accountant would have to be extended (Gray 1990:66) to include dealing with new taxation, taking new environmental regulations into consideration for investment appraisals, controlling costs under new pollution-reducing methods, estimating the impact of environmental consciousness, and changing responsibilities.

7.7 TOTAL QUALITY ENVIRONMENTAL AND REHABILITATION MANAGEMENT (TQEM)

7.7.1 Introduction

Total quality environmental management forms an integral part of the development of a comprehensive strategy for rehabilitation management accounting purposes. Although this management system is complex, it has inherent properties that can be utilised under constantly changing conditions. In order to survive under these changing circumstances, enterprises have to be both adaptable and willing to learn. The costs of poor quality which show up in the areas of scrap, repairs and warranties could be reduced (Blackiston

1996:16) if everything were planned and done correctly from the start.

Companies introducing total quality management systems have certain characteristics (IIE Solutions 1996:13), such as using high-skills technology, being employee-oriented and competing on the basis of quality, service and variety. Other features frequently found are flexible jobs, problem-solving in team context, participation by employees, high levels of training and education, and employment continuity. One of the major objectives of total quality management is that organisations continue to find innovative ways to improve quality.

Total quality management could be described as complex, dynamic and nonlinear (Leach 1996:85). This management system is complex and adaptive in the sense that it demonstrates evolutionary behaviour. It is not exactly chaotic and does not feature rapid unpredicted changes without any pattern. This dynamic system changes with time, and is nonlinear because responses are not directly proportional to inputs.

The implementation of total quality environmental management procedures inevitably comes up against limitations. These obstacles could be bureaucratic or cultural (Blackiston 1996:17). The concepts of quality do not seem to be difficult to master, but they might take many years to put into practice. It is therefore important to be aware of these barriers before and during the implementation of total quality environmental management.

The substrategy of total quality environmental management would include the consideration of the role of the mission and objective statements; the type of management structure; resource and maintenance management; total quality control; sustainability; the quality culture; international standards; strategic and value-based management, and futuristic views. This component influencing the comprehensive strategy towards environmental and rehabilitation management is illustrated in Figure 7.6.

Figure 7.6 5 TQEM STRATEGY

(Source: empirically developed)

7.7.2 Mission statement and objective statement

One of the initial steps of strategic management is to develop a mission statement for the organisation and for each section. From this mission statement objectives and goals are determined. Objectives are more general in nature; an example might be to rehabilitate damaged land in accordance with accepted international standards (SASOL 1997:4). Goals would be more specific (Hirsch 1988:408), a goal might be that wildlife would be introduced within five years of completion of rehabilitation operations. The basic mission statement, objectives and goals should be consistent with each other.

If a mission statement is to be effective in promoting quality management, it should include the vision of the top management, must be specific, must fit in with the organisational culture, has to be honest, and should contain input from personnel (Wright 1996:26). After the formulation of the mission statement, it should be communicated to all and should be conspicuously available. Objectives should be in keeping with the characteristics of the mining company, should be possible to achieve and should be motivational in nature (Hirsch 1988:408). In addition, they should also be clearly communicated and accepted by all participants in the rehabilitation process.

Rehabilitation management intentions would only contribute towards implementation policies if they are included in the mission, objective and goal statements of the mining enterprise. The environmental and rehabilitation managers who responded to the questionnaire confirmed that the mission statement and the objective statement have a positive influence on rehabilitation policies where they deal with environmental issues (Statement 3.2.2:83,3%).

As soon as the mission statement has been described and extended to the objective and goal statements, the management team should develop alternative strategies to meet these stated visions. Requirements for capital and human resources have to be assessed, as well as provision for risk and time, which involve both financial and non-financial factors. The mission, objective and goal statements are not static and have to be revised in accordance with changing circumstances. New approaches would be needed if the mining company were to change direction or in the case of mergers and technological developments.

7.7.3 Total quality control

The control stage of total quality management is part of the feedback loop. Rehabilitation results are evaluated and compared with budgeted standards, originating from the mission and objective statements. Actions are then taken to correct any unfavourable variances. These comparisons are made in terms of both financial and non-financial budgets, inputs and gains.

Since the natural environment is a public concern, rehabilitation management should constantly monitor the total quality of projects. Poor quality has its own hidden costs in the form of internal and external failure costs (Hughes & Willis 1995:15). Prevention and inspection costs which form part of total quality programs are incurred during the early stages to reduce from 70% to 80% of failure costs such as fines and penalties during later stages (Hughes & Willis 1995:16).

Various categories of quality (Riahi-Belkaoui 1993:5) could be identified as the basis for control analyses. They are the following:

- Performance and features quality categories refer to the operating attributes of rehabilitation management.
- Reliability, conformance, durability and serviceability quality categories determine future failure and maintenance costs.
- Aesthetics and perceived quality refer to how the external affected and interested parties experience the rehabilitation operations and final results, based on the amount of information that is available to them.

The management team has to decide which of, and to what extent, these categories of quality will be met, and what investments will be made in terms of the financial and non-financial expenditure on these objectives. All quality control costs and procedures in compliance with the reclamation strategy should be assessed, both for rehabilitation and for maintenance after vegetation. Projections should be made not only in terms of direct control expenditure, but also in terms of the periods involved for each control cost item and for inflation calculations (Bishoff 1984:169), especially under circumstances of significant fluctuations of price indices.

Part of total quality control is quality cost reporting. Quality cost reporting (Riahi-Belkaoui 1993:10) enables the management team to realise the extent of the quality-cost problems and shows them where the problems lie. It enables them to set and meet targets, to assess progress in respect of cost reduction policies, and it enables them to motivate departments to set targets and to assist these departments in achieving those goals.

Pollution control procedures and the associated costs should therefore be regarded as quality control measures to prevent water, air and soil pollution. These quality control costs would include expenditure to cover waste dumps, the establishment of vegetation, procedures to prevent injuries or loss of life from hazards at abandoned mine sites, shafts and boreholes, and methods to avoid fires (Bishoff 1984: 187), particularly at abandoned coal mines and coal discard dumps.

In order to supplement quality cost reporting which is based on historical figures, a feedforward control system (Riahi-Belkaoui 1993:98) for total quality control should be considered for implementation. This system is based on predictions, projections and simulations of the effects of future rehabilitation actions.

7.7.4 The bottom line; top-bottom management; bottom-top management

Changing public attitudes concerning environmental preservation and management are forcing management teams to reevaluate the traditional approach of an impressive balance sheet with high profits as the bottom line guideline. The bottom line is described (McLeod & Makins1993:126) as "the last line of a financial statement that shows the net profit or loss of a company or organisation", and as "the conclusion or main point of a process or discussion".

Accountability to workers, in the form of informed choices, is essential if the management system is to function adequately (Estes 1996:213). By concentrating not only on the achievement of higher profits, but also on the people in the workforce and on the natural environment, the purposes of total quality environmental management could be served. The key to effective rehabilitation management is to change the perspectives of the workforce towards support of the pollution management efforts, which would inevitably result in improved cost management and the prevention of contamination. They should regard the natural environment and rehabilitation management as a potential opportunity

and not as a liability. Although top-bottom management systems would be the only means of delegating under certain circumstances in South Africa, bottom-up management should constantly be considered and developed as a means of getting all levels of the workforce involved in improved quality management.

A bottom-up approach could add significantly to the quality of rehabilitation projects. Quality would be better served if everyone in the workforce understood the purposes behind the goals (Juran 1989:294). Since the workforce is interested in management, they should be informed about developments. Their suggestions for improvements to the tasks they are performing and any creative proposals they can offer on financial and non-financial issues should be included in the main flow of feedback to the rehabilitation management team. Employee involvement in quality issues should include teamwork, encouragement to solve problems, willingness to experiment with new ideas, and a commitment to do the best possible job (Ciampa 1991:181). The basis of quality work would be to do it right the first time and to yield real and valuable benefits (Hollington 1997:33) in both financial and non-financial terms.

