

CHAPTER 5

DEVELOPMENT OF THE THEORY FOR THE COMPREHENSIVE, PRACTICAL AND INTEGRATED MANAGEMENT METHOD

5.1 INTRODUCTION

From the previous chapters it appeared that a comprehensive, practical and integrated management method in the South African mining industry did not exist (refer section 4.2.3.3 and 4.4.2). The industry utilised mainly the process management approach together with various other short duration management practices available on the management market from time to time (refer section 4.2.2.1 (a) (i), 4.2.3.1 and 4.2.3.3). In chapter 4 it was established that the administrative management approach on its own was inadequate to enable mining employees to manage in a comprehensive, practical and integrated manner from the top level down to the worker level (refer section 4.3.6). As a result the average management competency was extremely low and the industry failed to deliver optimal results (refer section 4.2.2 and 4.2.3). It was established that in practice existing management practices were inadequate to enable the mining industry to manage in a comprehensive, practical and integrated manner (refer section 4.4.3). It appeared that adequate theory to develop such a management method did not exist either (refer section 2.8).

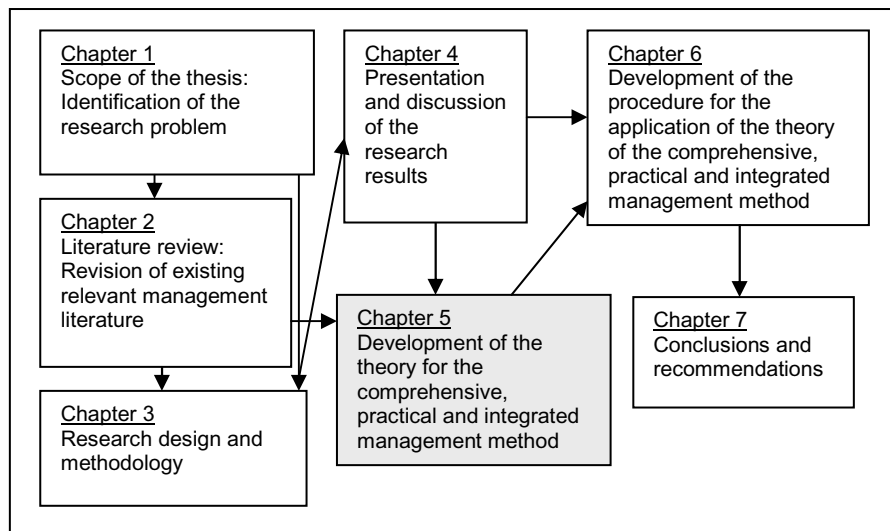


Figure 5.1: Chapter 5 in context to the overall thesis

In chapter 1 it was perceived that some components of the existing management theories and practices could totally or to some extent or in combinations be modified and utilised in conjunction with newly developed theory to develop a comprehensive, practical and integrated management method (refer section 1.5.2.6 and 1.5.2.7). In this chapter the theory for a comprehensive, practical and integrated management method, which could be successfully implemented by all the employees on all the levels of mining organisations, would be developed.

The objectives of this chapter were to:

- identify the relevant management theories that can be utilised in the development of the theory for a comprehensive, practical and integrated management method (refer section 1.7.2.2),
- develop the necessary required additional management theory for the development of the desired theory (refer section 1.7.2.3),
- develop a logical classification for management work,
- develop a comprehensive, practical and integrated management planning process, and
- develop a logical comprehensive, practical and integrated management planning structure (refer section 1.7.2.8).

5.2 REQUIREMENTS OF THE NEWLY DEVELOPED THEORY

The theory for the comprehensive, practical and integrated management method should:

- 5.2.1 be based on or derived from a management logic that would facilitate the complete, development, analysis and utilisation of management work down to the last task and resource,
- 5.2.2 enable all the employees on all the levels of the organisation to manage at all times in a comprehensive, practical, integrated and coordinated manner in order to efficiently realise objectives, utilise resources and timeously accommodate all changes at all times (refer section 2.2.1), and
- 5.2.3 eliminate all the deficiencies identified from and in sections 2.2.1, 2.8 and 4.4.

5.3 THEORY SELECTED FROM EXISTING MANAGEMENT LITERATURE

It was perceived that some of the existing management theories could and should be utilised in the development of the new theory. The existing theories that would be utilised to develop the new theory from were briefly discussed below. The reasons for selecting each of these are summarised in table 5.1.

