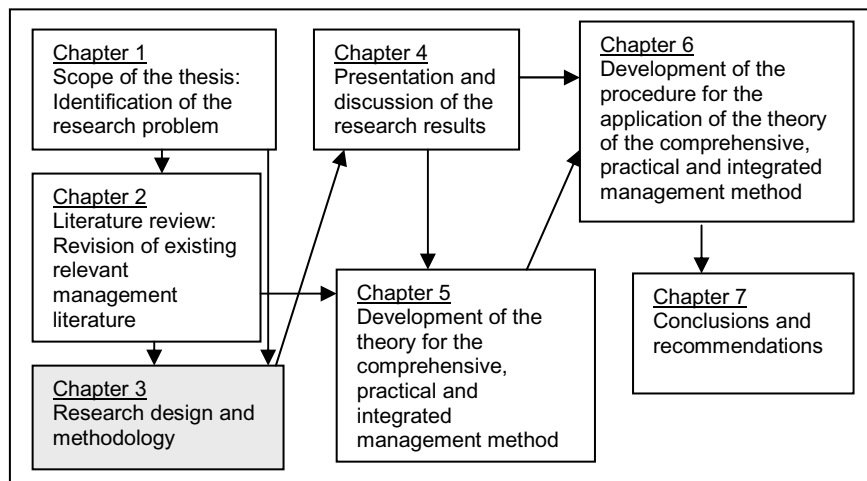


## CHAPTER 3

### RESEARCH DESIGN AND METHODOLOGY

#### 3.1 INTRODUCTION

In the previous chapter it was concluded that a comprehensive, practical and integrated management method and an integrated management planning process and planning structure could not be confirmed from existing management literature (refer section 2.8.2 and 2.8.5). It also appeared that serious deficiencies with respect to the present management practices and planning theories existed. It was concluded that each management practitioner utilised to some extent a personal preferred management practice. It became necessary to establish what the status of the management practices in the South African mining industry was. In chapter 1 it was perceived that the required empirical research and the methodology to affect the research could be designed and developed respectively (refer section 1.5.2.4).



**Figure 3.1: Chapter 3 in context to the overall thesis**

In this chapter the most suitable empirical research to facilitate the practical collection of the required data was designed. The required methodology was developed in order to accommodate all physical conditions, requirements from the potential respondents and mining groups in the South African mining industry and the requirements of the empirical research. It dealt with the type of data required, the sources of the data and the area to be covered by the research. The sampling methods and design were specified. The questionnaires and the assessment criteria used in order to obtain the necessary data with the minimum disruption and inconvenience to the mining industry were designed and motivated. The methods to gather the data were developed and the possible restrictions from the potential participating mining groups, mines and respondents were identified and evaluated.

The results of the research were evaluated and assessed. The conclusions played an indispensable role in the design and development of the comprehensive, practical and integrated management theory and the procedure to implement the theory in the practical situation on all the levels of the mining industry.

### **3.2 OBJECTIVES WITH THE EMPIRICAL RESEARCH**

The objectives with the empirical research were to establish:

- 3.2.1 which management practices are predominantly being utilised in the South African mining industry,
- 3.2.2 the deficiencies with existing management practices as perceived by management and the proposed suggestions to rectify it,
- 3.2.3 which planning processes are being utilised,
- 3.2.4 whether a comprehensive, practical and integrated management method does exist in the industry, and
- 3.2.5 the state of managerial competencies with respect to the comprehensive application of the main management functions of planning, organising, leading and controlling in the industry.

### **3.3 MOTIVATION FOR THIS RESEARCH**

Since its inception the South African mining industry had continuously developed and introduced more efficient technical mining and management methods in order to efficiently manage the industry-specific environmental factors and challenges, increasing complex geological conditions, labour demands, local and global competition, fluctuations in the R/\$ exchange rate and rocketing input commodity prices. In addition skills shortages, increasing social commitments, new laws, mandatory black economic empowerment and inadequate infrastructure were placing extraordinary demands on the managerial skills of the mine personnel.

The Chamber of Mines (COM, Annual Report, 2004-2005:14) emphasised the importance of the mining industry as the largest industry sector in the country to the employment, economy and development of South Africa (refer section 1.2.7.2). The industry developed a high degree of technical expertise and the ability to mobilise large amounts of capital for the development of new projects (DME, South Africa's Mineral Industry, 2004/2005:1).

The industry's favourable position as a cheap supplier of various minerals to world markets was lately, due to its unsatisfactory performance, deteriorating rapidly (COM, Annual Report, 2004 - 2005:22). This was further aggravated by unexpected restrictions on the consumption of electrical energy and water, unannounced cut-offs of electricity, limited generation capacities, tightening of environmental management laws, increasing global interest and investment and changes and challenges of new and revised mineral acts and the future decreasing competitiveness and survival of the industry (COM, Annual Report, 2004 – 2005:30-83).

### **3.4 TYPE OF DATA REQUIRED**

The data required should enable the researcher to realise the objectives set out in section 3.2. The main prerequisite of the required data was that it should enable the researcher to investigate, analyse and evaluate the state of existing management practices, planning processes, management deficiencies, the knowledge and competencies of management with respect to the requirements of the comprehensive, practical and integrated management method and to arrive at meaningful judgements and conclusions (refer section 2.2.1 and 2.8).

### **3.5 SOURCES OF THE DATA**

The data gathering was performed in the South African mining industry on a representative number of groups and mines (refer table 1.1 and section 3.6). It collected the appropriate data in order to evaluate the efficiency of the Mine Manager's Certificate of Competency (MMCoC) and the general predominant management practices being utilised in the mining industry. The motivation for assessing the Mine Managers Certificate of Competency was because it is, according to Regulation 28.13.1 - 28.16.3, a mandatory statutory required qualification suitable to manage a mine, part of a mine or works. In addition it is the predominant technical and management qualification of most mine managers in the South African mining industry (refer Mine Health and Safety Act, Act 29 of 1996:28-2). The reason for also enquiring on general management in the mining industry was to specifically obtain the responses from mining graduates having to succeed the legal part of the Mine Manager's Certificate of Competency only. These two categories of employees represent the main management levels in the mining industry (refer section 4.3.8.1 and table 3.1). It would include management positions from the Chief Executive Officer to the relative junior personnel qualified and registered as members of the mining associations. The assessments would enable the researcher to arrive at the most meaningful judgments and conclusions. It was then used in the development of the theory for a comprehensive, practical and integrated management method and for the development of a procedure to practically implement the theory in the South African mining industry.

### **3.6 AREA TO BE COVERED BY THE SAMPLE**

The researches focused mainly on the following mining sectors (refer section 1.2.4 and table 1.1):

- Gold mining sector,
- Coal mining sector,
- Platinum group of metals (PGMS) mining sector,
- Iron and ferrous mining sector,
- Chromium mining sector,
- Manganese mining sector,
- Diamond mining sector,
- Copper mining sector, and
- Other mining sectors.

### 3.7 DETERMINATION OF THE SAMPLING METHODS

The purposive and simple random sampling designs were planned for this study. The purposive sample design was intended for the total sample population whilst the simple random sample design was intended for a random selected number of the sample population selected by a suitably qualified independent consultant.

#### 3.7.1 The purposive sample design

It was planned to obtain the data from the registered members of the South African Colliery Managers Association, Association of Mine Managers of South Africa and the Northern Cape Mine Managers Association. There was the probability that some mining groups may refuse to release the names and addresses of their senior personnel to unauthorised entities. Some companies also have policies that prohibit the disclosure of information to any outside investigations (refer section 3.10.3).

The author of this thesis was convinced that the majority of the managers, however, would have access to the research. The sample consequently constituted an infinite sample. It was felt that the infinite sample would be representative of the views of management on all the levels in the South African mining industry.

Kothari (1990:19) defined the purposive sampling design as follows:

“This sampling method involves purposive or deliberate selection of particular units of the universe for constituting a sample which represents the universe.”

The sampling methodology was a plan of action that endeavoured to realise the objectives as set out in section 3.2. The sample was designed to obtain as many responses as practically possible with the most relevant information possible. The information would enable the researcher to arrive at the most meaningful judgments and conclusions.

Kothari (1990:18) defined sample design as:

“a definite plan determined before any data are actually collected for obtaining a sample from a given population.”

The potential available number of names and addresses of members registered at the three mine managers' associations was 245. It was highly probable that, for various reasons, some of these members would not participate in the sample (refer section 3.10).

### **3.7.2 The simple random sample design**

From similar previous research it was experienced that respondents generally were inclined to rate their managerial knowledge and competencies much higher than what they actually were (refer section 4.4.15, 4.4.16 and 4.4.17). Because of this phenomenon the researcher decided to apply the simple random sample design to select a predetermined population from the main population sample in order to verify the assessments as accurately as practical possible.

The assessments of each of these selected population respondents would be discussed with each of the respondents separately in order to establish a more realistic assessment. The difference, between the respondents' and the researcher's assessments, expressed as a percentage, was accepted as representative of the managerial competency gap of the sample.

## **3.8 QUESTIONNAIRES USED**

Five different questionnaires, one for each management level in the mining industry, were designed and utilised. The questionnaires were designed to realise the research objectives (refer section 3.2). Each question served to obtain specific information. The responses would enable the researcher to carry out the necessary evaluations.

### **3.8.1 Initial study**

Initially the research was aimed at the five main management levels in the mining industry (refer appendices 1 to 5). It was reasoned, at the time, that the more information gathered the better conclusions could be arrived at. A questionnaire for each level was designed with the main objective to determine to what extent mine management in the South African mining industry understand and was competent in applying comprehensive, practical and integrated management principles. The number of questions for each questionnaire was different. The questions were designed to be representative of the information logically applicable to that management level (refer table 3.1).

The request was that the head offices should distribute the appropriate questionnaires to the specific managers in their groups. The response was extremely disappointing. One group outright refused to respond at all to e-mails from non-company associated organisations requesting personal and sensitive information from the group. Only three half completed responses out of an estimated 1 200 potential responses were eventually received.

The researcher arranged and held individual discussions with some of the most senior mine executives of the largest mining groups. Each stated that the proposed questionnaires were much too lengthy and preferably should not consist of more than fifty questions each. The main objection was that the personnel would not always understand what was required with some questions and they simply could not afford to spend too much time on a questionnaire. Concern was also

expressed on the effectiveness of the Mine Manager’s Certificate of Competency and the planning processes available and utilised by the mining industry.

Management level	Number of questions
Chief executive level	60
Head office executive level	126
Mine executive level	148
Mine management departmental level	145
Mine management sectional level	119

**Table 3.1: Number of questions per management level**

The executives felt that:

- the certificate was an outdated generalised technical and management qualification,
- it does not fulfil in the managerial needs of modern mining personnel, and
- the technical and management parts should be presented as totally separate courses.

The main requests of these senior executives were that the questionnaires should be designed so that the specific questions should:

- be clear, brief and specific,
- still ensure an accurate assessment of the specific management practices in use in the South African mining industry,
- enable the assessment of the Mine Manager’s Certificate of Competency,
- enable the assessment of the other management practices in use in the South African mining industry where appropriate, and
- enable the researcher to evaluate the managers’ competency in the application of the requirements of the comprehensive, practical and integrated management method.

### **3.8.2 Redesign of the questionnaires**

Following the discussions with the senior executives mentioned in section 3.8.1 the researcher compiled two questionnaires. Each questionnaire consisted of 30 questions (refer appendices 7 and 8). One questionnaire was for management members who are the holders of the Mine Manager’s Certificate of Competency and the other one for graduated managers. The research essentially focused on mine management only. This is not to say that the rest of the employees in the organisation do not need to manage. The contrary is true – each employee needs to manage for the achievement of the results required from him. Right through this thesis it was assumed that management practices are applicable not only to management but to all employees employed in the South African mining industry.

The motivation for selecting the management levels in the industry was simply for the following practical reasons:

- the population was available,
- potential respondents have generally access to electronic communication media,
- each one had to succeed specific prescribed management training,
- each one is or was exposed to management responsibilities, and
- it would be more practical to contact respondents where and when required.

The assessment of management would be regarded as representative of the total management situation in the mining industry. A short cover letter explaining the purpose of the questionnaire was attached to each questionnaire.

As it could become necessary to clarify some of the answers to some questions potential respondents were requested to state their names, position/title, mine, company/group, minerals mined and contact addresses only. Participation was on a voluntarily basis and confidentiality was guaranteed at all times.

### **3.8.2.1 The Mine Managers Certificate of Competency**

Of these respondents it was required to indicate to what extent the management theory of the Mine Manager's Certificate of Competency, enables them to efficiently perform the management work required in their managerial positions. The assessment scale proposed in section 3.8.3.1 was utilised.

### **3.8.2.2 General management**

The academic training of mining graduates was regarded as more advanced than the technical training required by the Mine Managers' Certificate of Competency. They, therefore, needed only to succeed the legal requirements specified in the curriculum of the Mine Managers Certificate of Competency. From this category of employees it was required to indicate to what extent the management approach that they use enabled them to efficiently perform the management work required in those positions.

Each respondent had to:

- indicate whether or not the management approach that he and the mine utilises mainly consists of the management functions of planning, organising, leading and controlling, and
- briefly specify and describe the approach that he and the mine utilises in the event that the approach mentioned above is not utilised.

### 3.8.3 Assessment

As the questions and answers were expected to be to a large extent subjective it was deemed more practical to make use of an assessment scale that could most efficiently accommodate subjectivity. The scale was designed to be easy to use and to enable the researcher to arrive at acceptable accurate conclusions and judgments (refer section 3.8.3.1).

#### 3.8.3.1 Assessment scale

In the use of the assessment scale the following values were applicable:

- a) Column 0 = No/Not/Never,
- b) Column 1 = Seldom,
- c) Column 2 = Sometimes,
- d) Column 3 = Most of the time, and
- e) Column 4 = Yes/Always.

#### 3.8.3.2 Example

The following example serves to explain how the potential respondent should use the assessment scale:

Question: I give the correct instructions.

0	1	<del>2</del>	3	4
---	---	--------------	---	---

Responsive answer: The respondent is then saying, "I sometimes give the correct instructions."

It was expected that respondents may not have adequate theoretical management knowledge and as a result might experience difficulty in interpreting the questions correctly. The researcher therefore, decided to conduct structured interviews with a random selected number of respondents.

#### 3.8.4 Classification of the questions

The designed questionnaires covered the four management functions. The four main functions were represented in the questionnaires as follows:

- the planning function by questions 1 - 12.
- the organising function by questions 13 - 22.
- the leading function by questions 23 - 24.
- the controlling function by questions 25 –28.

Since the total number of questions were limited and that it was perceived by the researcher, at that stage, that the tasks or activities of the leading function are intertwined with that of the organising function only two questions on this function were included in the questionnaires (refer table 3.3



questions 13, 14, 15, 17, 18, 19, 20, 21, 22, 23 and 24). The two questions: selection of the most competent people and the development of the necessary training and development schedules were included as separate questions in order to obtain a reasonable complete picture of this management function. It was assumed that the other leading activities would be performed as a logical execution of the other three management functions.