One of the major assets of an enterprise is the power of people, including the workforce, managers, suppliers, customers (Johnson 1992:103) and the surrounding community, which could remove limitations that impede flexibility in a total quality approach. The workforce is no longer merely a source of energy and cost which is obliged to follow orders in a top-down system and is motivated merely to maximise profits. Included in the features of total quality management is the emphasis on the empowerment of employees. Employees can only be empowered when they are involved in strategic planning, can be trained to improve the way in which they perform their tasks, and can be trusted by management (Raiborn & Payne 1996:964). Senior managers should allow workers to participate in quality-related environmental decisions and to accept more responsibility for quality output in an atmosphere of flexibility.

7.7.5 Sustainability

The system of total quality environmental management has as one of its major aims sustainable development (Stead & Stead 1993:19). Companies need to respond to growing numbers of environmentally conscious stakeholders in the marketplace who champion the cause of the natural environment by including sustainable development in strategic

management programmes. Sustainability or sustainable development could be described (Bebbington & Tan 1996:75) as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". It means "preserving the ecosystem as well as maintaining the ability to provide humans with the goods and services necessary for a good life, complete with fulfilling work and economic justice" (Banks 1993:23, quoting Stead & Stead). An effort is made to find a balance between economic growth on the one hand and environmental preservation on the other, based on the limit that could be reached in population numbers whose needs could be met by finite resources (Todaro 1994:327). Sustainability therefore integrates the social, economic and ecological values (Milne 1996:137) of present and future generations in a multi-disciplinary focus, including future generations as a stakeholder.

In accounting and management accounting terms this would mean (Bebbington & Tan 1996:75) that a mining company leaves the natural environment no worse off at the end of the accounting period than the extent to which the company falls short of its target, by calculating the additional annual costs which would be borne by the company if it were to remedy any environmental damage it created during the course of the year. As part of the management team of trained professionals involved in sustainable rehabilitation strategies, the management accountant has the task of evaluating the costs of the pollution and developing preventive approaches (Ulhøi et al 1996:140). When the available resources are reduced for the present and future generations as a result of the failure to conserve, remediate and recycle, these generations are confronted with threats (Banks 1993:23), while conservation and remediation would give them opportunities. The essence of sustainable development is to benefit from natural resources while contributing to and improving them (Schmidheiny 1992:179).

In order to achieve sustainability, sufficient resources need to be committed to the effort as well as to making employees accountable for their actions. Sufficient capital should be allocated, appropriate equipment should be purchased, and the right personnel should be employed and trained to fulfil the commitment to sustainability (Banks 1993:25). Employees should be encouraged to strife for and rewarded for environmentally sound actions.

Various positions in respect of sustainability could be identified. The gaps between these positions would be components of full environmental cost accounting, while the gap

between the worst and best situation would form the basis for the calculation of sustainable costs. The following positions are identified (Bebbington & Tan 1996:76; Banks 1993:25):

- The present unsustainable position where costs are not calculated for externalities arising from activities.
- A more sustainable position where the cost of environmentally sound output is estimated. Since some environmental externalities have been internalised, output would cost more.
- A position where the environmental impacts of present activities are estimated. Additional costs to inputs are incurred to prevent adverse environmental impacts. Costs are required to remediate negative environmental impacts of output from activities.
- A fully sustainable position where the cost of environmental impacts for both present and past activities are included.

The gaps between the first and second positions, between the second and third positions, and between the third and fourth positions are the components of full environmental cost accounting. The gap between the first and the third positions forms the basis for sustainable cost calculations.

Various limitations to the introduction of sustainability would, however, be encountered (Banks 1993:24). Physical barriers include technical limitations such as the lack of substitutes for natural products at reasonable prices, processing methods producing significant levels of waste, and inadequate conservation methods. Social limitations to sustainable developments are found where different levels of development and commitment to environmental sustainability exist. Organisational barriers would include a culture that poorly understands the concept and prefers the familiar.

Provision should be made in the strategic programme for overcoming these limitations. These strategies would include drafting environmental policy statements as well as budgeting for improved training and education to employees, and for research and development to improve technical aspects. The complementary and interdependent parts of the strategy for sustainable development such as the protection of the natural environment, trade expansion, and economic growth and development (Schmidheiny

1992:81), should be provided for in the strategic plan.

Although South Africans do not always understand the concept of sustainability, their opinions on sustainable development are substantially in agreement with those of other countries (Shotter & Vorster 1996: 196). This would imply that local environmental and rehabilitation managers are not totally unfamiliar with this concept, and would be able to incorporate sustainability costs in their rehabilitation strategies.

The concept of sustainability should be regarded as a long-term policy, and should be constantly reviewed and re-evaluated (Bebbington & Gray 1996:137). Methods of assessing sustainability costs are being developed and include the involvement of companies and communities, as well as transparency and accountability. Additional mechanisms are required to capture the wider non-market impacts of mining operations in order to enable management accounting to include the externalities of sustainability. Sustainability is one of the most important components of full environmental cost accounting, which is in the first stages of evolution.

7.7.6 Quality culture

Traditionally and in the bureaucratic system the minority would do the thinking and give orders. The majority receive orders and do what they are told under close supervision (Wright 1996:19). Standards for quality are set from above and inspection, testing and performance control are top-down functions. Workers are not encouraged to make suggestions or to question.

If total quality environmental management is to succeed, every one in the mining company has to be involved and interested in quality environmental and rehabilitation policies. Each member of the organisation should be determined to reduce and eliminate any costs that do not add value to the remediation and rehabilitation process. Total quality management requires a culture where everyone believes that a contribution should be made towards the improvement of the quality of the processes or projects. In South Africa most environmental managers are positively disposed towards quality management approaches in rehabilitation policies in mining enterprises (Diagram 4.2 and Diagram 4.4).

In order to develop this total quality management culture, changes in empowerment are necessary. Managers must be prepared to allow others to take decisions and trust others, and workers have to be prepared to accept responsibilities (Wright 1996:27). A new approach should develop with the focus on "doing things right the first time" (Russell 1990:22). This process of change in the culture towards quality would involve both learning and unlearning. All changes should be negotiated and flexibility should be built into these plans so that there can be a change towards a quality culture or where a quality culture already exists it can be improved. A quality culture would lead to improved productivity, less waste, increased profitability and a better and pleasanter working environment (Russell 1990:23). The combination of people and quality is the link which leads to a successful total quality management future.

7.7.7 International standards: ISO9000 and ISO14000

International standards such as ISO9000 on quality management and ISO14000 on environmental management, issued by the International Standards Organisation (ISO), form an integral part of total quality environmental management. This view is supported by the environmental and rehabilitation managers who responded to the questionnaire. They agreed that the application of ISO9000 (Statement 3.1.1:76,6%) and ISO14000 (Statement 3.1.2: 89,1%) should be encouraged (Diagram 4.8). The introduction of ISO9000 and ISO14000 fulfils the need for a comprehensive international set of standards on quality and environmental management.

As South African companies start to compete with international companies in the global economy, more attention is being focused on their environmental management systems. A company wishing to promote new investments needs to ensure that it is implementing environmental and rehabilitation management systems and procedures that comply with international standards.

The series of ISO9000 standards consists (Webster 1997:19; Rothery 1993:30) of ISO9001 for the design and development of products, ISO9002 for installation and manufacturing according to design specifications, ISO9003 for the ability to inspect and test output, and ISO9004 for standards on services. The ISO9000 series of international quality standards ensures quality in goods and services manifested in increased productivity, lower overheads and less waste, and would stimulate creativity and

teamwork (Taormina 1996:44). Affected and interested parties can assess the quality system and check the ability to function satisfactorily (Sadgrove 1994:32). ISO9000 certification provides a competitive advantage for the measurement of gains and assists in the improvement of existing processes.