5.3.1 The management concept

Management was defined as the work that a manager performs to optimise the production resources: people, money, time and material in order to realise the objectives of an organisation most efficiently at all times (refer section 2.3.1 and 2.4.3). Drucker (1968:27) stated that:

“management is concerned with decisions for action. And action is always aimed at results in the future.”

In this thesis it was accepted that this definition indeed applies to every employee on all the organisational levels in all the mining organisations. Although inadequate, the management discipline is still the only known proven method by means of which managers can hope to utilise the

resources of the organisation in a manner that would be competitive and productive. Management needs to make the best with what is presently available.

Drucker (1968:21) remarked that:

“The ultimate test of management is business performance. Achievement rather than knowledge remains of necessity, both proof and aim. Management, in other words, is a practice, rather than a science or a profession, though containing elements of both. No greater damage could be done to our economy or to our society than to attempt to ‘professionalize’ management by ‘licensing’ managers, for instance, or by limiting access to management to people with a special academic degree.”

5.3.2 What managers do

The manager as well as every employee in an organisation has to get results through other people and they are generally seen as being responsible for realising the objectives of the organisation. All employees need to deliver the results required from each of them in the most efficient manner at all times (refer section 2.3.2). It implies that every employee should be able to plan for these results and should have the right, authority and power to take the necessary decisions in order to realise his formulated objectives. Managers and employees therefore have to apply the available management practices as a means to most efficiently achieve the results required from them.

5.3.3 Management and stakeholders

In practice organisations and stakeholders are associated in various ways and as a result are dependent on one another for survival, growth and prosperity. Stakeholders are defined as individuals or groups that have ‘interests, rights or ownership’ in the organisation and its activities (refer section 2.4.8).

In this thesis a stakeholder is defined as any person or entity that is involved with the organisation either as a shareholder, customer, supplier, government institution, community and employee or has for valid reasons a vested interest in the organisation.

Allen (1973:44-45) indicated that a manager has to contend with four definite organisational interfaces (refer section 2.4.7 and figure 2.6). The employees on the lowest levels have to contend with only three definite interfaces since they occupy the last positions in the organisational hierarchy. It follows therefore that any employee has specific relationships, which he must manage efficiently in order to realise his objectives and to contribute optimally to the achievement of the results of the section, department and company as a whole. To manage in a comprehensive, practical and integrated manner the manager must determine what he requires from each identified stakeholder and in turn what each stakeholder requires from him (refer section 2.4.9).

5.3.4 The environment in which management operates

Organisations need to be concerned about factors in the environment especially the external environment simply because it can create uncertainty for management. They must respond timeously in order to prevent catastrophes. The manager and employees must communicate efficiently, integrate and coordinate their activities and that of the departments as well as that of the entire organisation. The organisation should successfully accommodate and adapt to all the influences of the internal and external environments. The performance, results and survival of the organisation are influenced by the internal environment. The influence of the external environment, however, is limited.

McDaniel and Gitman (2008:35) concluded that:

“No one business is large or powerful enough to create major changes in the external environment. Thus managers are primarily adaptors to, rather than agents of, change.”

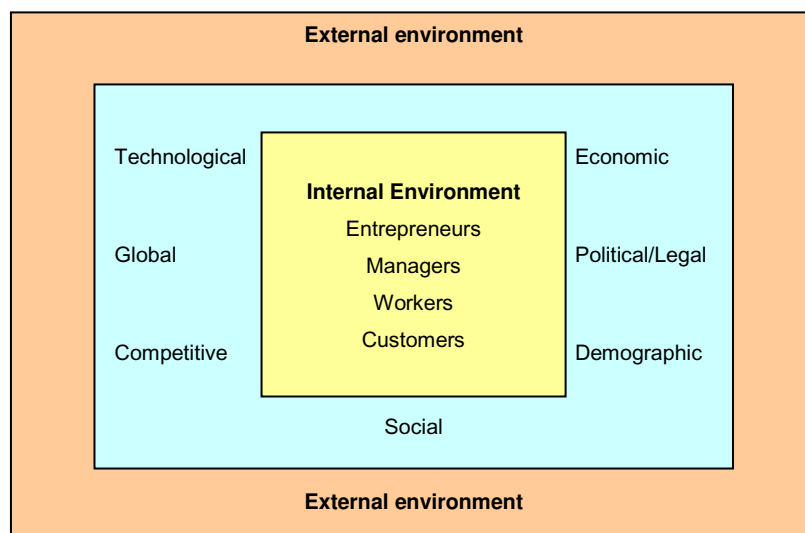


Figure 5.2: The total environment

McDaniel and Gitman (2008:35) classified the total environment into the external, technological, economic, global, political/legal, competitive, demographic and the internal environment (refer figure 5.2). The internal environment includes the interactions between the employee and his specific stakeholders within the organisation’s environment. This environment had up to now greatly been ignored by management theorists and practitioners (refer section 2.4.8).