### 3.8.5 The pilot study

In order to test the suitability of these questionnaires a pilot study was carried out. A number of member names were selected at random and used in the pilot study. This time the membership lists of the various mining associations were used because:

- members would be either holders of the Mine Managers Certificate of Competency, a degree in mining engineering, a degree in management or a combination of these, and
- better control and follow-up could be exercised by the researcher.

Qualification	Questionnaires		
	Send	Received	Percentage received
Mine Manager's Certificate of Competency	26	24	92.3
Graduate Manager	10	4	40.0
Total	36	28	77.8

**Table 3.2: The results of the pilot study**

A return rate of 77.8 per cent was achieved. This rate was deemed to be acceptable. It should give a true reflection of the reality as far as management knowledge, the application of management principles and the proficiency with respect to the knowledge of comprehensive management principles were concerned. The questionnaires were therefore used in the study.

### 3.8.6 The simple random selected sample

In chapter 1, it was stated that as a result of the lack of a comprehensive, practical and integrated management theory, the managerial competencies of employees on all organisational levels in the mining industry were, generally unacceptably low (refer section 1.5.2.5). The objective with this section was to establish the management competency in the industry.

An independent institution selected this sample. The methods used complied with acceptable academic and managerial policies. Only after the random selected sample had been established the researcher continued with the discussions. The discussions were conducted with the assessment criteria stated in table 3.3 as guidelines.

### 3.8.7 Personal discussions

The personal discussions ensured that a more objective assessment of the managerial competencies of the selected sample of respondents could be ascertained. This established an acceptable accurate basis for evaluation purposes and the development of the theory for a comprehensive, practical and integrated management method.

The discussions concentrated on the specific questions as set out in the questionnaires (refer table 3.3 and appendices 7 and 8). Through the discussions it was possible to determine reasonably accurately if respondents rated their managerial competencies higher than what they actually were and to what extent respondents generally were inclined to overrate their managerial competencies.

After the researcher had established, according to his judgement, what the respondent's actual understanding of a specific question was he rated the respondent's competency on that specific question. This assessment enabled the researcher to establish the management competency gap for the mining industry as a whole (refer section 4.3.10.3, table 4.15 and figure 4.17).

The researcher was confident that the discussions did not only reveal to what extend the specific respondent overrated his managerial competency but in addition gained a lot of useful information on the way management principles were interpreted. In the practical situation the information would enable management to establish the management competency gaps and which management development programs would be required to sufficiently close these gaps.

#### 3.8.7.1 Assessment criteria

In order to facilitate the evaluation procedure assessment criteria were suggested for each question during the personal discussions (refer table 3.3). The criteria were used by the researcher to conduct a meaningful and structured and representative interview with each selected respondent. This procedure ensured a more accurate, uniform and representative assessment of the respondent's understanding of a comprehensive, practical and integrated management theory. It in addition gave a more accurate picture of existing management practices being utilised.

Questions	Assessment criteria
1. Forecast the most probable results	1.1 An integrated planning structure exists for the whole organisation. 1.2 The reporting system ensures that the responsible stakeholders pick up events necessitating action. 1.3 These events trigger the planning process. 1.4 Stakeholders investigate and analyse factors involved. 1.5 Each stakeholder estimate and forecast the impacts of these factors on his required results. 1.6 Each stakeholder then determines and forecasts the most probable results that he could realistically deliver. 1.7 The most modern forecasting techniques are employed.

2. State the most probable achievable results	<p>2.1 Stakeholders jointly discuss the most probable results.</p> <p>2.2 Each stakeholder adjusts his most probable results where necessary.</p> <p>2.3 Each stakeholder determines whether he could make the required contribution to the achievement of the most probable achievable result.</p> <p>2.4 Stakeholders jointly discuss and agree on the most probable achievable results.</p>
3. Formulate the realisable objectives	<p>3.1 Each stakeholder formulates his preliminary objective.</p> <p>3.2 The stakeholders then discuss their objectives with their subordinates.</p> <p>3.3 Each stakeholder then reaches agreement with his subordinates on his most realisable objective.</p> <p>3.4 The stakeholders then jointly discuss their most realisable objectives.</p> <p>3.5 Where necessary stakeholders make adjustments and finalise their most probable realisable objectives.</p>
4. Develop alternative methods	<p>4.1 Each stakeholder develops the most realistic alternative methods with which to realise his objective.</p> <p>4.2 Each stakeholder then discusses these alternative methods with his subordinates.</p> <p>4.3 Each stakeholder sets the results to be achieved as provisional selection criteria.</p> <p>4.4 Each stakeholder together with his subordinates jointly selects the three to five best alternatives.</p> <p>4.5 The stakeholders thereafter discuss these alternatives with their superiors and get approval to use that for planning.</p>
5. Develop the work flow for each alternative method	<p>5.1 For each alternative method each stakeholder must:</p> <p>5.1.1 Commence with the most probable achievable results,</p> <p>5.1.2 Write down the most realisable objective.</p> <p>5.1.3 Develop one of the selected alternative methods into main tasks,</p> <p>5.1.4 State the results required (performance standards) for each main task,</p> <p>5.1.5 Define the objective for each main task,</p> <p>5.1.6 Develop each main task into supporting tasks,</p> <p>5.1.7 State the supporting tasks in a practical logical sequence,</p> <p>5.1.8 State the results required (performance standards) for each supporting task,</p> <p>5.1.9 Define the objective for each supporting task,</p> <p>5.1.10 Develop each supporting task into controlling tasks,</p> <p>5.1.11 Develop tasks further where necessary until the end tasks are identified.</p>
6. Determine the task and resources for each alternative	<p>6.1 Each stakeholder must determine during the task and resources analysis the:</p> <p>6.1.1 Resources such as tools, equipment, materials etc,</p> <p>6.1.2 Labour (employees),</p> <p>6.1.3 Working cost per task,</p> <p>6.1.4 Capital requirements per task,</p> <p>6.1.5 Start, finish and duration time per task,</p> <p>6.1.6 Performance standards applicable to the specific task,</p> <p>6.1.7 Possible deviations,</p> <p>6.1.8 Possible consequences,</p> <p>6.1.9 Risks,</p> <p>6.1.10 Corrective measures,</p> <p>6.1.11 Supervisory control, and</p> <p>6.1.12 Design and development of the organisation structure.</p>
7. Schedule the work flow for each alternative method	<p>7.1 The tasks of each alternative method are scheduled.</p> <p>7.2 The task duration times are optimised.</p> <p>7.3 Optimal critical path schedules are determined.</p> <p>7.4 The total time of each alternative is determined.</p> <p>7.5 The most optimal critical paths are selected.</p> <p>7.6 Tasks are coordinated and integrated with that of the related stakeholders.</p>
8. Compile the budget for	<p>8.1 Include all the required resources in the budget.</p>



each alternative method	<p>8.2 Each employee compiles his own budget.</p> <p>8.3 Budgets are integrated and coordinated.</p> <p>8.4 The budget is delegated and authorised.</p> <p>8.5 The budget is expressed in resource units and finally in monetary terms.</p>
9. Select the best method	<p>9.1 State the original results required as selection criteria.</p> <p>9.2 Specify the possible adjusted selection criteria.</p> <p>9.3 Evaluate the developed alternatives.</p> <p>9.4 Select the best alternative method.</p>
10. Determine and assess all risks	<p>10.1 Determine risks involved with tasks, tools, equipment, materials and internal and external factors.</p> <p>10.2 Determine the risks of operational practices.</p> <p>10.3 Determine the risks involved with policy setting.</p> <p>10.4 Determine and assess political related risks.</p> <p>10.5 Eliminate where practical all high risks.</p> <p>10.6 Where not possible to eliminate risks compile procedures to efficiently manage it.</p>
11. Develop the necessary policies and procedures	<p>11.1 Identify areas where policies and procedures are required.</p> <p>11.2 Compile procedures to manage unavoidable risks.</p> <p>11.3 Compile procedures for training and development.</p> <p>11.4 Compile procedures for the coordination of interdepartmental cooperation.</p> <p>11.5 Compile procedures and policies to ensure coordination and integration of tasks and activities.</p> <p>11.6 All policies and procedures are compiled with the necessary involvement of the relevant stakeholders on every level.</p>
12. Computerise the total plan	<p>12.1 Each stakeholder:</p> <p>12.1.1 Has a planning structure</p> <p>12.1.2 Ensures the complete integration and coordination of all planning in his department or section</p> <p>12.1.3 Ensures the codification of all items on the task and resources analysis plan sheet.</p> <p>12.1.4 Ensures the delegation and authorization of each plan.</p> <p>12.1.5 Computerises each plan.</p> <p>12.1.6 Coordinates and integrates with all relevant employees.</p> <p>12.1.7 Integrates all the plans.</p> <p>12.1.8 Integrates the total plan and that of all stakeholders, and</p> <p>12.1.9 Ensures that all plans are integrated and coordinated.</p>
13. Determine the job specifications or requirements	<p>13.1 Identify the tasks supporting the same objective.</p> <p>13.2 Add up the times of the tasks.</p> <p>13.3 List these tasks for the post.</p>
14. Develop the necessary posts	<p>14.1 Use eight hours per day to constitute for shift duration.</p> <p>14.2 Develop the necessary posts.</p> <p>14.3 Group the posts to form sections, departments and finally the total organisation.</p>
15. Delegate accountability to each job	<p>15.1 Establish the authority per post.</p> <p>15.2 Delegate the work (post) to the most competent employee.</p> <p>15.3 Delegate the necessary authority.</p> <p>15.4 Create accountability.</p>
16. Develop the optimal organisational structure	<p>16.1 Combine posts to constitute a section supporting a specific objective.</p> <p>16.2 Combine sections to form departments supporting a specific objective.</p> <p>16.3 Combine departments to form the organisation.</p>
17. Determine the lines of authority	<p>17.1 Develop superior – subordinate authority relationships.</p> <p>17.2 Develop peer authority relationships.</p> <p>17.3 Develop interdepartmental authority relationships.</p> <p>17.4 Develop functional authority relationships.</p>
18. Determine	<p>18.1 Develop superior – subordinate communication lines.</p>

communication lines	18.2 Develop peer communication lines. 18.3 Develop interdepartmental communication lines. 18.4 Develop functional communication lines.
19. Create the necessary relationships amongst posts	19.1 Create superior – subordinate relationships. 19.2 Create peer relationships. 19.3 Create interdepartmental relationships. 19.4 Create functional relationships.
20. Affect proper coordination	20.1 Always keep the stakeholders adequately informed. 20.2 Synchronise the operations of all departments. 20.3 Involve all in the planning for the results required from each of them. 20.4 Inform stakeholders where appropriate of opportunities and threats.
21. Determine supervisory schedules.	21.1 Prepare supervisory schedules from the task and resources analysis. 21.2 Specify the type of inspections necessary. 21.3 Specify inspection intervals.
22. Determine supervisory accountabilities	22.1 Delegate supervisory responsibilities. 22.2 Create supervisory accountabilities. 22.3 Institute periodic follow-up.
23. Select the most competent people available	23.1 Compile post specifications. 23.2 Advertise for the required personnel. 23.3 Interview most suitable applicants. 23.4 Select the best applicants. 23.5 Appoint the selected applicants. 23.6 Develop skills where required.
24. Develop training and management development schedules	24.1 Compile development programs. 24.2 Develop training and development schedules. 24.3 Implement training and development schedules.
25. Develop the necessary performance standards for each task.	25.1 Establish the results required with each task. 25.2 Utilise these results required as the performance standards.
26. Measure work in progress and completed.	26.1 Use the appropriate inspection schedules. 26.2 Measure the work in progress or completed. 26.3 Record measurement.
27. Evaluate performance	27.1 Identify significant deviations or expectations. 27.2 Evaluate the impact of these exceptions. 27.3 List exceptions that need to be corrected.
28. Correct deviations	28.1 Compile plans to correct exceptions. 28.2 Implement these plans. 28.3 Follow up on progress and results achieved with the corrective action plans.
29. List main deficiencies of management theory.	29.1 Respondents to evaluate existing management theory against what they feel they require at present. 29.2 List the perceived deficiencies.
30. List suggestions to eliminate deficiencies	30. 1 Respondent proposes improvements. 30.2 Motivate the proposals.

**Table 3.3: Assessment criteria of questions**

### 3.8.7.2 Assessment criteria in relation to the four management functions

Out of a total number of 135 criteria listed in table 3.3 the greatest number of criteria were with respect to the planning function (refer table 3.4). The number of questions was based on the concerns of the senior mining executives with regard to the number of questions for the

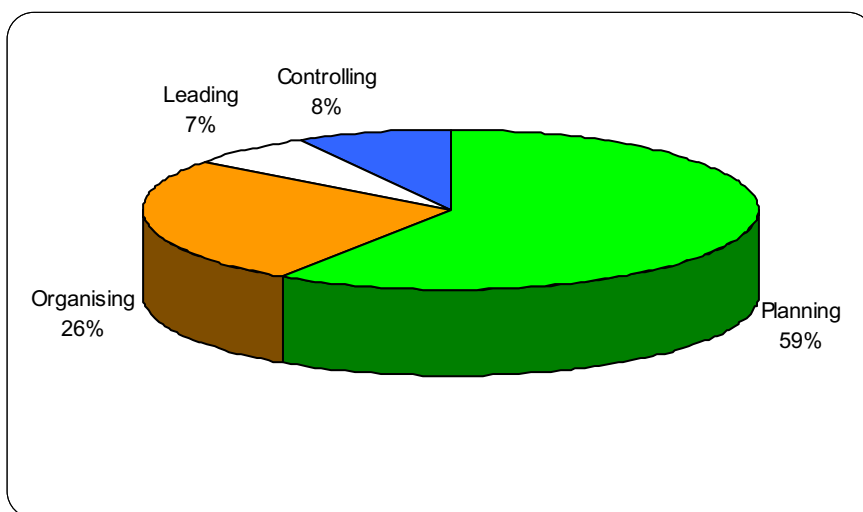
questionnaires and the researcher’s judgment as to which questions to use for the gathering of the required perceived information to analyse the management practices and competency of the respondents in the research population. It can not be taken as absolute but do give a valuable indication of the relative values of the management functions (refer section 2.6.2.1, figure 3.2 and table 3.3 and 3.4).

Management function	Number of criteria	Percentage
Planning	80	59.26
Organising	35	25.93
Leading	9	6.67
Controlling	11	8.14
Total	135	100.00

**Table 3.4: Relative values of the management functions**

The tendency reflected in table 3.4 supported the views of the importance of the planning function of many management theorists and practitioners. The value of the number of criteria per management function was reflected in figure 3.2. It confirmed that the criteria of the planning function (59.26 %) comprised the majority of the criteria of the four management functions. This indicated to what extent the planning function forms part of management work at present (refer section 2.6.2.1 and table 3.3).