During the ISO9000 registration process (Webster 1997:21) all employeesare trained on the quality policy of the company and of the audit procedures. Before a company can pass the registration audit, ISO9000 requires that all procedures should be written down in detail. This quality manual develops into a document control system which is the foundation of a quality system. The corrective action of internal audits provides feedback on problems, and their causes can be identified and resolved in a process of continuous improvement. Previously hidden cost constraints could be revealed by this process of registration and could then be reduced. The costs of the initial assessment and certification, surveillance costs, the costs of extra meetings and planning, and of additional control measures, should be budgeted for (Sadgrove 1994:35). These costs could, however, be largely offset by efficiencies and savings on costs which could be achieved by the introduced standards. ISO9000 also provides opportunities (Vloebergs & Bellens 1996:48) and creates an orderly organisation. The input of human resources, employee cooperation and involvement will eventually determine the degree of success of the quality management system.

Although the ISO9000 series was issued in 1987 and revised in 1994, a variety of interpretations of these standards (Ridley 1997:52) indicates that ISO9000 is not yet fully developed. But ISO9000 registration should not be applied only as a marketing instrument, thereby defeating the purpose of the quality standard. Other limitations (Vloebergs & Bellens 1996:48) are the failure to include leadership characteristics and cooperation at various levels, and the failure to make allowances for the fact that improvements do not occur automatically. Previously lenders relied only on the World Bank Environmental Guidelines to assess environmental pollution risks regarding international investment projects. This practice is in the process of being extended to include voluntary international environmental standards such as ISO14000. The World Bank Guidelines provide a useful first screen for evaluating environmental risk, but more comprehensive criteria are needed. Lenders do not want to be associated with projects abroad that contaminate the natural environment. Since South Africa is dependent on overseas investments to a large extent, registration of these international environmental

standards might in future be the key to obtaining funds and surviving economically.

ISO14000, which developed from ISO9000 (Begley 1996:50), attempts to provide a framework to prevent and detect violation of environmental laws and regulations in all the countries involved. Companies have to identify and evaluate all the environmental effects of its activities, products and services. In order to obtain registration the company has to "establish, implement and maintain an ongoing comprehensive system of policies, procedures and practices to identify and comply with its environmental requirements" (Henderson 1995:50). The ISO14000 standard requires that a company should define an environmental policy that includes the following (Henderson 1995:51):

- nature, scale and environmental effects of activities
- a commitment to continuous improvement
- a commitment to compliance with environmental laws
- a framework for setting and reviewing environmental objectives and goals
- documentation of policies
- training of employees on the importance of environmental policies
- emergency planning and response
- procedures for controlling all documents related to environmental conditions
- potential consequences of noncompliance with these procedures

The ISO14000 series consists of ISO14001 on the minimum requirements and of ISO14004, which provides the framework. Both have already been accepted. Other standards that are being developed (Alexander 1996:15), are standards on environmental auditing, environmental labelling, environmental performance evaluation, life-cycle analyses, environmental aspects of product standards, and standard terms and definitions.

The advantages of ISO14000 registration and implementation would be that a mining company would be able to identify and correct environmental damage and unsafe working and living conditions. Cost control would be improved, while environmental legislation would be adhered to. Ensuring more effective ways of complying with environmental norms would increase the possibility of obtaining funds from lending countries. In addition to the long-term beneficial effects on the environment and international trade, ISO14000 will also benefit the people involved (Alexander 1996:18). The ISO 14000 framework provides the minimum standards for an effective environmental compliance

programme.

It is possible to a large extent to integrate ISO9000 and ISO14000. If ISO9000 has already been implemented, it is not necessary to change all the systems being implemented for ISO9000 in order to introduce ISO14000 (Van Rooy 1998). The successful implementation of these standards depends on commitment from all levels and from the people who perform all activities, especially from top management. Policies to include these standards go through the stages of planning, implementation, operation, corrective action, management reviews and continuous improvement (Department of Environmental Affairs & Tourism 1998).

International trends are directed towards standards for establishing general environmental guidelines relating to the various stages of the mining process, and of different types of environmental impacts of mining on the health and safety of employees and the communities (Dias 1992:112). In this regard accountants and management accountants involved in rehabilitation decision-making processes should be prepared to make provision for these developments. Adherence to these voluntary standards would assist mining companies and the community to reduce long-term damage and to increase sustainability.

7.7.8 Resource management

The task of the resource manager should be included in the overall task of the environmental and rehabilitation management team. The resource manager acts as mediator between society and the natural environment from which resources are derived (Bonnicksen 1991:11). A framework is established to organise relationships and interactions between people in industry and their natural environment with the aim of achieving sustainability. This function forms an integral part of total quality environmental management.

Resource management would therefore include life-cycle assessments from impact assessments to closure provisions. These would entail the development of pollution risk profiles, the preparation of strategic plans, regular progress measurements and reviewing and modification of plans. These actions would emphasise the commitment of the mining company towards the maintenance and improvement of the natural environment, the

protection of the health of the people involved, and the ensuring of sustainable development. Mining companies that work with hazardous waste materials have to consider the potential impact of these substances on natural resources. A natural resource damage liability regards the natural environment as an asset and realises that the services provided by the natural environment to outside markets are highly valued by society (Smith 1994:16). For each type of natural resource a set of property rights for the community is defined in terms of this approach.

Resource management would include the assessment of pollution of the natural environment and of the effect of pollution on the community. In Colorado, for example, damage to natural resources from releases into a river system was determined by studying (Smith 1994:30) the utilisation of water resources by the outside community, and how pollution would influence their quality of life.

Constant changes and developments regarding mining and processing techniques, laws and regulations, and the interests of the stakeholders necessitate regular feedback and update procedures. Environmental assessment and auditing of resource and asset management are useful especially for transfers and acquisitions of mining properties.

Resource management is an indication of the commitment of the mining company towards maintaining and improving the quality of the natural environment. This policy would protect human health and would ensure sustainable development. In compliance with international standards, constant financial and non-financial assessments, audits, evaluations and feedback would demonstrate continuous improvement and the integrity of the company would be maintained.

7.7.9 Future cost policies

The formulation of future cost policies forms an integral part of total quality environmental management. Since total quality management is still in the process of being introduced and developed, future developments within the total quality framework should be provided for in financial and non-financial terms. Compilers and users of accounting and management accounting information need to recognise and accommodate changes in cost structures. New approaches to calculating and presenting financial and non-financial information in a meaningful way should be developed.

In order to assess future investments, the particular stage of development on various aspects towards total quality management should be determined. Traditional operations management and total quality management should therefore be compared (Prasad & Sprague 1996:73). Where the focus on quality is part of inspection after the completion of a task in the traditional system, it is incorporated into the process together with total quality management. In the first-mentioned system defects are defined, while the latter system would not tolerate defects. Under total quality management continuous improvement originates from the technical and human sides, whereas technological breakthroughs are the only means of improvement under the traditional system. Problem solving is undertaken by small groups or teams under total quality management, whereas the other system has only an individual manager or specialist to solve problems. More emphasis is placed on customer satisfaction under the total quality management approach than under the traditional system. Responsibility is spread throughout the organisation under total quality management where only one department is involved with the traditional approach.