5.3.4.1 The global environment

Mining organisations operate primarily within their own specific business environments. To be successful they must, at all times, also operate within and in harmony, where applicable, with the

total national and global environments. These environments are continuously changing and are in more than one way competitive amongst different countries and organisations.

5.3.4.2 The macro-environment

Management must at all times be fully in touch with global as well as local developments and market trends. The desired management method should enable all the employees to:

- a) anticipate or 'pick up' possible potential and real impacts that could either negatively or positively affect the organisation,
- b) be in a continuous position of awareness of potential trends that could present threats, opportunities, weaknesses or strengths,
- c) rapidly adapt to changes with the least detrimental impact on their required results, and
- d) forecast and optimally capitalise on these changes to the benefit of all the stakeholders.

The macro-environment would include institutions such as educational institutions, governmental bodies; competitors and research (refer section 2.4.8 and figure 2.7). Any organisation should identify the relevant environments in which it operates.

5.3.4.3 The micro-environment

The mines operate within their own micro-environments consisting of the company, the owners, suppliers, stakeholders and the customers. In the new democratic dispensation, great demands, sacrifices and contributions from the mines to the communities, governmental institutions, and sustainable development and especially to the upliftment of previously disadvantaged communities are demanded.

5.3.5 The multiple interface management concept

All employees in the organisation have to deal with different interfaces which place them in the unique position where only they as individuals have the objectivity, perspective and balance to satisfy the sometimes varying and conflicting needs of subordinates, peers and supervisors (refer section 2.4.7 and figure 2.6). This interaction is necessary and essential for efficient, comprehensive, practical and integrated management for the organisation as a complete system. There will always be interaction between the manager or employee and the stakeholders. All employees should be equipped to efficiently deal with these interactions. The desired management method should fully accommodate these requirements.

The multiple interface management concept implies that employees on all the levels of the organisation interact vertically and horizontally with the relevant stakeholders within their sphere of accountability in order to efficiently perform their work. This statement is true for all employees from the highest to the lowest levels of the organisation. In the case of the worker it should be noted that

he normally has three faces with which he has to interact. It simply means that he has no subordinates reporting to him but that he still must interact with his peers and supervisor.

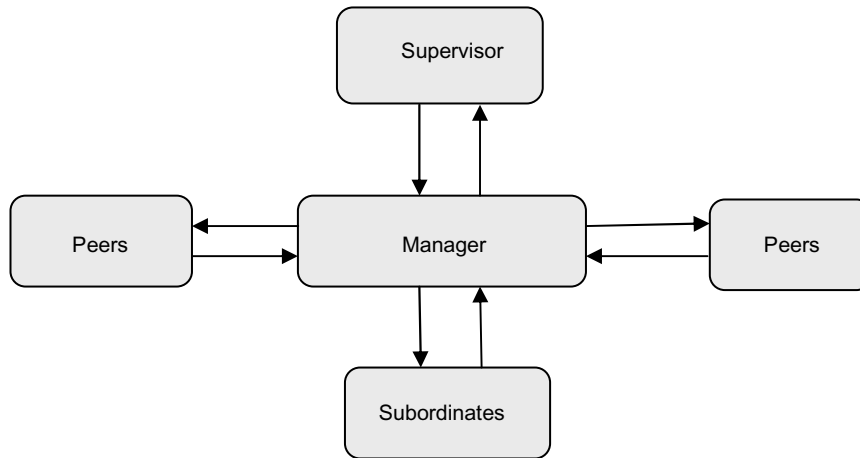


Figure 5.3: Management interfaces

All employees must realise that the results required by their supervisors are the sum total of the results that they should obtain from their subordinates and the contribution, participation and support from their peers and supervisors respectively. Equally so are the results of the subordinates, peers and supervisors directly and indirectly influenced by the manager’s contribution and support. The results of each employee in the organisation must ultimately contribute optimally to the end result of the organisation (refer section 2.4.7).