A more accurate assessment of the relative values of the management functions should be determined during the development of the theory for the comprehensive, practical and integrated management method in chapter 5 of this thesis. It is perceived at this stage that the planning function would remain the dominant component of management work.



**Figure 3.2: Relative values of the management functions**

### **3.9 GATHERING OF THE DATA**

#### **3.9.1 Period over which the data was gathered**

It was planned to gather the required data during the period of October 2004 to April 2005. This would afford the researcher adequate time for possible enquiries and investigations where necessary.

#### **3.9.2 Methods to gather the data**

The methods of sending questionnaires to potential respondents and conduct personal discussions with a random selected group of the respondents were used as the two main methods of collecting the necessary data. These two methods were deemed as adequate to gather the required data.

The questionnaires were e-mailed to all registered members of the South African Colliery Managers Association, Association of Mine Managers of South Africa and the Northern Cape Mine Managers Association. The contact addresses were obtained from the relevant professional mine managers' associations. The method of collecting the required data by means of e-mailing the questionnaires was in recent times regarded as the most extensively used sampling method in research. This method was relatively cheap, fast, reliable and facilitated the electronic processing of the completed questionnaires. It would ensure an acceptable statistical analysis and evaluation of the data. It would, where and when necessary, enhance the quick clarification of possible ambiguities and queries with regard to specific questions (Kothari, 1990:22).

### **3.10 PROBABLE RESTRICTIONS TO THE EMPIRICAL RESEARCH**

It was likely that the workload of and pressure on mining personnel would continue to increase in the future. As a result it was expected that:

- 3.10.1 responses to requests for information could be rejected outright,
- 3.10.2 permission for access to the various institutions, facilities and organisations could be limited or denied,
- 3.10.3 company policies on secrecy might limit the quantity as well as the quality of information,
- 3.10.4 people might be reluctant to reveal some of the data for the research,
- 3.10.5 companies would want to screen and withhold certain vital information, and
- 3.10.6 participating institutions might demand exclusive rights to the utilisation of the proposed comprehensive, practical and integrated management method.

The mining industry had always been a close society well known for its supportive and cooperative approach to mutual challenges. There was good reason to believe that the potential participating entities would cooperate to the extent that adequate quantity and quality information would be gathered. It was felt that the probability of all of the above restrictions materialising in the industry as a whole would be relatively small and remote.

### 3.11 CONCLUSION

In this chapter the research methodology to establish the state of the utilisation of management practices in the practical situation and the managerial competencies of management was designed.

It was felt that the methodology would enable the researcher to gather sufficient data to:

- determine which management practice or practices were predominantly being utilised,
- assess the managerial competency of management in the industry,
- establish what, to the judgment of the respondents, were the most significant deficiencies of existing management practices being utilised,
- obtain suggestions from the respondents how to improve the managerial deficiencies, and
- enable the researcher to establish the deficiencies of the management practices and management as a whole in the practical situation.

The results obtained with the gathering of the required data would be presented, prepared, evaluated and discussed in the next chapter. The conclusions arrived at together with the deficiencies identified in chapters 1, 2 and 4 would be utilised in the development of the theory and the planning process for and the procedure for the implementation of the comprehensive, practical and integrated management method.

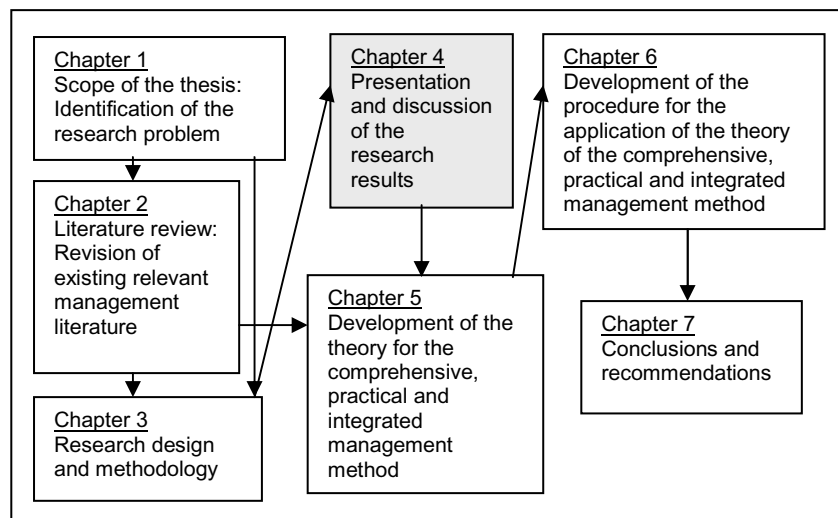


## CHAPTER 4

### PRESENTATION AND DISCUSSION OF THE RESEARCH RESULTS

#### 4.1 INTRODUCTION

In this chapter the results received, the deficiencies, the suggestions from the respondents to improve management practices in the South African mining industry and the observations and conclusions, arrived at by the researcher during the discussions with the respondents of the random selected sample were discussed in detail. All the data were presented, prepared and evaluated in terms of the requirements of the perceived comprehensive, practical and integrated management requirements (refer section 2.2.1).



**Figure 4.1: Chapter 4 in context to the overall thesis**

The management competency of management in the South African mining industry was determined and assessed. For purposes of assessment a competency standard of 85 per cent was proposed. Management competency is defined as the degree of proficiency of the employee in understanding and applying the perceived comprehensive, practical and integrated management theory in his own practical situation.

It was emphasised that the competency standard applied by the specific organisation was a matter of choice that it has to make. It might initially have been difficult to train, improve and maintain the competency level of all the employees to comply with this standard but the lower the selected competency standard the higher the risk of not being competitive in the global market arena. The conclusions arrived at together with existing management theory were utilised in developing the theory for the comprehensive, practical and integrated management method.

## **4.2 PRESENTATION OF THE RESEARCH RESULTS**

### **4.2.1 Responses received**

Questionnaires were e-mailed to a total of 245 members of the three mine managers' associations (refer section 3.9.2). A total of 164 (66.94 per cent) responses were received within the planned period of October 2004 to April 2005 (refer table 4.1). By mid April 2005 the return rate of the responses decreased rapidly and completely ceased towards the end of that month.

### **4.2.2 The deficiencies identified and the suggestions proposed by the respondents**

The respondents' perceptions of the deficiencies of the existing management practices and their suggestions to rectify these deficiencies and the deficiencies as measured by the researcher were summarised below. It should by no means be considered as complete but did reflect an acceptable representative assessment of the existing management practices in the South African mining industry.

#### **4.2.2.1 Deficiencies as identified by the respondents**

The perceived deficiencies with the existing management practices in the South African mining industry and the suggestions proposed by the respondents to rectify these deficiencies were listed in the sections below. They are categorised as as follows:

##### **a) Management programs**

- i) Management endeavoured to accommodate managerial needs almost entirely by short duration, single-topic management programs,
- ii) Many programs were not entirely based on management theory.
- iii) Many programs were not practical to implement.
- iv) These programs were not comprehensive and almost without exception intended for line management only.
- v) Too many different programs caused confusion and resistance by the employees.
- vi) The administrative management approach was not comprehensive and practically applicable as an integrated program.

##### **b) Management planning**

- i) The present planning structures were not complete, logical, integrated and comprehensive enough.
- ii) Comprehensive planning processes did not exist.
- iii) Not all the employees on all the levels of the organisation were involved in the planning of the results required from each of them.

- iv) No logical step by step breakdown of work tasks was performed by the responsible employees anywhere in any of the mining organisations.
- v) Time and method studies were seldom conducted and when mainly by dedicated technical staff with special projects in departments and sections.
- vi) Top management and the technical departments mostly specified the performance standards that the employees have to comply with.
- vii) Workers were not trained and allowed to set the standards applicable to their own work themselves.
- viii) Workers did not always sufficiently know and understand the objectives and results required from each of them.
- ix) Special trained staff departments mainly carried out risk assessments.
- x) Budgets were mostly updated and escalated versions from the previous year.
- xi) Risk assessments were performed by a separate department, mostly on an ad hoc basis or because of special requests.
- xii) When risk assessments were performed it was mainly carried out by a specific dedicated department.

### **c) Organising**

- i) Organisational structures could not be scientifically designed.
- ii) Existing organisational structures were mostly carry-overs from other similar organisations.
- iii) Logical scientific methods for developing organisations did not exist.
- iv) Relationships were not adequately determined and developed.
- v) It was not possible to develop job descriptions correctly with existing management approaches.
- vi) Very few employees understood what coordination means, what it implied and how it should be affected.

### **d) Leading**

- i) Motivation was low because existing management practices largely ignored leadership theories.
- ii) Leadership programs were presented on an ad hoc basis only.
- iii) As a result of the incomplete organisational development it was basically impossible to communicate efficiently with all the relevant stakeholders.
- iv) Not all subordinates were allowed to take the decisions necessary to achieve the results required from them.
- v) Discipline and authority were adversely affected by head offices' appeasement approach to unions.

### **e) Controlling**

- i) Performance standards were not set from the top down for each level of the organisation.
- ii) Performance levels were not scientifically established.

- iii) Management seldom controlled by exception.
- iv) Physical controlling methods on the lower levels were strict and generally of a high standard.
- v) Specific staff departments normally developed performance standards for all the employees.

**f) The Mine Managers' Certificate of Competency**

- i) It was too technically orientated.
- ii) It did not adequately cover the management and human resources theories.
- iii) It was technical totally outdated.

**4.2.2.2 Suggestions proposed by the respondents**

Most respondents were convinced that existing management practices were very limited and did not enable employees to efficiently execute their management work. They felt that existing management theories and practices should be, as a matter of urgency, critically scrutinised, evaluated and improved in order to comply with the requirements of efficient management.

The following proposals were made by the respondents:

- a) Update the present Mine Manager's Certificate of Competency.
- b) Acquire more up to date relevant management programs.
- c) Introduce more leadership and human resources theory.
- d) Introduce a planning process and management method that could be utilised by all employees on all the levels of the organisation.
- e) Introduce management development programs for all employees on all the levels of the organisation.
- f) Develop and maintain the managerial competencies of all the employees on all the levels of the organisation.
- g) Allow each employee to manage his own work.
- h) Introduce a standard based assessment process.

**4.2.3 Conclusions arrived at by the researcher during the discussions**

The researcher arrived at the following conclusions:

- 4.2.3.1 The administrative management approach appeared to be the management approach predominantly being utilised by the mining industry.
- 4.2.3.2 Short duration management programs were extensively used by the mining industry.
- 4.2.3.3 A comprehensive, practical and integrated management method did not exist in the South African mining industry.
- 4.2.3.4 Planning was not performed on a comprehensive company wide basis according to a specific planning process with all employees fully involved.
- 4.2.3.5 Comprehensive efficient planning procedures involving all the employees from the executive level to the worker level on the mines did not exist.

- 4.2.3.6 Employees were normally told what their results and objectives should be.
- 4.2.3.7 Organisational structures could not be developed scientifically with the existing management practices.
- 4.2.3.8 Delegation of responsibilities and authority were normally inefficiently performed.
- 4.2.3.9 Employees were not adequately involved in setting their own objectives, performance standards and the results required from them.
- 4.2.3.10 Work flows were seldom performed and alternative methods to achieve planned results were rarely determined and developed and the best alternative was basically never selected and implemented especially at the lower levels.
- 4.2.3.11 Performance standards as well as risk assessments were set and performed mainly by staff departments who in many cases lack the relevant practical work experience.
- 4.2.3.12 Leading was totally inadequate and was raised as a problem area by all respondents.
- 4.2.3.13 Top management mainly set policies, procedures and regulations mostly without the necessary involvement of all the people affected by it.
- 4.2.3.14 Action plans could not be adequately integrated and coordinated.
- 4.2.3.15 Job specifications could not be determined scientifically with existing management practices.
- 4.2.3.16 Employees were mainly recruited, selected, appointed and trained by staff departments with no or limited involvement of the relevant supervisors.
- 4.2.3.17 Employees, especially on the lower levels, were not allowed to recruit, select and appoint the employees they require.
- 4.2.3.18 Training and development programs were mostly carry-overs from the past and in many instances were not mine specific but general group deduced programs.
- 4.2.3.19 Communication, reporting and control were in most cases totally inadequate.
- 4.2.3.20 Existing management systems did not lend themselves to complete computerisation.

### **4.3 PREPARATION AND EVALUATION OF THE DATA**

The data from the responses was arranged into a systematic and logical format in order to facilitate the analysis and evaluation of it. The purpose with the preparation of the data was to study the effect of variations or relations between specific factors and categories of the responses to the questions in the questionnaires. The results of each category of the 28 questions (refer appendices 7 and 8) of the bulk and the random selected samples were firstly statistically processed by the Department of Statistics of the University of Pretoria. The purpose was to evaluate the validity of the averages or arithmetic means of the assessment of each question (Bowker & Lieberman, 1959:7). The Department confirmed that all the responses to the questions qualified within the normal acceptable limits and could be utilised for further evaluation purposes.

#### **4.3.1 Responses to the questionnaires**

A total of 36 mining groups, representing 73 mines, mining 12 different minerals, participated in the completion of the questionnaires. In total 43 managerial positions, classified into four main

management levels, participated in the research (refer table 4.1). Of these responses there were a total of 62 (37.80 per cent) responses where no comments or suggestions were made or proposed. The 62 responses consisted of 26 and 36 responses from the Mine Managers' Certificate of Competency and the General Management questionnaires respectively. Of the 110 Mine Managers' Certificate of Competency responses 26 (23.64 per cent) made no comments or suggestions. Of the 54 General Management responses 36 (66.67 per cent) made no comments or suggestions respectively (refer table 4.1). Of the total of 164 respondents, 102 (62.20 per cent) expressed their concern with the adequacy of the existing management practices in the mining industry.

Of the random selected sample of 42 respondents, 16 (38.09 per cent) initially made no comments or suggestions. After the discussions all 42 (100 per cent) expressed their concern with the present management practices in the mining industry and proposed suggestions to improve it. It in effect implied that 144 (87.8 per cent) of the respondents eventually expressed their concern with the inadequacy of existing management practices.

Item	Number
Questionnaires sent	245
Questionnaires returned	164
Mining groups participating	36
Total mines participating	73
Main minerals covered	12
Managerial positions participating	43
Management levels participating	4

**Table 4.1: Results of the sampling**

One factor that became apparent from the responses was that a comprehensive, practical and integrated management method in the South African mining industry did not exist. The theoretical managerial knowledge of the respondents was low. As a consequence some of the respondents might not have understood and interpret all the questions correctly. In general it was felt that the data obtained with this research was the best that the researcher could hope to obtain under the circumstances. It can be regarded as a reliable reflection of the status of existing management practices in the South African mining industry.