To enable companies to provide for future costs in respect of total quality rehabilitation management procedures, causes of failure of total quality management should be taken into account. It is important that these barriers should be understood and avoided before and during the implementation and development of total quality management procedures. The following are some of the causes of failure of total quality management that have been identified (Masters 1996: 54):

- lack of management commitment in the form of support and interest, and improper planning which does not provide for dialogue, a time frame, flexibility and for a reward system
- inadequate knowledge and understanding of total quality management, a lack of continuous training and education for all, and inability to create a learning culture that provides for continuous improvement
- inability to change the organisational culture owing to a fear of change, and poor relations
- ineffective assessment procedures, unreliable data, a lack of access to results and short-term focus on preventing immediate pollution
- insufficient attention to the expectations of internal and external stakeholders

An awareness of these causes of failure should be emphasised. Plans could be made to overcome these potential problem areas by understanding them and being prepared to counter them. The traditional role of management accountants as watchdogs would be replaced by a new role as suppliers of information and part of decision-making teams (Bromwich & Bhimani 1989:5). Management accountants should in future be able to recognise opportunities and challenges since accounting will become more decision-driven.

Certain social trends are evolving which will require the restructuring of existing accountancy approaches in future. Although these trends are noticeable in the USA, they are also present in South Africa, where they are at an earlier stage of development. Some of these directions, which have implications for management accounting as well as for a total quality approach, are the move towards an information society, the trend from national to international economics, a move from short-term to long-term strategies, and a shift from hierarchial structures to information networks (Enthoven 1985:6). The information measurement system will link companies, authorities and national accounts and provide more relevant and projected information. Efficiency and effective measurements will be required which are supported by legal and statutory guidelines, professional and institutional accounting infrastructures, research, education and training, and socioeconomic structures. A greater need for utilisation and measurement of assets at their service value is developing as well as a need to evaluate in terms of alternatives (Enthoven 1985:27). These integrated, multidisciplinary trends and concepts should be evaluated and included in strategic management planning models.

Each company has its own version of total quality management and this results in a complex situation for purposes of comparison. Continuous improvement in quality rehabilitation is based on the technical and human attributes of the mining company. Diverse total quality management strategies are integrated with existing traditional strategies, cultures and systems (Prasad & Sprague 1996:82). Although a company might be utilising total quality management procedures, it would only be fit under its own particular circumstances. A total quality management strategy is necessary to achieve efficiency, but is not sufficiently developed to be effective in all respects. The existing transition process towards total quality environmental management still needs to be refined in order to be regarded as a global model. It might even be necessary to accept new paradigms in the process of development.

As part of the futuristic view of and expectations for total quality environmental management, provision should also be made for management systems after total quality management has been achieved. In the stages that follow after total quality management, the approach towards invisible quality is likely to emerge (Maromonte 1996:14). Performance improvement at reduced operating expenses would be achieved in an infrastructure originating from total quality management.

7.7.10 Strategic management

Since escalating environmental costs and long-term pollution prevention are serious concerns, rehabilitation management policies should be built into the comprehensive strategic management plan of a mining company. A strategic management plan is the "course of action leading to the allocation of scarce resources over time to reach identified goals" (Pascale 1991:42).

Extensive environmental damage and the accompanying expenditure could be avoided through better long-term management practices and policies. All aspects of environmental and rehabilitation management varying from preventive costs to clean-up costs should be incorporated into strategic management programmes. The accounting and management accounting functions of financial analysis, planning and control (CIMA Stage 4 Paper 14 1996:77) should not be independent of the central total quality strategy, but should be complementary to it. Issues such as high quality on a timely basis together with low costs (Hiromoto 1988:26) should also be valid for management accounting members of management teams who are preparing strategic plans. Strategic management and quality management with the objectives of achieving efficient methods of functioning that produce less pollution should therefore be integrated into strategic quality management.

In order to determine effectiveness and efficiency as well as to evaluate performance, the management team has to refer back to an overall or strategic plan. In this regard Hirsch (1998:397) defines a strategic plan as

> an organizing statement of what a company wants to accomplish and how they will achieve their basic mission. Measures of success must relate to this plan to have ongoing future-orientated meaning.

Kabat (1983:10) sees in long-term planning on a global, national and corporate level the solution to the survival of society. Strategic planning would enable its users to anticipate problems and opportunities, to assign priorities to them, and to manage diminishing resources. This is in accordance with the quality master plan which defines quality objectives and formulates goals. Basic goals that would support the quality objective (Russell 1990:18) are to integrate and promote quality management, to consider the needs of stakeholders, to provide value to them, and to achieve continuous improvement. Continuous forward planning and adequate information would form the bases for these goals.

Internal as well as external factors should be taken into account when preparing a strategic plan (Hirsch 1988:398; Pearce & Robinson 1994:17). Internal capabilities include past strategies, the availability of capital, capacity and human resources. External realities such as economic projections, the milieu of operations, the availability of labour, technological developments, regulations, and overseas experience have to be taken into account. The gradual or immediate implementation of the strategic plan, the involvement of individuals and teams, as well as the monitoring of actions would also be documented in detail in the plan.

Strategic management accounting has to support the strategic objectives concerned with quality, cost and time (Ansari et al 1997c:SMA-6). These functions would include short-term and long-term operations as well as the positive involvement of the extended enterprise in pursuit of the achievement of the strategic objectives. The objective of strategic management accounting is not only to collect data, but also to turn raw data into strategically relevant financial information (Ward 1992:304), allowing for a degree of flexibility. Strategic cost analysis for information purposes would consist of the following actions (Wilson 1991:95):

- Identify the value chain and assign costs and assets.
- Find the cost drivers of each value activity and determine their interactions.
- Benchmark with similar mining companies.
- Develop a cost strategy for lower cost by changing cost drivers or the order of the value chain.
- Ensure that cost reductions do not negatively affect sustainability.

The link between strategic management and management accounting is to be found in the shared characteristics of both functions, namely analysis, planning and control (Ward 1992:9). Strategic management accounting has to ensure that adequate funding can be made available for rehabilitation purposes as required by the strategic movements of the company. It provides the financial and non-financial values which would form the basis for decision making (Kabat 1983:102) and which would influence the processing of the attributes of the strategic plan.

Strategic rehabilitation management accounting is concerned with life cycle costs, and in particular with the quality of land, water and soil, from impact assessments to aftercare and maintenance. Other concerns are related to the types of financial risk involved with the source of funding, and a combination of life cycle costs and cash flows in the Boston Matrix (Ward 1992:40).

Formal strategic control practices could negatively influence performance when they are focused on rigid plans, objectives, targets and the collection of information. Flexible and more creative strategic reactions under certain circumstances should, however, be allowed in quality strategic planning (Ittner & Larcker 1997:310). The strategic quality management process requires continual reassessment and updating. Although the basic strategic management model is unlikely to change, the branch strategies have to be adapted to changed circumstances.

7.7.11 Maintenance management

Maintenance management in this study concerns asset care after closure and the rehabilitation of abandoned mines. A proactive approach towards the maintenance of abandoned land would require forward thinking in order to develop the best practices by means of mixing and matching systems and methodologies (Lane 1996:20). A team of experts would participate in an effort to meet the specific needs of a particular site. Efficient maintenance practices would contribute to the lessening of the financial burden associated with reclamation activities.

Maintenance management should be integrated with other applications such as human resources, financial applications, workflow and electronic documentation. Expenditure in connection with contracting out against in-house maintenance management options

should be realistically compared by the management accountant. Asset care through maintenance management would add value to existing abandoned mine sites.

Expenditure associated with maintenance management includes assessment costs during the initial stages, operating costs, control costs, and fines and penalties. To enable companies to become more proactive, costs should be incurred in respect of continuous staff training and the establishment of standards (Rahman 1996:19). A balance should be found between preventive and maintenance costs. Non-financial factors such as the needs of the surrounding communities of these sites, and the period for which maintenance would be required, have to be included in the total quality environmental management programme.

With this information available, operational and overhead costs could be controlled in accordance with the strategic plan (Rahman 1996:21) and without forfeiting basic ethical standards. Effective assessment and monitoring of the long-term plan would provide feedback that would make it possible to achieve total quality service. This would encourage continuous improvement of the maintenance management strategy.

7.7.12 Value-based management

Value-based management is an approach, a framework and a set of financial instruments for building maximum long-term shareholder value (Bannister & Jesuthasan 1997:15). A series of analyses are included in the value-based audit, which is the evaluation of the culture for decentralised decision making, performance measurement, financial information system, and incentive design (Bannister & Jesuthasan 1997:12).

An increased awareness on a global level of environmental values and attitudes would cause people to rethink values within their management strategies. The interested and affected parties for which the financial statements are produced would expect their suppliers to integrate sustainable development into their strategic planning in order to demonstrate their accountability (Allen 1994:53). Environmentally responsible companies would choose to avoid investing in enterprises that give rise to a great deal of pollution or in countries where higher levels of pollution are tolerated. Other companies would prefer to invest or locate in parts of the world where pollution control would permit higher profits. In the short term only, the profits of the first-mentioned company would

decrease in relation to those of the latter company.

The long-term benefits for a company with an environmentally responsible strategy would be visible in a decrease in the cost of activities, increased profits, decreased cost of capital and a decrease in the risks associated with laws and regulations. The following are some of the benefits identified in respect of an environmentally responsible strategy which would add value to companies applying this strategy (Allen 1994:70):

- Less sick leave as a result of fewer health problems would result in higher morale and the possibility of attracting higher quality workers. Reduced insurance premiums related to disabilities and medical claims would be possible in the long term. Lower employee turnover would reduce expenditure related to recruiting and training.
- Management would have more time available to improve quality management in the absence of lawsuits requiring secondary time.
- Better relationships with the community and activist groups owing to environmentally responsible strategies would lower public relations costs.
- In some countries mining companies could benefit from tax incentives for pollution abatement equipment.
- Both suppliers and buyers from the same country and from other countries would evaluate the environmental standards of the company and decide on the discontinuation or maintenance of business relationships. Risk premiums could be attached to dealings with environmentally irresponsible companies.
- Input costs could be reduced by the consciousness of minimising waste, as well as by the reduced costs of waste disposal.
- The environmentally responsible company would be able to market itself better, and might even receive support from environmental groups. This would enable the company to attract more eminent members to its board of directors, which would enhance its image and profitability.
- Overseas lending companies carefully audit the environmental records and risks of companies before investing. If future laws and regulations were to require compliance with additional pollution standards, preference would always be given to an environmentally responsible company that strives to exceed standards in order to prevent huge adaptations at a later stage.

Strategies to improve the value of a company are based on the elimination of wasteful expenditure and the management of costs. Inappropriate cost management and management structures impose high overheads which might negatively affect the company in its markets. The cutting of costs would only be free of risks if the management team are purposely aiming at the adding of value. The economic benefits in terms of added value for being an environmentally responsible mining company could indeed exceed the costs of environmental and rehabilitation operations. By achieving new levels of excellence and quality through improved planning and technology, companies have the means to add real value for their stakeholders, which include future generations.

Total quality environmental management can be enhanced by incorporating aspects of value-based management. The concepts of value and improving value could support the continuous improvement objective of total quality management. Both quality (fitness for use) and value would enhance the total quality paradigm.

7.7.13 Feedback: gain or loss: to management

Total quality environmental management encourages a company to develop, evolve and grow, and improves the chances of long-term prosperity. Part of the total quality approach is the development and maintenance of comprehensive feedback cycles. The introduction of changes should be geared to provide rapid feedback and adaptation (Leach 1996:90). Both internal feedback from employees and external feedback from the community at large should be obtained in order to improve existing quality management strategies.

Total quality environmental management could also be introduced in smaller mining companies in view of their uniqueness. Although resources are often severely limited, adaptations could be made to accomplish more with less (Bonvillian 1996:35). A greater sense of teamwork among employees, a basic approach of minimising waste, and more comprehensive expertise from leaders would support feedback in a quality management culture.

The commitment to quality environmental management commences with the mission statement and of the objective. Management has to decide what management structure would yield the best quality rehabilitation output and how much input would be allowed from bottom to top management. A policy on asset and resource management in

combination with value-based management should be determined, as well as maintenance policies after the closure of mines. Decisions should be made on the degree of total control over quality, costs and non-financial inputs and gains. Transparency on the sustainability views of the management team as well as the implementation and maintenance of a quality culture should be included in the comprehensive rehabilitation management strategy. Since international standards such as ISO9000 and ISO14000 will be required in the near future by international companies dealing with South Africa, provision should be made for their registration. A comprehensive strategic management plan for the long-term, including management of rehabilitation projects and future investments, should be formulated as the basis for the total quality environmental management programme.

Since total quality environmental management is a complex strategy, the management team, which includes the accountant and the management accountant, should be prepared to constantly acquaint themselves with alternative methods for achieving continuous improvement.

7.8 RESEARCH AND DEVELOPMENT

7.8.1 Introduction

In order to achieve continuous improvement according to the total quality management plan, research should be conducted and adequate training provided to develop the capabilities of employees, and update existing rehabilitation management policies. The leading role of industries such as the mining sector should not be underestimated. Traditionally "order and good government...among inhabitants of the country who had before lived almost in a continual state of war with their neighbours" were introduced by the development of industries (Adam Smith 1920, written in 1776:363).

Since research and development programmes in respect of rehabilitation management in various mining companies vary considerably, performance measurements should be designed for the particular needs (Maromonte 1996:108) of the company. The research and development budget for rehabilitation projects should be applied as a basis for comparing the actual performance assessments. An indication must be given of what progress has been made towards achieving the stated goals.

Technological developments would not only increase output at lower cost, but would also support rehabilitation management policies. New methodologies would decrease pollution as well as expenditure on clean-up operations. The rate of resource depletion could be reduced (Meadows et al 1983:1977), with the result that the value of land would not be decreased.

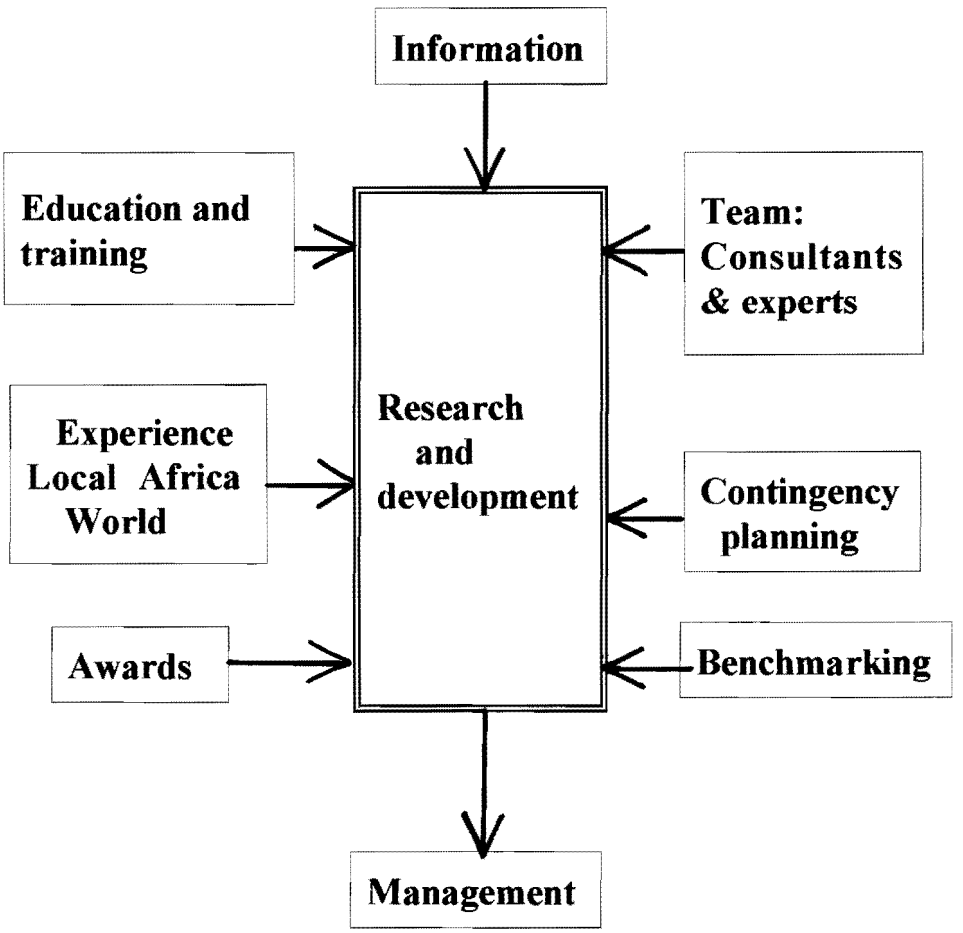
Expenditure on research could be classified into basic and general research, and applied research for particular projects (Van der Schroeff & Groeneveld 1984:260). Simultaneously with technological and processing research and development programmes for rehabilitation management, improved accounting and management accounting concepts should also be investigated and attempted.