Responses	Made no comments or suggestions	Made comments or suggestions	Total
Mine Managers' Certificate of Competency	26	84	110
General Management	36	18	54
Total	62	102	164

**Table 4.2: Analysis of the responses**

#### 4.3.2 Management approaches in use in the South African mining industry

From the total of 164 responses, 158 (96.34 per cent) supported the process or administrative management approach (refer section 4.2.3.1). It would appear that this management approach was currently the predominant management approach being utilised in the mining industry. Other short-term management programs and interventions were to some extent popular on the mines and were implemented on a continuous basis but were usually of a short-lived nature and value (refer section 4.2.2.1. (a) (i)). It could be concluded that the process management approach, originally developed by Henri Fayol, remained the most popular and utilised management approach in the South African mining industry to date.

#### 4.3.3 Area covered by the research

Responses were received mostly from mining groups and mines representing the eight main mineral mining sectors (refer section 3.6 and tables 1.1 and 4.3). The responses covered the geographical areas of the Western Cape Province, Northern Cape Province, Free State Province, North Western Province, Limpopo Province, Gauteng Province, Mpumalanga Province and the Kwa-Zulu Natal Province of the Republic of South Africa.

#### 4.3.4 Main minerals covered by the research

Twelve different types of minerals were covered. They were grouped into the eight main mineral groups and 'other' (refer figure 4.2 and table 4.3). Most of the larger mining groups normally have interests in more than one mineral sector. For training purposes and to fill vacancies their managers were frequently transferred, between the mines in the different mineral sectors where and when required. The sample could therefore be regarded as representative of the total South African mining industry.

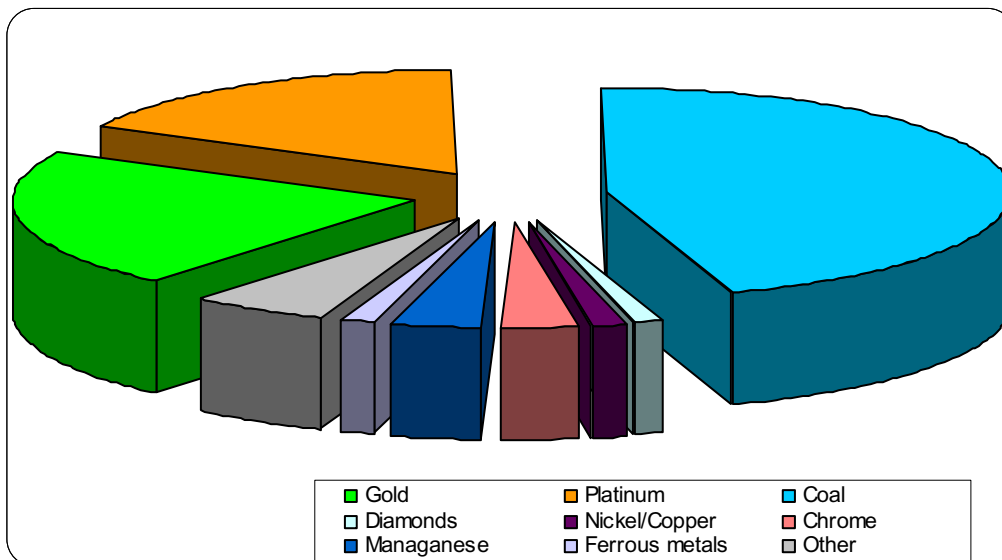


Figure 4.2: The mineral sectors covered by the research

The greater contribution by the coal mining sector had no specific implications except that it most probably could be construed as an indication of the greater interest and preparedness of the managers in this sector to participate in the research. This sector appeared to be more concerned with the application of management principles. Low percentage returns such as those from the diamond, ferrous, chrome and nickel/copper mineral sectors should be awarded the same value, as that of the higher percentage returns such as the coal, gold and platinum mineral sectors. Most of the larger mining groups control several mineral sectors and the managers of these groups, are as part of their scheduled development programs, regularly transferred between the different mineral sectors in which the specific group holds mining interests.

Mineral sector	Returns	Percentage
Gold	35	21.34
Platinum	27	16.46
Coal	73	44.51
Diamonds	2	1.22
Nickel/Copper	5	3.05
Chrome	5	3.05
Manganese	6	3.66
Ferrous metals	2	1.22
Other	9	5.49
Total	164	100.00

**Table 4.3: Mineral sectors covered by the research**

#### 4.3.5 Evaluation of the sampling results

For evaluation purposes the sampling was designed in five phases as outlined below:

- The bulk self rated sample.
- The random selected self rated sample.
- The random selected rated sample.
- The managerial deficiencies (refer section 3.8.7.1, table 3.3 and question 29), and
- The suggestions to improve existing management practices (refer section 3.8.7.1).

In the bulk self rated sample all the respondents rated their own management competencies measured against the perceived requirements of the comprehensive, practical and integrated management theory and method. The objective with the research questions was to established an accurate as practical possible judgment of the compency of managers in the mining industry.

As a result of the low management competency deduced from the responses the researcher deemed it necessary to conduct a further study on a random selected group from the rspndents. The random group was scientifically selected by an independent accredited institution. The sample constituted of a proportionally representation of the main management categories in the mining industry



Questions	Bulk sample	Random sample	
	Self rated	Self rated	Rated
	Ave mean	Ave mean	Ave mean
1	2.40	2.62	1.29
2	2.41	2.67	1.26
3	2.43	2.52	1.21
4	2.54	2.52	1.21
5	2.23	2.43	0.50
6	2.35	2.45	0.57
7	2.24	2.38	0.73
8	2.25	2.38	1.05
9	2.39	2.48	1.29
10	1.80	1.71	0.21
11	2.36	2.50	1.29
12	1.51	1.76	0.57
13	2.03	2.86	1.67
14	2.07	2.67	1.07
15	2.24	2.45	1.29
16	1.86	1.71	0.26
17	2.33	2.36	1.14
18	2.21	2.23	1.38
19	2.07	2.36	1.36
20	2.14	2.40	1.19
21	2.14	2.62	1.45
22	2.36	2.38	1.48
23	1.91	2.07	1.21
24	1.88	2.10	1.19
25	2.10	2.19	1.00
26	2.40	2.65	1.81
27	2.43	2.74	1.90
28	2.50	2.63	1.98
Total	61.58	66.94	32.56
Ave	2.20	2.39	1.16
Std Dev	0.24	0.29	0.44

**Table 4.4: Results of the first three phases of the sampling**

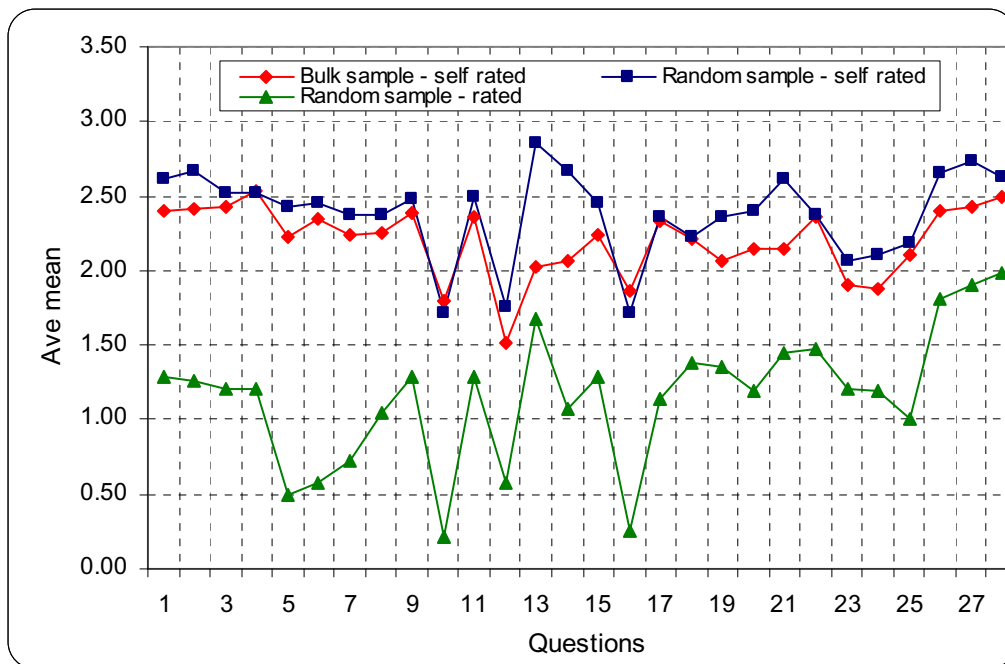
#### 4.3.5.1 Results of the first three phases of the sampling

The results of the first three samples are depicted in table 4.4. Only the average mean of each question and of each sample is reflected for further evaluation and analysis of the:

- a) results of the sampling, and
- b) efficiency of management practices and determination of the management competencies.

It would appear that significant variations in the assessments between the questions within each sample and between the three sample results exist (refer table 4.4 and figure 4.3). This trend is evident right through the industry in the different management categories. It, at this early stage, would appear that the management development programmes introduced by the industry are totally inadequate to enable managers to efficiently manage for the results required from each of them.

There may be many reasons for the incompetency of managers in the mining industry. The reasons for the variations and the low assessments would be analysed, established and discussed in the following sections.



**Figure 4.3: Graphical presentation of the three samples**

#### 4.3.5.2 The bulk self rated sample

The bulk sample represented the total sample and was the first and initial step in inviting responses from potential members of the three mining associations. It constituted the basis from which:

- a) a general assessment of the state of the prevailing management practices in the South African mining industry and the opinion or views and possible suggestions from the respondents for improvement of these practices could be established, and
- b) a random sample could be selected in order to further establish or confirm the validity of the general responses.

#### 4.3.5.3 The random selected self rated sample

From the responses of the bulk sample it would appear that there were significant and unrealistic variations within each questionnaire. It was therefore deemed necessary to select a representative sample at random from the responses received (refer section 3.7.2).

The purpose with this was to determine whether there were significant inconsistencies and if so what the magnitude and implications of it were. It would further be utilised to determine and evaluate the differences and magnitude of these differences between the self rated and rated assessments.

#### 4.3.5.4 The random selected rated sample

Through personal discussions with the respondents of the random selected rated sample the researcher attempted to establish whether respondents in general were inconsistent with the

assessment of the questions in the questionnaires. It was also expected that respondents were in general inclined to rate their knowledge and application of management work higher than what it actually was (refer section 3.7.2).

This sample would serve to establish a more realistic assessment which could be used to determine the most realistic managerial competency gap in the South African mining industry. The managerial competency of the different levels of management in general in the South African mining industry is expected to be unacceptably low.

#### 4.3.5.5 Grouping of the data of the three samples

Class interval	Frequency ( <i>f</i> )			Cumulative Frequency			Fraction Cumulative Frequency		
	<i>F</i> <sub>1</sub>	<i>F</i> <sub>2</sub>	<i>F</i> <sub>3</sub>	<i>CF</i> <sub>1</sub>	<i>CF</i> <sub>2</sub>	<i>CF</i> <sub>3</sub>	<i>FCF</i> <sub>1</sub>	<i>FCF</i> <sub>2</sub>	<i>FCF</i> <sub>3</sub>
0.21 – 0.30			2			2			0.071
0.31 – 0.40			0			2			0.071
0.41 – 0.50			1			3			0.107
0.51 – 0.60			2			5			0.176
0.61 – 0.70			0			5			0.176
0.71 – 0.80			1			6			0.214
0.81 – 0.90			0			6			0.214
0.91 – 1.00			1			7			0.250
1.01 - 1.10			2			9			0.321
1.11 – 1.20			3			12			0.429
1.21 – 1.30			8			20			0.714
1.31 – 1.40			2			22			0.786
1.41 – 1.50			2			24			0.857
1.51 – 1.60	1		0	1		24	0,036		0.857
1.61 – 1.70	0		1	1		25	0.036		0.893
1.71 – 1.80	1	3	0	2	3	25	0.071	0.107	0.893
1.81 – 1.90	2	0	2	4	3	27	0.143	0.107	0.964
1.91 – 2.00	1	0	1	5	3	28	0.179	0.107	1.000
2.01 – 2.10	4	2		9	5		0.321	0.179	
2.11 – 2.20	2	1		11	6		0.393	0.214	
2.21 – 2.30	6	0		17	6		0.607	0.214	
2.31 – 2.40	7	7		24	13		0.857	0.464	
2.41 – 2.50	3	5		27	18		0.964	0.643	
2.51 – 2.60	1	2		28	20		1.000	0.714	
2.61 – 2.70		6			26			0.929	
2.71 – 2.80		1			27			0.964	
2.81 – 2.90		1			28			1.000	

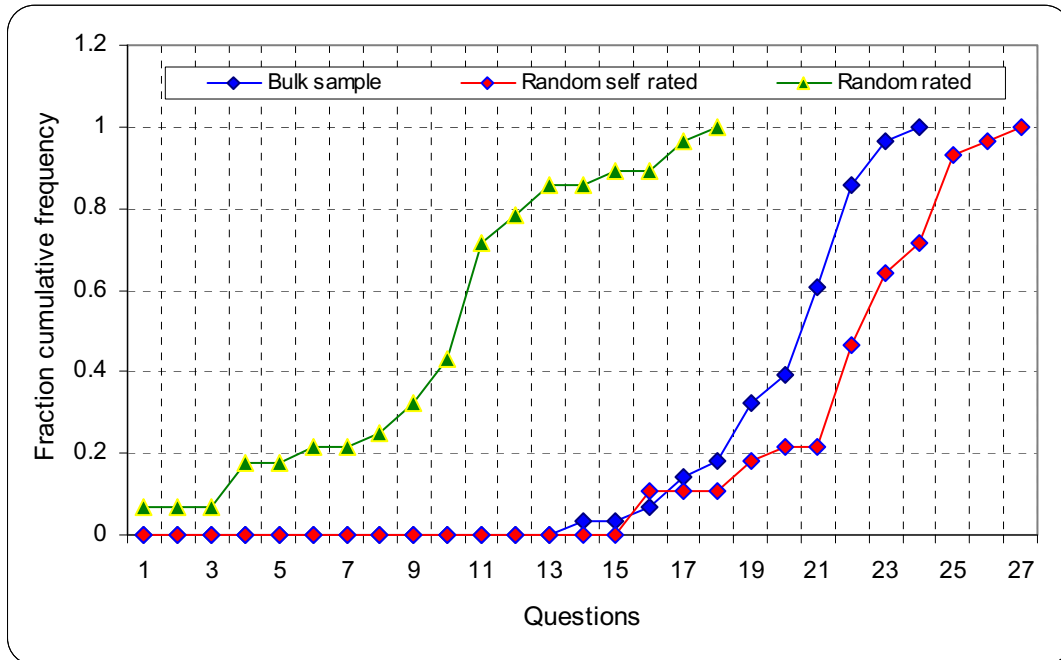
**Table 4.5: Cumulative frequency table**

Variations between the average means of the self rated bulk sample, self rated random sample and the rated random sample are reflected in table 4.4. The data of each is arranged into a cumulative frequency table displaying the class intervals, frequencies (*F*<sub>1</sub>, *F*<sub>2</sub>, *F*<sub>3</sub>), cumulative frequencies (*CF*<sub>1</sub>, *CF*<sub>2</sub>, *CF*<sub>3</sub>) and fraction cumulative frequencies (*FCF*<sub>1</sub>, *FCF*<sub>2</sub>, *FCF*<sub>3</sub>) as reflected in table 4.5. The grouping of the data would facilitate easier deductions, evaluations and comparisons.

From table 4.5 it was concluded that the assessments of all 28 questions fall below the following class intervals:

- the bulk self rated sample below 2.60 (65 per cent),
- the random selected self rated sample below 2.90 (72.5 per cent), and
- the random selected rated sample below 2.00 (50 per cent).

The above implies that the assessments of the bulk self rated and random selected self rated samples were much higher than that of the random selected rated sample. This could be attributed to the fact that the respondents in general were inclined to assess their managerial competencies significantly higher than the assessed values.



**Figure 4.4: Cumulative frequency functions**

From the assessments of the three samples it appeared that there were large variations between the assessments of the different questions. Most significant are the assessments of questions 5, 6, 7, 8, 10, 12, 14, 16 and 25 which involved the following tasks:

- a) Develop the work flow for each alternative method.
- b) Determine the task and resources for each alternative.
- c) Schedule the work flow for each alternative method.
- d) Compile the budget for each alternative method.
- e) Determine and assess all risks.
- f) Computerise the total plan.
- g) Develop the necessary posts.
- h) Develop the optimal organisational structure.
- i) Develop the necessary performance standards for each task.

The differences were significant. The possible reasons for the differences would be discussed further after the evaluations of the management functions and the management discipline. It, however, confirmed the statement earlier in chapter 3 and proved to some extent in chapter 4 that respondents in general were inclined to overrate their management competencies (refer section 3.7.2). The reason for this difference could be that existing management practices were simply inadequate.

#### 4.3.6 Evaluation of the management functions

For the purpose of evaluating the management functions, the results of the random selected sample were used. The self rated and rated mean values were directly analysed, evaluated and compared

Management function	Questions	Random selected sample				Proposed standard
		Mean per question				
		Self rated	Average	Rated	Average	
Planning	1	2.62		1.29		
	2	2.67		1.26		
	3	2.52		1.21		
	4	2.52		1.21		
	5	2.43		0.50		
	6	2.45		0.57		
	7	2.38		0.73		
	8	2.38		1.05		
	9	2.48		1.29		
	10	1.71		0.21		
	11	2.50		1.29		
	12	1.76		0.57		
Total		28.42	2.37	11.18	0.93	3.4
Organising	13	2.86		1.67		
	14	2.67		1.07		
	15	2.45		1.29		
	16	1.71		0.26		
	17	2.36		1.14		
	18	2.23		1.38		
	19	2.36		1.36		
	20	2.40		1.19		
	21	2.62		1.45		
	22	2.38		1.48		
Total		24.04	2.40	12.29	1.23	3.4
Controlling	25	2.19		1.00		
	26	2.65		1.81		
	27	2.74		1.90		
	28	2.63		1.98		
Total		10.21	2.55	6.69	1.67	3.4

**Table 4.6: Analysis of the random selected sample**

From table 4.6 it appeared that the:

- self rated assessment values were significantly lower than the proposed standard mean of 3.4 (85 per cent),
- all assessment values, self rated and rated, were unacceptably low,
- assessment of the planning function in particular was extremely low, and
- low assessment of the planning function should be regarded as the main reason for the unacceptable low managerial competency of the mining industry.

##### 4.3.6.1 Evaluation of the planning function

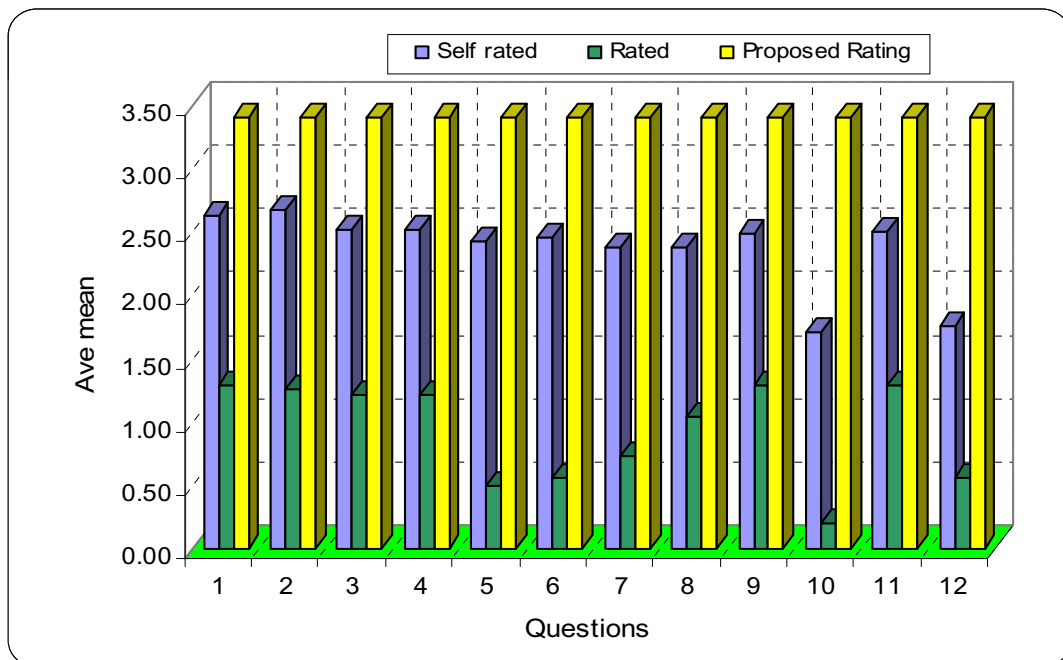
Most management theorists and practitioners agreed that planning should occur at all the levels of the organisation. It should form the basis of a sound management approach and of the four

management functions. Planning was regarded as the most fundamental management function and that all management work stemmed from it (Donnelly et al,1995:156). Donnelly et al (1998:139) stated that planning is essential if organisations are to achieve effective levels of performance and if they wish to become and remain competitive in the local and global markets (refer section 2.6.2.1).

The planning work goes mainly through two identifiable phases: the operational phase and the planning phase respectively. During these phases the emphasis and time spent on the management functions would vary depending on the circumstances and the management work required at that specific stage. For example less time would be spent on planning work during the operational period whilst during the annual planning period more time would be spent on planning work. It is important that, in view of the importance of planning to the success of an organisation, this management function be awarded the correct attention. The plan should be the blue print for optimal performance for the ensuing period. It would provide the direction and control measures for the employees and the organisation as a unit to achieve the required results.

**a) The operational phase**

The average mean of 0.93 (23.25 per cent) of the rated random sample for the planning tasks implied, according to the assessment scale, that planning was seldom performed correctly (refer table 4.6). When comparing the assessments of the self rated and rated random samples it would appear that the assessments of questions 5, 6, 7, 8, 10 and 12 were exceptionally low (refer section 4.3.5.5, figure 4.5 and table 4.6).



**Figure 4.5: Evaluation of the planning function**

The extremely low assessments of these questions were proof that in the South African mining industry, in general, certain management planning work is not or was seldom performed by the

managers. Planning is the fundamental management function where the 'plan' for the company's future action is designed. It should establish the results required, the objectives and the best method with which to realise these objectives (refer section 2.6.2.1).

From the comments on the deficiencies and proposed suggestions by the respondents to improve the existing management practices and the observations by the researcher it would appear that the low assessment of the planning function could mainly be attributed to the following reasons (refer sections 4.2.2.1 (b) and 4.2.3.2):

- i) Comprehensive and logical planning processes did not exist or alternatively were inadequately developed and implemented.
- ii) Planning procedures were seldom used.
- iii) The most probable results were seldom forecasted.
- iv) The most probable achievable results were seldom stated.
- v) The realisable objectives were seldom formulated.
- vi) Alternative methods were seldom developed.
- vii) The best methods were seldom selected.
- viii) Risks were not determined and assessed by the specific responsible employees.
- ix) Risk assessments and the compilation of procedures were mainly compiled by senior and top management assisted by trained specialist staff members.
- x) Policies and procedures were not compiled as a logical step in the planning process.
- xi) Not all employees were involved in the planning of the results required from them and the objectives they should endeavour to realise.
- xii) Tasks and resources were very seldom determined for alternative methods.
- xiii) The work flow and time and motion studies were seldom scheduled and compiled.
- ix) Budgets were in many instances escalated versions of the previous year's budget.
- x) Plans were not comprehensively computerised throughout the organisation.

From the above it would appear that available management practices did not equip the mine management with the required theoretical management knowledge and as a result the planning function in general was inadequately performed. It can not form a sound basis for the other management functions.

#### **b) The planning phase**

From the empirical research findings it would appear that the mining industry in general do not follow specific planning structures (refer section 4.2.2.1 (b)). The following plans were normally compiled:

- Strategic plans.
- Long-term plans and or operational plans.
- Budgets.

It was assumed that the times spent by management on the management functions would vary during the planning and operational periods in the organisation (refer appendix 9). During the

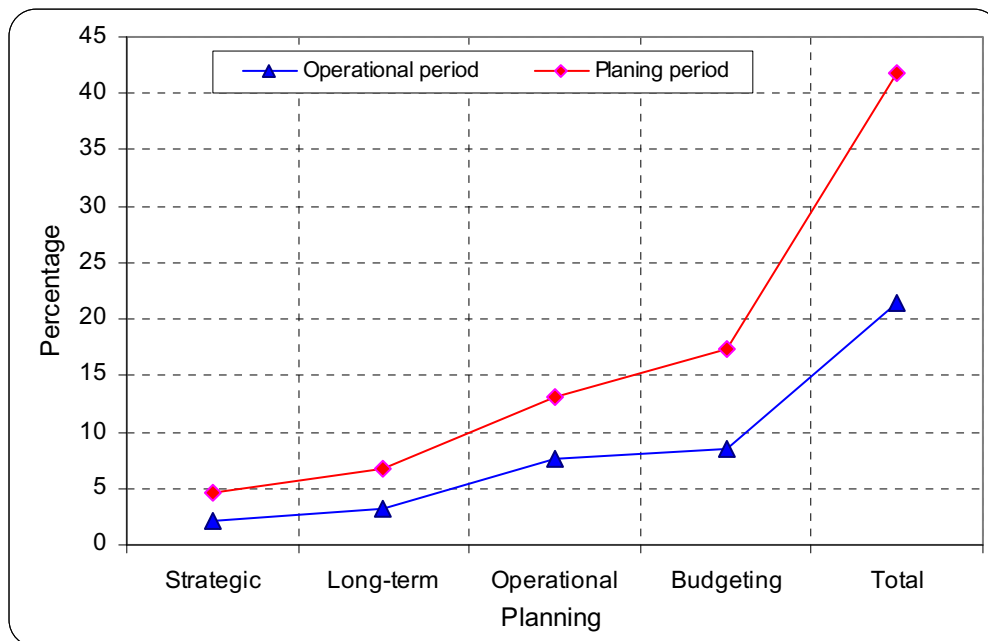
interviews with the random selected group of respondents the assessments of 23 (54.7 per cent) of these respondents were obtained on the percentage time spent on the:

- different components of the planning function during the planning period, and
- management work during the operational and planning periods.

Planning components	Percentage time spent during	
	Operational period	Planning period
Strategic planning	2.17	4.56
Long-term planning	3.26	6.74
Operational planning	7.61	13.04
Budgeting	8.48	17.39
Total	21.52	41.73

**Table 4.7: Time spent on the planning components during the operational and planning periods**

The planning period on the mines normally lasts for approximately three months. From table 4.7 and figure 4.6 it appeared that during the planning period approximately 41.73 per cent of the total management time was devoted to planning work. This was mainly due to the urgency associated with the finalisation of the plan and the time required to do it. During the operational period the average time spent on planning was approximately 21.52 per cent. Planning at the lower levels basically consisted of one-sheet budgets directly derived from the supervisor’s budget.



**Figure 4.6: Time spent on the planning function during the planning period**

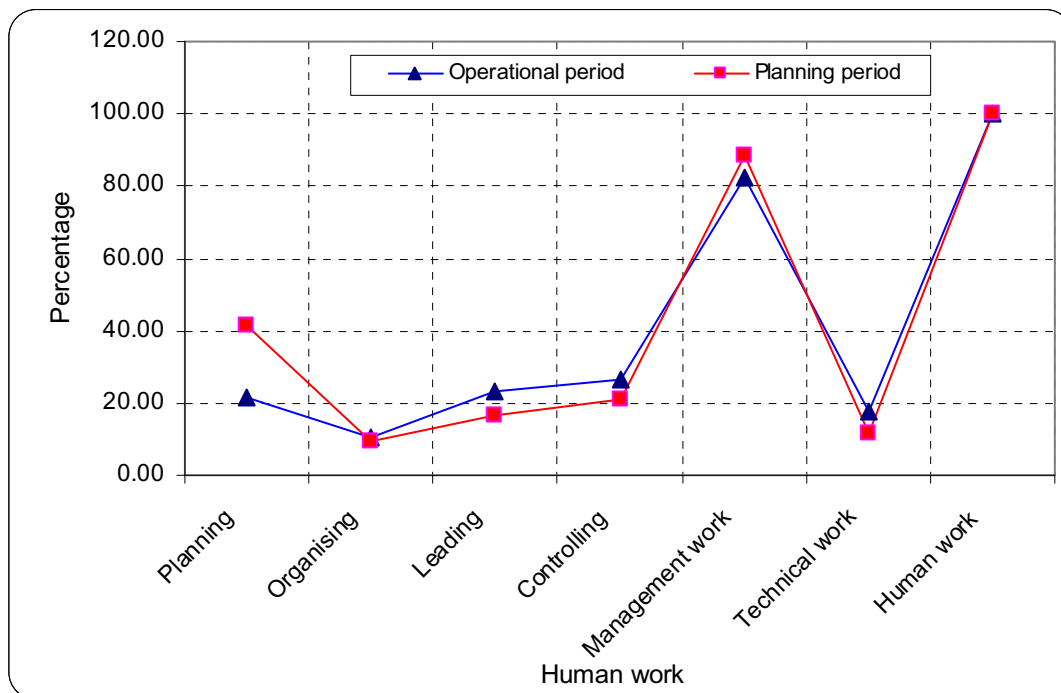


No standard criteria with regard to the percentage of management time that should be spent on the planning components could be ascertained from the literature. In table 4.8 human work is the sum of management work and technical work. The time spent per planning category depends on the:

- type of business and level in the organisation,
- size of the organisation,
- geographical distribution,
- term of contracts, and
- the planning components required for that specific environment.