Research and development form an integral part of the development of a comprehensive rehabilitation management strategy for the mining sector in South Africa. Research and development programmes would include the education and training of employees and employers, team approaches involving consultants and experts, benchmarking, contingency planning for emergencies, the investigation of experience from other countries, and award systems. These components of the research and development programmes are illustrated in Figure 7.7.

7.8.2 Education and training

A culture should be established in which people know what rehabilitation entails and where it is going. In a state of chaos with poor supervision, inadequate management practices and limited statistical control, it is impossible for anyone in the company to develop their potential to perform quality tasks (Deming 1982:194). This might lead to unsatisfactorily rehabilitated land where projects would have to be initiated to rectify mistakes from the past at huge expense to future generations. According to a study by the HSRC (Daily Dispatch 1997) companies in South Africa do not yet realise the financial and non-financial benefits that could be derived from employing environmentally trained people who would reduce waste and maximise production.

Figure 7.7 6 Research & Development Perspectives



(Source: Empirically developed)

The environmental managers, however, who responded to the questionnaire, confirm that positive changes in behaviour towards rehabilitation and environmental management are attained by means of education and training (Statement 3.2.6:83,3%). This attitude is supported by the view that monetary investments (Statement 2.2.3:64,6%) and investments of time (Statement 2.3.2:70,2%) in education and training of the whole workforce in environmental preservation would improve strategic management policies.

As part of the management team the management accountant has to plan and budget for training and education for all employees and employers. The entire management team should be included, together with all functions and all levels (Juran 1989:323). Provision should be made for money and time in this plan, as well as for decisions on voluntary or mandatory training, sequence of training procedures, subject matter and the practical aspects of training.

By being more aware, and better informed, qualified and able to understand changes in respect of rehabilitation management policies and the accompanying cost aspects, both employees and employers would be able to make contributions of a considerably higher quality. Higher productivity and earnings would eventually follow.

In this regard the developed skills and knowledge applicable to specific tasks could be referred to as human capital (Meyer & Thibadoux 1996:539; Enthoven 1985:19). The provision of education and training to employees for improving skills and decision-making, results in people who are more valuable and productive both in the company and in the community. Better education makes it possible to adopt more sustainable practices, particularly in respect of environmental and rehabilitation issues. Qualified and trained employees are not easily replaced and an atmosphere of job security should be achieved. This leads to less expenditure on recruitment and training.

Modern methods of training on the job form an integral part of management strategy (Deming 1982:31). This should be supported with a vigorous and continuous programme of education and retraining in new knowledge and new skills (Deming 1982:47). Better educated and trained employees would adjust more easily to new responsibilities, fewer inspections would be needed, and the quality of inspections would improve. Education increases an awareness of a subject and this would support the forming and development of personal values. Everybody should be exposed to education and training programmes

in the section of rehabilitation management pertaining to their field of specialisation.

7.8.3 Team of consultants and experts

The management accountant should function with the support of cross-functional teams and experts through all the phases from design to disposition during rehabilitation activities. This is the opinion of 78,7% (Statement 2.1.5) of the environmental and rehabilitation managers who responded to the questionnaire. These teams of experts could include any combination of botanists, chemical engineers, actuaries, geologists, civil engineers, hydrologists and community leaders. Strategies should be developed that ensure full utilisation of their technical skills, experiences and expertise (Diagram 4.9). The rehabilitation managers who responded to the questionnaire do not represent management accountants (Table 4.2(a) and Table 4.2(b)). The current rehabilitation managers in South Africa do not have as one of their qualifications extensive management accounting training.A need for people with this qualification in the team therefore exists.

Each one of the members of the management team must be given an opportunity to create, innovate, learn, inspire and advance their careers as a result of team experience (Milas 1996:37). Provision should be made for necessary external consultation and relationships with other teams. These teams have to function within predetermined financial budgets and commitments, and have limited resources available to them.

Accountants and management accountants should be involved in the strategic process from the design phase right up to maintenance after closure of mines. Their role is changing from that of record-keeper to that of joint planning manager (De Villiers 1998:3). Through involvement in the comprehensive rehabilitation management programme, a positive contribution could be made in terms of the design of better accounting and management accounting systems designed right from the start. Accountants and management accountants have to determine exactly what skills are required and how to acquire them (Lowry & Yap 1997:50). In addition to traditional skills, other proficiencies would be required such as proficiency in written and verbal communication, computer training and staff management.

7.8.4 Benchmarking

An important instrument towards research and development is the process of benchmarking. Benchmarking consists in the investigating and identifying of best practices and utilising them as standards to improve processes and activities (Ansari et al 1997c: SMA-17). Benchmarking is "a systematic search for the best practices, from whatever source, to be used in improving a company's practices" (Schonberger & Knod 1994:38).

Therefore, benchmarking is a technique for achieving continuous improvement. The company's services, products and activities are measured against those of top performing, world-class companies, and against practices either internal or external to the company (Drury 1996:24). The objective of benchmarking is to find how rehabilitation processes and activities could be improved. The latest developments, best practices and methods could then be incorporated, directly or with adaptations, within various sectors of the company.

Benchmarking as a means of searching for information comprises of a systematic set of steps (Schonberger & Knod 1994:39). The benchmarking team begins the procedure with planning and organisation. Team members and the rehabilitation management process are selected. The management accountant should be part of the benchmarking team in order to obtain the maximum benefit in terms of total quality environmental management. The team then benchmarks their own process in terms of measurements in numbers, and practices in each step of the process. In the following step information is obtained on whom to benchmark and what information to ask for. The necessary approvals are gained and plans finalised for exchange visits. At the benchmarking company's site parallel information in terms of measurements and practices is sought. Finally the benchmarking team analyses the data, develops plans, proposes changes and follows through with activities.

The importance of benchmarking was emphasised by the environmental and rehabilitation managers who responded to the survey (Diagram 4.1). All respondents emphasised that there should be an awareness of the continued need to keep striving to improve processes and activities (Statement 2.1.8). They agree that benchmarking should be used by management in the same mining sector and/or region (Statement 2.1.6:91,7%).

7.8.5 Local and overseas experience

Research and development programmes would not be complete without the inclusion and analysis of local and overseas experience of similar mining companies regarding rehabilitation management. Benchmarking only concentrates on the best practices of other companies, and does not include analyses of failures of seemingly good practices. Local and overseas experience regarding rehabilitation management policies and management accounting practices should be investigated in terms of both successful and failed operations. By not repeating or not developing potential unsuccessful operations, unnecessary expenditure could be avoided or diminished. Costs of developing existing procedures would be higher than the cost of utilising them directly or indirectly in an adapted form.