Management function	Percentage time spent during	
	Operational period	Planning period
Planning	21.52	41.73
Organising	10.65	9.35
Leading	23.48	16.52
Controlling	26.74	21.09
Total management work	82.39	88.69
Technical work	17.61	11.31
Total human work	100.00	100.00

**Table 4.8: Time spent per management function during the operational and planning periods**



**Figure 4.7: Time spent per management function during operational and planning periods**

The average time spent on the different management functions during the operational period is depicted in table 4.8 and figure 4.7. During the planning period the time spent on the other management functions decreased in order to allow for more time to be spent on the planning function.

#### 4.3.6.2 Evaluation of the organising function

From table 4.6 it would appear that the rated means of the questions on the organising function were extremely low. The average mean of the ten questions (questions 13 to 22) was 1.23 (30.75 per cent) which implied that according to the assessment scale the organising function was seldom or never performed correctly (refer section 4.2.2.1 (c) and 4.2.3.5).

Of particular concern was the low assessments of the activities of developing the necessary posts (26.75 per cent), developing of the optimal organisational structure (6.50 per cent), determination of the lines of authority (28.50 per cent) and the affecting of adequate coordination (29.75 per cent). The average assessment of 6.50 per cent of the developing of the optimal organisational structure could be attributed to the fact that existing management theories did not provide management with the means to develop an organisational structure. In practice organisational structures can not be developed scientifically because existing theories do not provide adequate means (Davis & Weckler, 1996:19) and (Drucker, 1968:352). Despite this deficiency of the administrative management approach management theorists and practitioners still maintain that management consists of the functions of planning, organising, leading and controlling.

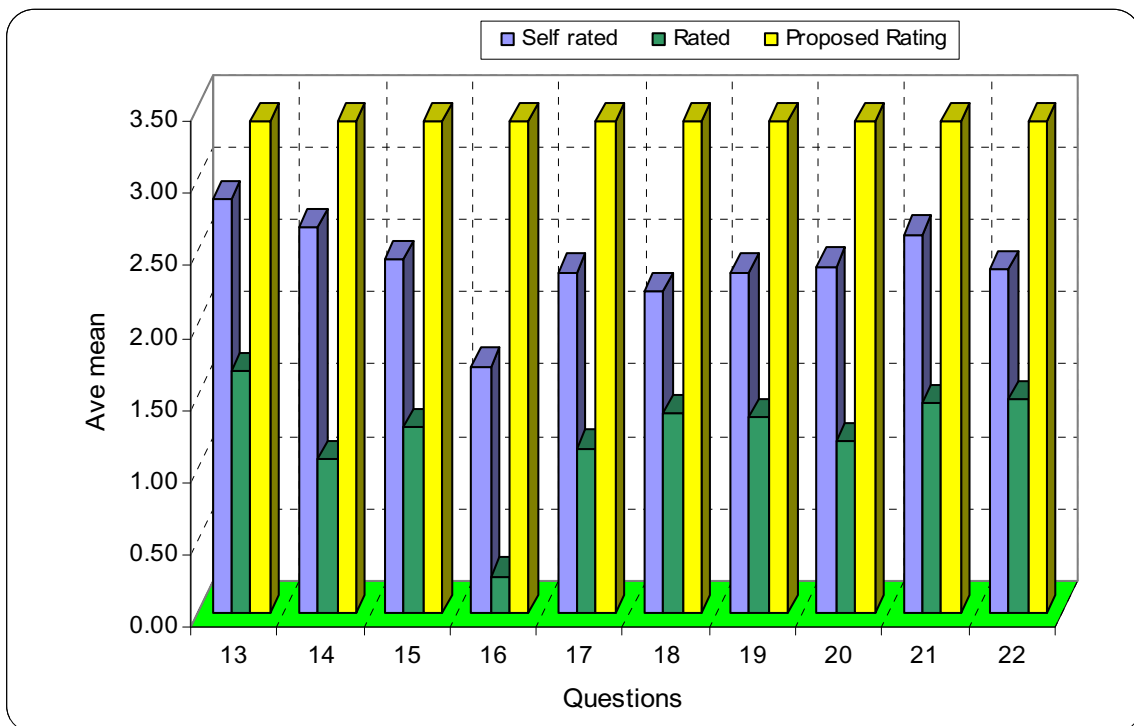


Figure 4.8: Evaluation of the organising function

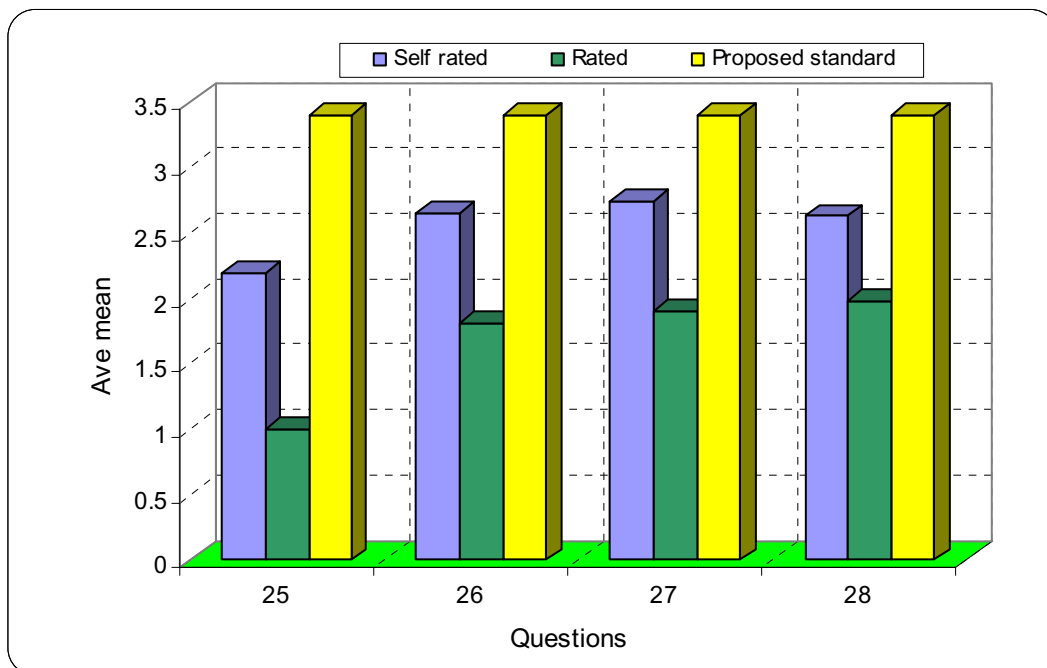
The low assessments proved that in practice the following management work was inadequately performed:

- a) Development of job specifications and posts.
- b) Delegation of accountability.
- c) Determination of the optimal organisational structure and authority lines.
- d) Establishment of communication lines.
- e) Establishment of relationships among posts.
- f) Establishment of effective coordination.
- g) Establishment of supervisory schedules on all levels, and
- h) Determination of supervisory accountabilities.

The comments and observations from the respondents and researcher supported the views above (refer section 4.2.2.1 (c) and 4.2.3.5). This deficiency was most probably responsible for the many haphazardly labour reductions that could do more harm than good to the operating performance of the organisation.

#### 4.3.6.3 Evaluation of the controlling function

The average self rated assessment of the controlling function is 2.55 (63.75 per cent) and the average rated assessment is 1.67 (41.75 per cent) – on average 22.00 per cent lower than that of the self rated assessment (refer table 4.6). The management activity of developing the necessary performance standards was extremely low at 1.00 (25.00 per cent). This proved the point that performance standards were in general not set on each management level by each employee for each task and resource (refer section 4.2.2.1 (e i)).



**Figure 4.9: Evaluation of the controlling function**

With reference to sections 4.2.2.1 (e), 4.2.3.7 and 4.2.3.9 during the analysis and evaluation of the deficiencies identified by the respondents and observed by the researcher it was established that:

- The performance levels and standards were set mostly by specialised staff departments and very seldom by the individual workers.
- The standards sometimes set by the workers were mostly not based on scientific analysis and measurement.
- Corrective measures were taken most of the time.
- Performance standards were not established during the planning process by each employee.
- Measurement and reporting of performance was in many situations statutory compulsory by means of the shifbosses' logbook.

#### 4.3.7 Evaluation of the management discipline

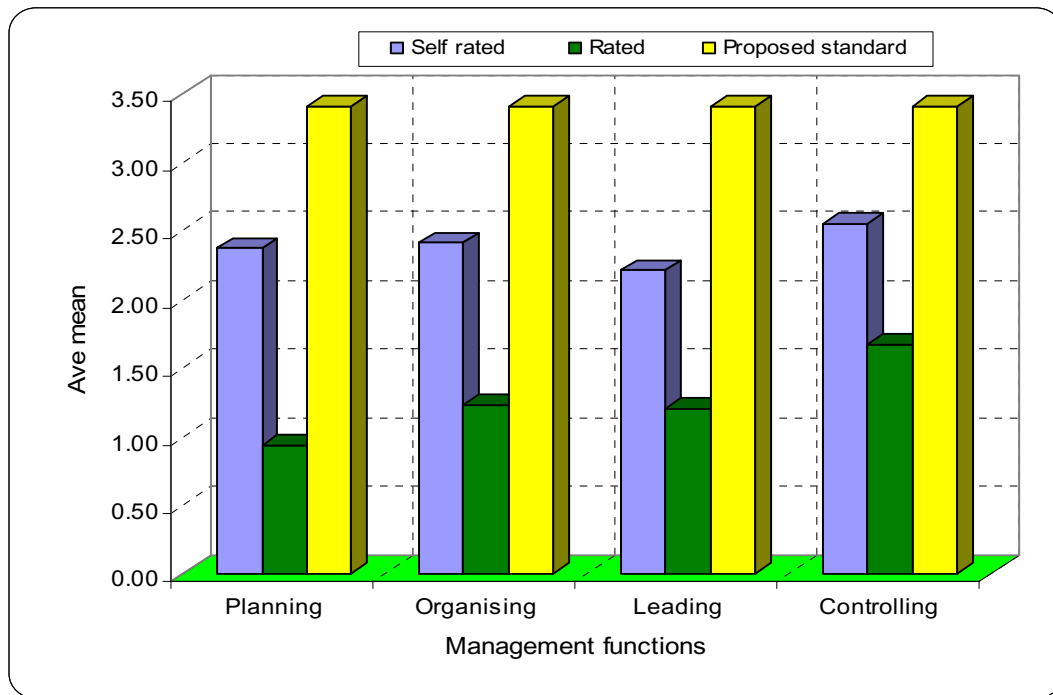
The assessment of the four management functions of the random selected rated sample reflected an average mean of 1.26 (31.50 per cent) - a difference of the mean of 1.10 (27.5 per cent) compared to the average mean of 2.36 (59.00 per cent) of the random selected self rated sample. This huge difference could be attributed mainly to the tendency of the respondents to assess their managerial knowledge and competency much higher than what it actually was (refer table 4.9).

Management functions	Random selected self rated sample		Random selected rated sample		Proposed standard	
	Ave mean	Percentage	Ave mean	Percentage	Ave mean	Percentage
Planning	2.37	59.25	0.93	23.25	3.4	85.00
Organising	2.41	60.25	1.23	30.75	3.4	85.00
Leading	2.09	52.25	1.20	30.00	3.4	85.00
Controlling	2.55	63.75	1.67	41.75	3.4	85.00
Average	2.36	59.00	1.26	31.50	3.4	85.00

**Table 4.9: Evaluation of the management discipline**

On a rated basis the average mean of 0.93 (23.25 per cent) of the planning function was the lowest of the average means of the four management functions. Although the other three functions were rated slightly higher (organising 1.23, leading 1.20 and controlling 1.67) the average assessment of 1.26 was totally unacceptable for efficient management performance by any organisation.

When compared to the proposed standard of 3.4 a deviation of 2.14 (53.5 per cent) was reflected (refer table 4.9). The reasons for the huge deviation were identified during the evaluation of the planning, organising and controlling functions (refer section 4.3.6.1, 4.3.6.2 and 4.3.6.3).



**Figure 4.10: Evaluation of the management discipline**

#### 4.3.8 Evaluation of the management levels

##### 4.3.8.1 Classification of the management positions

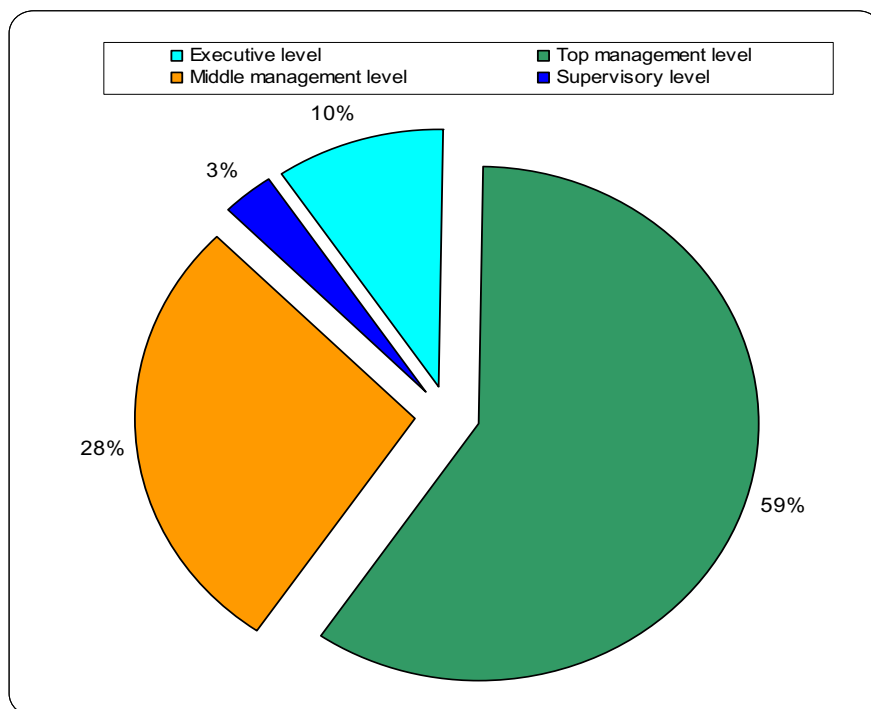
In order to determine whether there could be differences in the managerial competencies of the different management levels the respondents were classified into the four main levels of management in the mining industry and analysed separately. The 43 managerial positions that participated in the research, as mentioned in section 4.3.1 and table 4.1 were classified and grouped into the following four managerial levels and defined as follows:

- a) The executive level is the top level of the mining house or head office and consists normally of the chief executive officer or managing director and the departmental heads reporting directly to him in line positions. It constitutes the main decisionmaking body of the mining house or group.
- b) The top management level is the top level in charge of the mine and normally consists of the general manager or mine manager and the departmental heads reporting directly to him. This team needs to implement company decisions and policies and is solely accountable for the delivering of the required results to the customers and stakeholders.
- c) The middle management level consists of the departmental heads on a mine and the in-line subordinates reporting directly to them. The middle management teams on the mines represent the different departments and is each accountable for specific results which would jointly add up to the total results of the mine.
- d) The supervisory management level consists of the supervisors reporting to middle management and supervising the performance of the front-line workers. These levels are primarily accountable for the efficient running of the operations of the sections of each department in order to render the most desirable results safely and efficiently.