Experience of local and overseas approaches to rehabilitation management is discussed in the paragraph (7.3), which deals with the inclusion of background information as part of the development of a comprehensive strategy.

7.8.6 Contingency planning

Contingency planning for unexpected events and emergencies forms an integral part of research and development programmes, because rehabilitation management in the mining industry is involved with hazardous materials and enormous earth moving projects. A contingency is a possible future event which planners do not expect to happen, and which is not provided for in the major strategic programme. Contingency plans should be prepared in advance in the event of known possible contingencies, such as the flooding of silt dams.

These crisis management plans should provide for action immediately after they have been prepared but before the contingency situation arises, and for action in the contingency situation itself (Kabat 1983:204). Since there is no certainty as to what actions would be needed if a contingency were to arise, provision must be made for flexible plans and special arrangements that are capable of being changed from the original strategies. An interdisciplinary approach should be followed where all major types of crises are included in contingency plans, both in the short term and in long-term strategies.

Environmental and rehabilitation managers in the mining sector who responded to the questionnaire confirm that contingency planning should exist for unforseen disasters (Statement 3.1.3: 81,3%). They agree that monetary provision should be made for contingencies such as flooding (Statement 2.2.5:66,7%). Investments in the development of contingency planning would eventually reduce risks and the accompanying expenditure on remediation and cleaning up after accidents and disasters caused by natural forces.

Contingency planning forms part of the total quality environmental programme and should be prepared according to the following schedule (Comfort & Pitts 1996:2124):

- Identify problems and their probable causes in the planning stage by analysing the performance of the company in respect of technical, organisational and cultural design.
- Devise a means of diminishing and preventing errors and improving quality when transforming these plans into action.
- Provide for control, evaluation and feedback to improve the learning process within the company and within the surrounding community.
- Redesign contingency policies to improve its individual actions in order to reduce risks.

Research and development aimed at effective contingency planning would eventually reduce the costs associated with losses of personnel, materials, energy and time. Social and economic projects within the surrounding community would not be interrupted at high cost, and there would be less damage to the natural environment both in financial and non-financial terms in the long term.

7.8.7 Awards

In the process of benchmarking best practices should be identified and adapted. In order to find the companies with best practices, a starting point would be to find companies which received awards for rehabilitation management, environmental reporting and for total quality management. These companies might be using good practices that are worth analysing.

Rewards to excellent rehabilitation management and management accounting teams

would further encourage improved rehabilitation approaches in the mining industry. In order to achieve these improvements, further research and development programmes should be allowed. Environmental and rehabilitation managers in the mining sector who responded to the questionnaire confirm that awards to encourage improved and successful rehabilitation management policies are important (similar to awards for safety hours) (Statement 4.1: 77,1%). They also support the statement that awards for green reporting enhance the awareness of cost management for rehabilitation purposes (Statement 4.2: 70,8%).

When considering internal award systems to encourage and improve rehabilitation awareness, care should be taken to ensure that awards should be aimed at people for outstanding group efforts, and not just at results (Johnson 1992:171). In the process of continuous improvement this attitude would lead to the long-term quality performance of the group.

7.8.8 To management

Research and development programmes pertaining to rehabilitation management should be encouraged because of the financial and non-financial benefits that could be obtained in the long term. Furthermore, research (Maher 1995:36) indicates that companies that are innovative in manufacturing and processing practices are also innovative in managerial accounting. The development and introduction of improved management accounting procedures would lead in the long term to improved decision making and higher financial and non-financial gains for companies.

Research and development programmes form an integral part of the development of a comprehensive strategy for rehabilitation management and management accounting. Investments to improve existing practices would result in the long term in improved financial and non-financial benefits to mining companies. Components of these programmes would include education and training for all employees in their particular areas of specialisation. A relatively small team of experts, which includes the management accountant, would cooperate to provide information for management decision making. Benchmarking should be encouraged in order to find the best available practices in similar rehabilitation situations for the assessment of inputs and gains. Contingency plans for emergency and unforseen circumstances should be researched and

developed. A system of awards for rehabilitation management and reporting would encourage further research and development programmes to improve existing policies and approaches. Experience of other mining companies in similar situations should be researched, and successful procedures and processes should be implemented directly or in an adapted form.

7.9 ETHICS

7.9.1 Introduction

For the purposes of the strategy pertaining to environmental and rehabilitation management and management accounting, ethics is regarded as "a code of behaviour considered correct, especially that of a particular group, profession, or individual" as well as "the moral fitness of a decision, or course of action" (McLeod & Makins1993:382).

True and fair approaches should be regarded as a list of permissible interpretations instead of a single point. It is important to determine "who exactly is accountable to whom for what" (Gambling 1978:31). Moral progress is a way of assessing progress in terms of intentions and the capability to respond to the needs of all mankind in the present and the future (Simon 1990:184). It is the task of the accountant and management accountant as part of the management team to adapt profitability to satisfy an increasingly environment conscious world. In a society with rapidly changing values, the business sector will be held responsible for its negative impact on the environment.

In order to extend existing codes of ethics between professionals and between professional and client, a social contract on ethical grounds should be entered into between business and society which would include accounting disclosures on natural environmental issues. But an extension of financial and non-financial reporting is not exactly the same as ethical and moral behaviour. Ethical behaviour has to be developed in terms of other factors as well, such as a broader educational basis for professionals and the setting of appropriate standards for decision making by the management team (Mathews 1995:670). In order to match the scientific, technological and economic revolution, a moral, intellectual and spiritual revolution is needed (Gourley 1997:23) to which education should make a significant contribution.

The influence of the ethical views of the management team in respect of environmental and rehabilitation management forms an integral part of the development of a comprehensive strategy. These ethical issues regarding the natural environment should be compared with total quality management, profits and values, the accountability of the involved parties, and the welfare of the community as a whole.

7.9.2 Total quality management

Total quality management techniques are designed to improve performance by empowering employees, minimising waste, changing processes and behaviour, and increasing the integrity of people, services and products with the emphasis on stakeholder satisfaction (Raiborn & Payne 1996:963). This means that total quality management is ethics put into practice. In terms of a total quality approach, present costs and benefits in respect of rehabilitation management should be regarded in the context of costs and benefits to the "ongoing chain of generations extending ... into the future" (Nürnberger 1996:55). Human costs and benefits should similarly be regarded in the context of costs and benefits to the natural environment. This means that financial instruments which are applied to analyse for decision-making purposes have to be supplemented by other instruments based on ethics.

7.9.3 Ethics and profits and value

By implementing improved internal cost accounting procedures, a greater awareness could be developed of the true costs of pollution and of the true benefits of environmentally conscious methods and procedures (Parker 1996:52). When ethical issues are included in profit calculations, the objective of the maximisation of profits would change to the optimisation of profits (De Vries 1993:6). With activity-based costing techniques as a basis, for example, methods could be developed to collect, separate and assign cost data for environmental accounting.

In the process of ascribing values to the functions of nature, decisions have to be made on "whether and how far value intrinsic in nature enables humans to come to own these values" (Rolston 1988:3). The kinds of value which are distinguished by Rolston, are applicable in the areas of life-support, economics, recreation, science, aesthetics, genetic diversity, history, cultural symbolisation, character building, diversity unity, stability and

spontaneity, dialectics (study of reasoning), life and religion. Irreversible changes in the natural order with the loss of species or the natural society might lead to hidden and unknown risks of serious financial and non-financial damage to humans and their civilisations (Ehrenfeld 1978:188). With these functions and values of nature in mind, management teams should develop rehabilitation policies that do not disturb these values, or that cause minimum disruption. Investments in the preservation of natural diversity would lead to the long-term survival of civilisations.