#### 4.3.8.2 Evaluation of the management levels

Due to the absence of a comprehensive, practical and integrated management theory it was perceived that not only could there be an overassessment of managerial competencies by the respondents but also significant differences in managerial competencies between the different management levels. For these reasons it was decided to conduct personal interviews with a random selected group from the main group of respondents and to classify the main group of respondents into management levels (refer section 4.3.8.1).

Of the total of 164 respondents, 16 (9.75 per cent), 97 (59.15 per cent), 46 (28.05 per cent) and 5 (3.05 per cent) were executive, top, middle management and supervisory management members respectively. The head office management and supervisory management members are relatively few compared to the top and middle management levels that constitute by far the majority of the certificated members (refer figure 4.11). The supervisory management levels are directly responsible for the achievement of the ground floor results of the organisation. In total the top and middle management levels constitute 87.2 per cent of the sample.



**Figure 4.11: The relative ratios of the management levels**

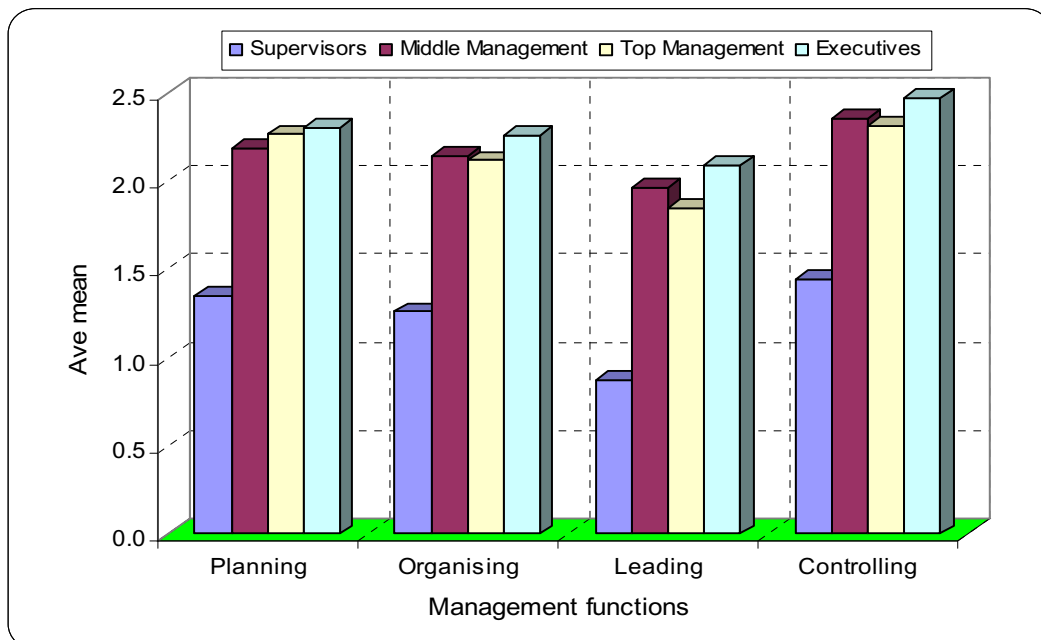
It is a relative true reflection of the reality in the mining industry. It is also true that most certificated members normally progress through the ranks and only qualify to enroll for the Mine Manager's Certificate of Competency examination when they are within the supervisory and middle management levels. Most managers would eventually be accommodated in the middle and top management levels. Only a few would eventually reach the executive level position.

From the four management levels the supervisory management level was assessed as the lowest with an average mean of 1.3 (32.5 per cent). This could be attributed to the fact that the supervisory levels in general received less theoretical management training and was less experienced in management work. The average mean assessment of the four management levels was 1.98 or 49.5 per cent (refer table 4.10 and figure 4.12).

Management level	Management function				Average
	Planning	Organising	Leading	Controlling	
	Ave	Ave	Ave	Ave	
Executive	2.3	2.3	2.1	2.5	2.3
Top management	2.3	2.1	1.8	2.3	2.1
Middle management	2.2	2.1	2.0	2.4	2.2
Supervisory	1.4	1.3	0.9	1.4	1.3

**Table 4.10 Assessment of the management levels**

There appeared to be very little differences between the ratings of the executive, top and middle management levels. One reason for this could be that management training in most mining groups was basically the same for these three management levels. The exception would be that the executive and top management levels would be normally more exposed to strategic and analytical management training programs.



**Figure 4.12: Rating of the management levels**

#### 4.3.9 Determination of the management competency gap

In this section the management competency of the four management levels identified would be analysed and evaluated against a proposed competency standard expressed as a percentage (refer section 4.1). A general universal competency standard could not be ascertained from the research work. A management competency standard of 85 per cent was therefore proposed. The difference between the actual rated competency and the proposed standard would constitute the management competency gap.

The task of management is to efficiently perform the management functions of planning, organising, leading and controlling in pursuit of the efficient realisation of the planned objectives (refer section 2.3.2). Successful management is regarded as the key to the success of any enterprise. Success would be directly related to the competency of management.

The difference between the average random self rated assessment and the average random rated assessment amounted to 29.07 per cent (refer table 4.11). The main reasons for this large deviation were that managers generally were inclined to overassess their managerial competency and their lack of knowledge of comprehensive management. The difference between the random selected rated sample and the proposed management competency standard represents the management gap. In this case the difference or average management gap is 55.93 per cent (refer table 4.11 and figure 4.13). The average management competency per management function indicated that the largest and smallest gaps existed in the planning and controlling functions respectively (refer figure 4.13).

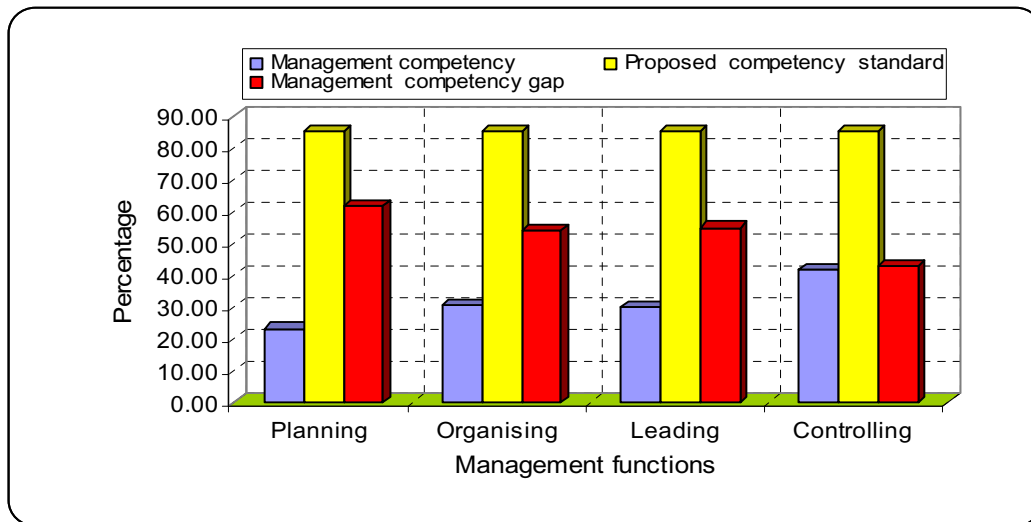
The accepted management competency gap would be a matter of choice – a serious choice since the greater the accepted gap the greater the deficiency would be and it could result in decreasing competitiveness and eventual closure of the organisation. With a relatively lower competency standard the organisation runs the risk of not competing efficiently in the local and global markets. It could eventually run out of business.

The decision of an acceptable competency standard remains one of the biggest decisions that the organisation could take. It would either have a negative or positive impact on company results in the long run. From a competitive point of view it would be wise for a company to establish what the average competency of the best performing company in that specific field of operations is and then to benchmark itself against that company. But the best approach still would be to introduce a comprehensive, practical and integrated management method which should enable the organisation to ultimately achieve and maintain the proposed standard competency rate of 85 per cent.



Questions	Bulk sample	Random selected sample	
	Self rated	Self rated	Rated
	Averages	Averages	Averages
1	60.00	65.50	32.25
2	60.25	66.75	31.50
3	60.75	63.00	30.25
4	63.50	63.00	30.25
5	55.75	60.75	12.50
6	58.75	61.25	14.25
7	56.00	59.00	18.25
8	56.25	59.00	26.25
9	59.75	62.00	32.25
10	45.00	42.75	5.25
11	59.00	62.50	32.25
12	37.75	44.00	14.25
13	50.75	71.50	41.75
14	51.75	66.75	26.75
15	56.00	61.25	32.25
16	46.50	42.75	6.50
17	58.25	59.00	28.50
18	55.25	58.25	34.50
19	51.75	59.00	34.00
20	53.50	60.00	29.75
21	53.50	65.50	36.25
22	59.00	59.50	37.00
23	47.75	51.75	30.25
24	47.00	52.50	29.75
25	52.50	54.75	25.00
26	60.00	66.25	45.25
27	60.75	68.50	47.50
28	62.50	65.75	49.50
Average	54.98	58.73	29.07

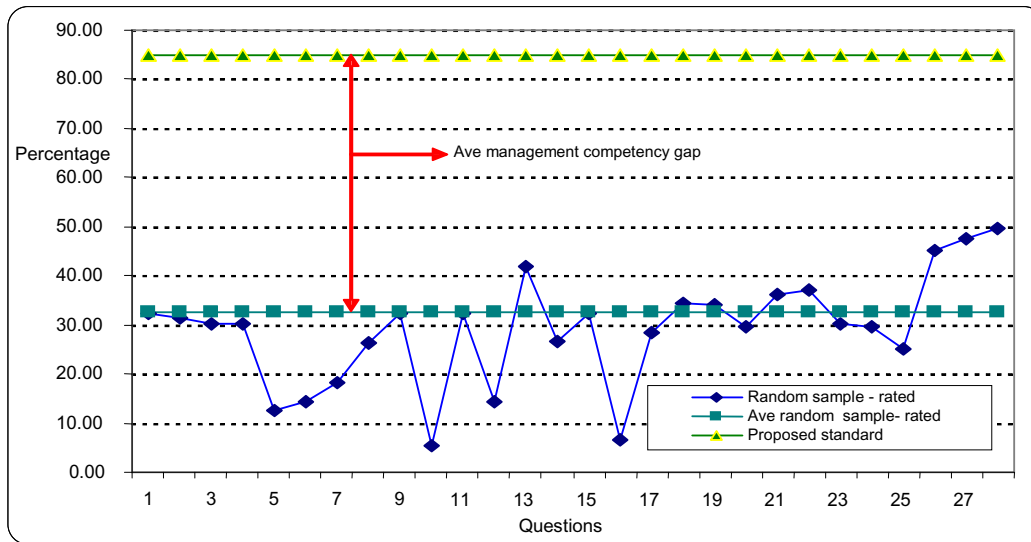
**Table 4.11: Assessment of the sampling in percentage**



**Figure 4.13: The management competency gap per management function**

Figure 4.14 depicts the proposed management competency standard and the management competency gap as identified by the difference between the average rated assessment and the proposed standard. The large gap was regarded as the main reason for the unacceptable performance and deteriorating competitiveness of the industry locally and in the global markets. This

gap should be greatly reduced. If reduced or preferably totally eliminated it would positively reflect on the overall performance of the mining industry. The problem is that a comprehensive, practical and integrated management method does not exist at present (refer section 2.8.2 and 4.2.2.1 (a)).



**Figure 4.14: The average management competency gap**

#### 4.3.10 Evaluation of the Mine Managers' Certificate of Competency and General Management responses

Since the senior mining executives were concerned about the general competency of management in their specific groups, particularly on the value of the Mine Manager's Certificate of Competency or 'ticket' it was deemed appropriate to analyse the responses of the random sample in terms of the two mentioned qualifications (refer section 3.8.1). The random selected sample consisted of a total of 42 responses – 24 and 18 responses from the holders of the 'ticket' and graduates respectively. The objective was to determine whether there were significant differences between the two categories.

##### 4.3.10.1 Evaluation of the responses of the Mine Managers' Certificate of Competency

The results of the responses of the Mine Managers' Certificate of Competency respondents, expressed in percentage, were analysed and are depicted in table 4.12. Although the respondents rated their average management competency at 52.36 per cent and the researcher it at 22.38 per cent both ratings, particularly the rated management competency, are much lower than the proposed standard of 85 per cent. The rated management competency of 22.38 per cent was regarded as the more reliable assessment and should be a reason for serious concern in the mining industry

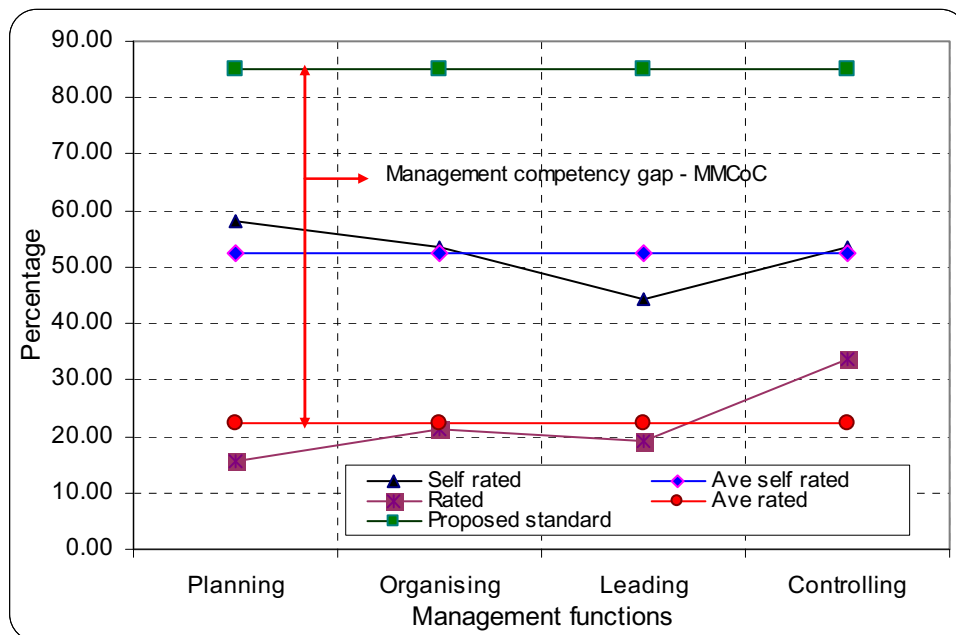
The overall management gap of 62.62 per cent can to a large extent be attributed to the extremely low management competency of 15.50 per cent in the planning function (refer table 4.12 and figure 4.15). Because of the low competency in the planning function the management work can not be performed efficiently by the manager. As a result the other three management functions were poorly

developed and performed with the resultant negative impact on the performance of the organisation (refer section 2.6.2.1).