Putting a value on the utilisation of natural resources involves human interests and the possibility of ownership. In this regard Rolston (1988:32) argues

> If value is always and only a matter of satisfying our human preferences, the morality that issues from value preservation is *ipso facto*, constrained to a class self-interest.

Daly and Cobb (1989:104) confirm this view of a broader valuation of nature by stating that

> The goodness of the world in general cannot be understood simply as its value for human beings.

It is therefore important for the development of successful long-term rehabilitation strategies to consider the future implications of the strategies on ethical grounds, as well as from the perspective of the non-financial value of nature.

7.9.4 Accountability

The accountability aspect of an ethical approach towards the development of a comprehensive rehabilitation management strategy means that the management team should be "responsible to someone or for some action" (McLeod & Makins 1993:8). In order to discharge this responsibility, the principles of ecology (Gray 1992:406) should be understood. These are

- Every separate entity is connected to the rest.
- Everything goes somewhere.
- One cannot get anything for nothing from the natural environment.

- Nature knows best.

In the accountability context the focus is on the supplier of the accounting and management accounting information and the user of this information within or outside the mining company. The accountant and the management accountant should realise that interested and affected parties want more funds to be channelled into rehabilitation and pollution abatement projects, even if this means a cut in dividends (Epstein & Pava 1992:32).

Traditionally accounting information needs to be relevant, useful and give a faithful representation of realities (Ijiri 1983:78). Ethical issues are not visibly part of these information frameworks. According to the opinions of the environmental and rehabilitation managers who responded to the questionnaire, mine managers would not operate according to an ethic of responsibility to preserve the natural environment if there were no laws, regulations and inspections (Statement 3.2.5). This means that ethical and accountability principles would only be applied when enforced by external means.

In order to include the ethical responsibility towards nature and future civilisations, this framework needs to be adapted. Management teams should add to and implement environmentally responsible policies by being aware of ethical issues and developing structures for dealing with these crises (Epstein & Prava 1992:33). Incentives to promote ethical, environmental and socially responsible behaviour should be encouraged as part of the development of accountability.

7.9.5 Welfare

The accountability function of the management accountant in respect of rehabilitation management extends to the welfare of the community, which means their "health, happiness, prosperity, and wellbeing in general" (McLeod & Makins 1993:1349). It is important not only to consider how profits are generated and money made, but also how this money is spent. The principle of welfare economics should be valid for the management team involved in decisions on rehabilitation management policies. This principle is that one economic situation could be preferred above another only on the condition that no-one would lose and that at least one person would gain (Van den Bogaerde 1974:421). This principle is also referred to as the Pareto optimum position. It

is defined (Blaug 1985:588) as

> a position from which it is impossible to improve anyone's welfare, in the sense of moving him to a position that he prefers, by transforming goods and services through production or exchange without impairing someone else's welfare

Pareto improvement is similar to some gaining with none losing (Perman et al 1996:85). This means that the management team involved in rehabilitation decision-making processes should adopt the ethical view of not merely gaining from mining activities, without considering the influence of rehabilitation projects on future and stakeholder financial and non-financial interests. This responsibility would include all stakeholders, of which the natural environment is one of the most important representatives. In this regard environmental and rehabilitation managers responding to the questionnaire agree that true profits are only recognised when none of the stakeholders incur losses from the process of profit generation (Statement 3.2.7:64,4%). In the calculation of economic welfare, damage due to pollution and other environmental damage should be deducted (Daly & Cobb 1989:410). Projections of long-term environmental rehabilitation of damage should be added to these calculations of welfare.

7.9.6 To management

By utilising ethical norms in considerations affecting the natural environment, environmental and rehabilitation management could reach a stage of development where treating the environmental challenge as an opportunity would result in reduced costs in the long term. Balances could be found which benefit both society and the environment. Within the framework of total quality management, present rehabilitation expenditure extends into the future with the accompanying financial and non-financial implications. Profits and values intrinsic to nature as well as their future values should be included when preparing a strategy for rehabilitation management. The accountability of the management team involved with rehabilitation projects would allow them to support and implement environmentally responsible policies. This responsibility would extend to the welfare of the affected and interested parties, in the sense that some might gain without anyone losing. Not only gain, but also considerations of the influence of environmental and rehabilitation projects on future financial and non-financial interests should form the basis of present management decision making.

7.10 SUMMARY

The implementation and maintenance of a strategy for total quality rehabilitation management requires a team approach that would include a variety of multidisciplinary expertise. The functions of the management accountant and the accountant form an integral part of the development and functioning of the various systems encompassed in and influencing the major long-term strategy. As a designer of management accounting information systems, the management and cost accountant has the responsibility for developing a better understanding of the information requirements of specific tasks so that he or she is able to provide more relevant and useful information, taking into account the varying needs of varying rehabilitation situations. The following contributions, briefly, are made by management accountants, or should be included in their contribution:

- An appropriate knowledge of the background influences of time, money and environmental perspectives would enable the environmental management accountant to provide a better quality information and advice to management. These influences have their origins in local heritage and culture from within and from outside the company, but also from South Africa, Africa and other countries such as Canada, the USA and the UK. The relationship between people and the natural environment requires financial and non-financial burdens to be fairly shared among stakeholders. The influence of different management systems based on the generations of management determine the amounts and nature of investments and recommendations. (Paragraph 7.3.).
- A holistic view of the interdependency and independency of relevant aspects of rehabilitation programmes. This view supports continuous improvement as well as research and development. The effects of life-cycle costs from impact assessment to aftercare maintenance are included as well as value-added principles, the cost of finding an ecological balance for sustainability, rehabilitation costs in relation to the needs of the community, paradigm shifts and flexibility for changed circumstances, and the cost of the extended and future enterprise. (Paragraph 7.4.)
- Policies and information for improving cost management. These would include advice on updating and adapting cost policies to changed circumstances, reducing long-term environmental costs, introducing and developing life-cycle costing, target costing, total and full cost accounting, and utilising the feedback

mechanism. Improvements in cost management would also include the consideration of non-financial indicators, the shifting of costs, and the adjustment of rehabilitation costs during the planning stages. Distinctions and analyses of internal and external costs, as well as of profits and increases in the value of natural capital and wealth, indicate possible problem areas. (Paragraph 7.5.)

- Dealing with the influence of legal aspects of local and central authorities. These would include a thorough knowledge of present and anticipated environmental taxation policies and regulations to be considered for investment decisions. Controlling and failure costs could eventually be limited. (Paragraph 7.6.)
- The introduction and development of total quality environmental management. This system is complex, dynamic and non-linear, and includes cost management aspects arising from the mission and objective statements as well as from the long-term rehabilitation strategy; the management structure, resource and maintenance management, total quality control, sustainability, the quality nature, international standards (ISO14000, ISO9000), strategic and value-based management and futuristic views. (Paragraph 7.7.)
- The encouragement of investments of time and money for rehabilitation research and development programmes would lead to financial and non-financial benefits. These would include components such as education and training for all employees in their specialised areas, the involvement of teams of experts, benchmarking to find the best available practices both locally and internationally, contingency provisions for emergencies, and internal and external awards for supporting improvement efforts. (Paragraph 7.8.)
- The adaptation of profitability on ethical grounds is needed to satisfy an increasingly environmentally conscious world which wants to know who exactly is accountable to whom for what. These ethical approaches regarding the natural environment should be seen in comparison with total quality management, profits and values based on the natural environment, the accountability of responsible persons, as well as the welfare of the community. Traditional financial cost management instruments need to be supplemented by instruments based on ethics to provide for future interests. (Paragraph 7.9.)

These sub-strategy groups of factors that influence a strategy for total quality rehabilitation management accounting culminate in the final stages of the management accounting strategy which follow in the next chapter.