Management functions	Random selected sample (Percentage)				
	Self rated	Ave self rated	Rated	Ave rated	Proposed standard
Planning	58.25	52.36	15.50	22.38	85.00
Organising	53.54	52.36	21.15	22.38	85.00
Leading	44.27	52.36	19.27	22.38	85.00
Controlling	53.39	52.36	33.59	22.38	85.00

**Table 4.12: Evaluation of the Mine Managers' Certificate of Competency**

The low average rating of 22.38 per cent was a clear proof that the Mine Managers Certificate of Competency was totally inadequate to equip mine management with the required managerial skills. It certainly must impact very negatively on the performance of the South African mining industry. The most important contributing factor to this state of affairs was that a comprehensive, practical and integrated management method and a logical management planning process did not exist in the mining industry (refer section 2.8.2 and 4.2.2.1 (b) (ii)).



**Figure 4.15: Management competency gap of the Mine Manager's Certificate of Competency respondents**

The main deficiencies were that:

- the most probable achievable results were seldom correctly established and stated by the specific incumbents,
- the realisable objectives were as a result never or seldom correctly formulated,
- alteralternative methods were seldom developed by every employee,

- d) the best alternative method was seldom selected,
- e) the work flow was never or seldom developed by each employee,
- f) employees seldom determined the resources required for each task,
- g) the tasks developed during planning were seldom scheduled,
- h) a budget for each developed alternative was seldom compiled,
- i) all risks were not determined by the employees,
- j) policies and procedures were not developed during the existing planning processes, and
- k) the total organisational plan can not be comprehensively computerised.

#### 4.3.10.2 Evaluation of the responses of the General Management random selected sample

The results of the responses of the General Management respondents, expressed in percentage, were analysed (refer table 4.13 and figure 4.16). The average self rated management competency was 63.81 per cent and the average rated management competency was 42.81 per cent which still was 42.19 per cent below the proposed competency standard of 85.00 per cent.

Management functions	Random selected sample (Percentage)				
	Self rated	Ave self rated	Rated	Ave rated	Proposed standard
Planning	60.75	63.81	32.25	42.81	85.00
Organising	61.00	63.81	39.50	42.81	85.00
Leading	60.50	63.81	43.00	42.81	85.00
Controlling	73.00	63.81	55.50	42.81	85.00

**Table 4.13: Evaluation of the competency of the General Management respondents**

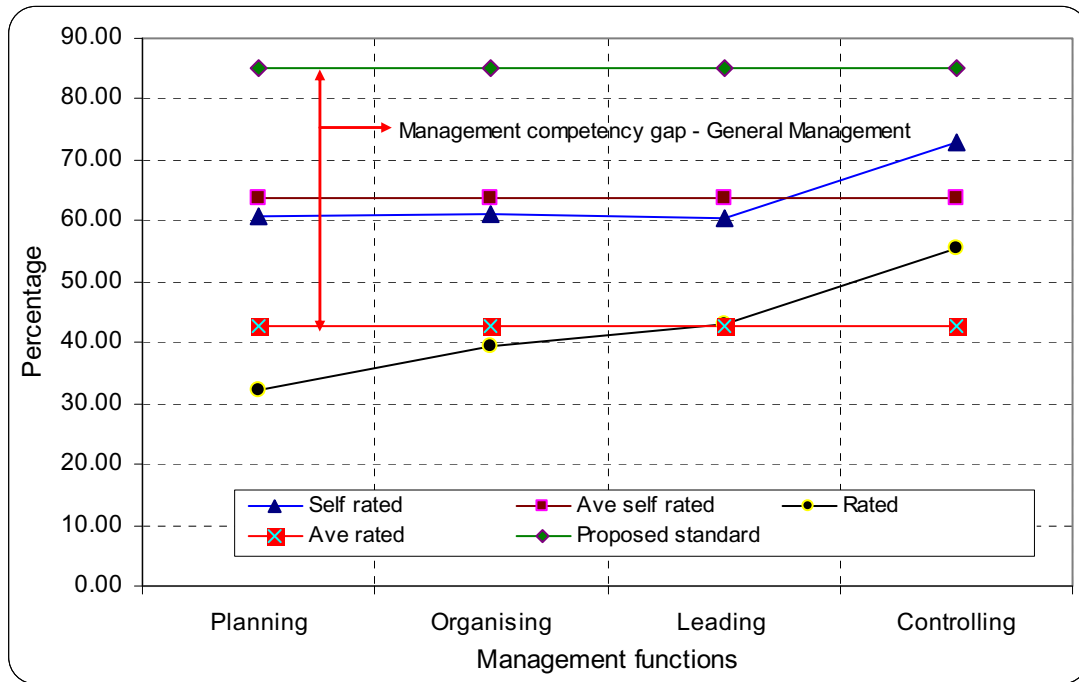
It would appear that there was a significant difference between the competency gaps of the Mine Manager's Certificate of Competency category and that of the General Management category. The main reasons for this deviation were that a comprehensive, practical and integrated management method and a logical management planning process did not exist in the industry. The biggest reason for this deviation was probably the fact that graduated mining engineers received more advanced theoretical training in management principles as part of the degree qualification.

The low management competency in the planning function impacted negatively on the execution of the other three management functions. It can mainly be contributed to the lack of a comprehensive management planning process in the South African mining industry (refer section 2.8.5).

The results were that:

- a) the most probable achievable results were very seldom determined and stated by the specific incumbents,
- b) the reliable objectives were as a result seldom formulated,
- c) alternative methods were seldom developed by every employee,
- d) the best alternative method was seldom selected,

- e) the work flow was seldom developed by each employee, and
  - f) employees seldom determined the correct resources required for each task.
- g



**Figure 4.16: Management competency gap of the General Management respondents**

- h) a budget for each developed alternative was seldom compiled,
- i) all risks were not determined by the employees, and
- j) policies and procedures were very rarely developed during the existing planning processes.

#### 4.3.10.3 Comparison of the average competencies of the Mine Manager’s Certificate of Competency and the General Management responses

From table 4.14 it was immediately clear that the overall average competency rate of the two management categories was significantly lower than the proposed standard. This competency gap must certainly impact negatively on the optimisation of the available resources and results.

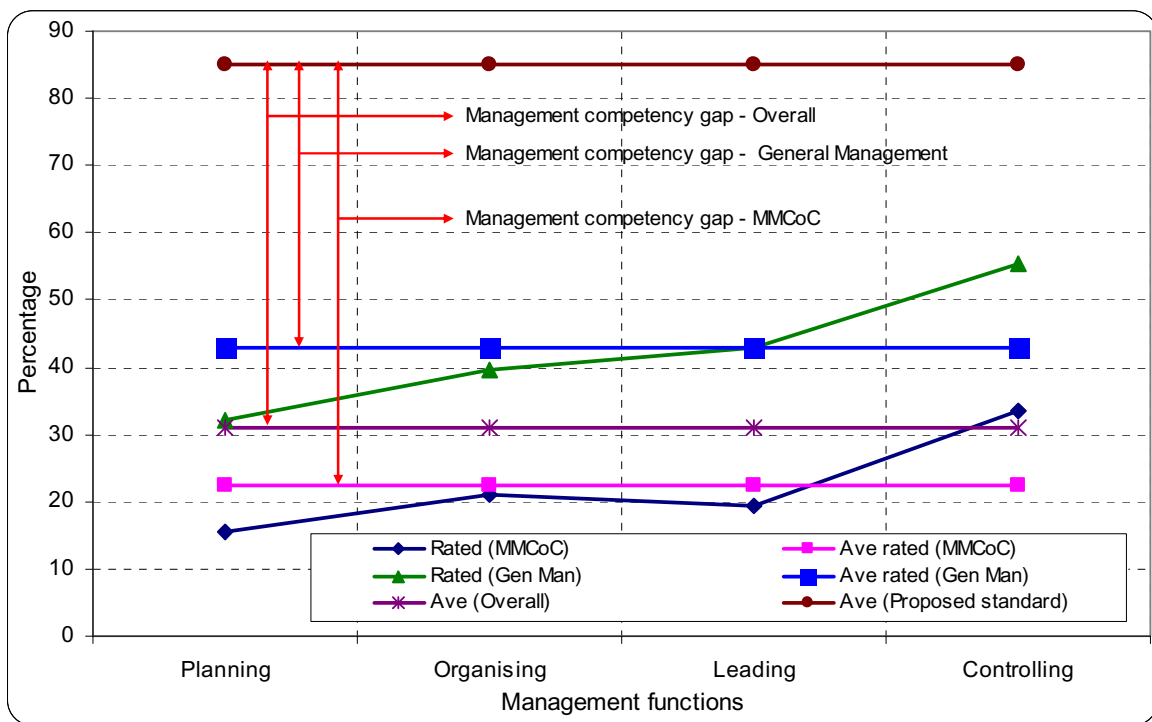
Management functions	Management requirements (Percentage)					Proposed standard
	Mine Manager’s Certificate of Competency		General Management		Overall rating	
	Rated	Ave rated	Rated	Ave rated		
Planning	15.50	22.38	32.25	42.81	31.06	85.00
Organising	21.15	22.38	39.50	42.81	31.06	85.00
Leading	19.27	22.38	43.00	42.81	31.06	85.00
Controlling	33.59	22.38	55.50	42.81	31.06	85.00

**Table 4.14: Comparison of the average management competency gaps**

Of these categories the competency rate of 22.38 per cent of the Mine Managers Certificate of Competency respondents was the lowest. The average management competency rate of the General Management respondents was 42.81 per cent which was 20.43 per cent higher than the average management competency rate of the respondents of the Mine Manager’s Certificate of Competency and 42.19 per cent lower than the proposed standard (refer figure 4.17). The average competency rate of 31.06 of the two categories was still 53.94 per cent lower than the proposed management competency standard of 85.00 per cent.

It can be seen that the:

- a) average competency rate of the respondents of the Mine Manager’s Certificate of Competency was the lowest, and
- b) average competency rate of the respondents of the General Management category was the highest of the two.



**Figure 4.17: Comparison of the MMCoC and the General Management responses**

One could argue that any reduction in this competency gap would positively contribute to the improvement of the performance of the mining industry. It then follows that should the industry implement a comprehensive, practical and integrated management method on all the levels of the industry the management competency of all employees on all the levels would increase. Its performance as a result would increase to the extent that it would again become competitive and the leader in the global mining arena. It would also result in the reduction or total elimination of all the concerns of the industry (refer section 1.2.9).

## 4.4 CONCLUSION

With the analysis and evaluation of the responses, comments and suggestions from the respondents and the observations by the researcher of the management practices in the mining industry it was established that:

- 4.4.1 the administrative management approach was predominantly being utilised in the mining industry (refer section 4.3.2),
- 4.4.2 a comprehensive, practical and integrated management method did not exist in the South African mining industry (refer section 2.8.2),
- 4.4.3 the management practices and programs utilised in the industry were totally inadequate to enable the mining personnel to manage in a comprehensive, practical and integrated manner on all the levels of the organisation (refer section 4.2.2.1 (a)),
- 4.4.4 the Mine Manager's Certificate of Competency was largely outdated and should either be replaced with a comprehensive, practical and integrated management method or be adequately updated (refer section 4.2.2.1 (f)),
- 4.4.5 the planning processes utilised were incomplete and can not enable management to plan comprehensively, practically and in an integrated manner (refer section 4.2.2.1 (b) (ii) and 2.8.5),
- 4.4.6 organisational structures and labour requirements were not scientifically developed and were, in most cases, carry-overs from the past and similar organisations (refer section 4.2.2.1 (c) and 4.2.3.5),
- 4.4.7 alternative methods and work were seldom developed into tasks – the best alternative was not selected and implemented especially at the lower levels (refer section 4.2.3.8),
- 4.4.8 performance standards and risk assessments were set and performed mainly by staff personnel, who in most cases had inadequate knowledge and experience of the practical operations of the company (refer section 4.2.3.9),
- 4.4.9 employees were normally told what results were required from them (refer section 4.2.3.4),
- 4.4.10 policies, procedures and regulations were seldom instituted and when, mainly by top management (refer section 4.2.3.11),
- 4.4.11 employees were mainly recruited, selected, appointed and trained by staff departments (refer section 4.2.3.14),
- 4.4.12 supervisors were seldom involved in the selection and appointment of their own subordinates (refer section 4.2.3.14 and 4.2.3.15),
- 4.4.13 job specifications can not be determined scientifically (refer section 4.2.3.13),
- 4.4.14 training and development programs were carry-overs from the past and in many instances were not mine specific but general group programs (refer section 4.2.3.18),
- 4.4.15 the average measured competency gap of the respondents of the Mine Manager's Certificate of Competency was 62.62 per cent (refer section 4.3.10.1, table 4.13 and figure 4.15),
- 4.4.16 the average measured competency gap of the General Management respondents was 42.19 per cent (refer section 4.3.10.2, table 4.14 and figure 4.16),
- 4.4.17 the average overall competency gap of the two management qualification categories was 53.94 per cent (refer section 4.3.10.3, table 4.15 and figure 4.17), and

4.4.18 management systems can generally not be comprehensively computerised particularly not on all levels of the organisation (refer section 4.2.3.18).

In this chapter it was proved that existing management practices utilised by the mining industry have a great number of deficiencies (refer section 2.8, 4.2.2 and 4.2.3). Consequently the industry can not perform at its optimal level. The mining industry is predominantly making use of the administrative management approach (refer section 4.3.2) This approach was based on the assumption that management was a process. It is not based on a specific management logic.

Allen (1973:47) endeavoured to develop a management logic that would enable the systematic development of management work. This logic proved to be totally inadequate and was not utilised by the industry. To date a management logic that would comply with all the perceived management requirements of a comprehensive, practical and integrated management method does not exist (refer section 2.2.1). Existing management practices are inadequate to enable the management to classify management work and to plan and manage in a comprehensive manner on all the levels of the organisation. It does not facilitate the development of the main objectives of the the company down to the last task and resource required to support it.

The management knowledge and competency of mine management in the South African mining industry proved to be totally inadequate (refer section 4.4.17). It would be logical to assume, with a relative degree of certainty, that the management competency of all mine employees would be equally inadequate. It could be regarded as one of the main reasons for the unacceptable production and safety performance of the industry. The reduction of this management competency gap would greatly improve the performance and competitiveness of the industry as a whole and would benefit the whole country and population.

The existing management practices do not meet with the requirements of a comprehensive, practical and integrated management method (refer sections 2.2.1 and 2.8). The main objective of the next chapter would be to develop the theory for a comprehensive, practical and integrated management method which could be successfully implemented by all the employees on all the levels of the mining industry.