In the practical work situation all employees must liaise and interact with all the relevant stakeholders in that specific situation or environment where and when necessary. The different management categories imply that a vertical and horizontal down and up relationship exists in any organisation (refer section 2.4.7 and figure 2.6). This interface environment had up to now greatly been ignored by many if not all management theorists and practitioners. It plays an important role in the optimal performance, coordination and integration of management work in any organisation. Total commitment, cooperation and contribution from employees would be extremely ineffective without the optimum utilisation of this interface.

The internal relationships between the supervisors, peers and subordinates, departments, sections and individual employees should be efficiently managed for optimal performance, integration and coordination of the management work. It is the ideal area where team spirit, loyalty, dedication and positive attitudes could be cultivated, developed, instituted and maintained. The most important relationships are indicated in figure 5.4. The management practices utilised should enable all employees to optimise the multiple interfaces. Existing management practices are incomplete and therefore inadequate to optimally utilise the advantages that should stem from the efficient utilisation of the multiple management interfaces.

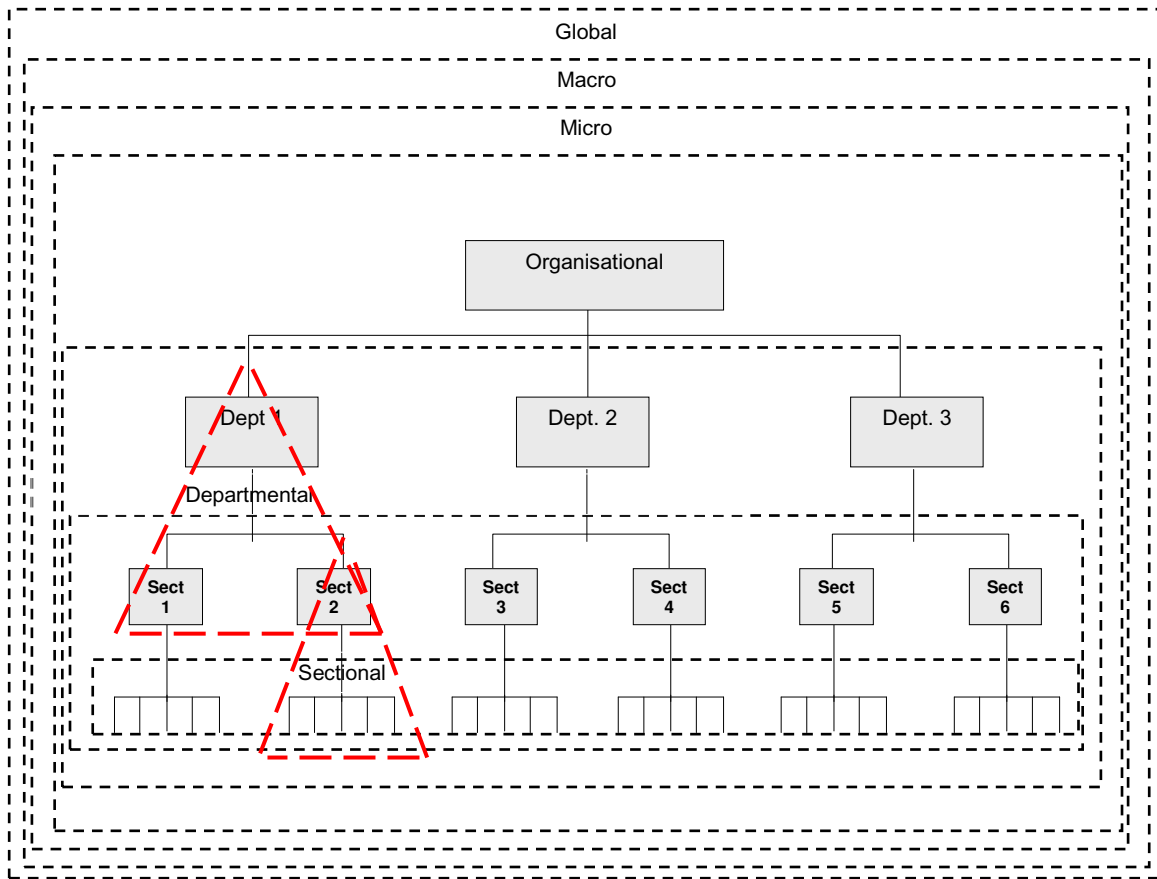


Figure 5.4: The total employee interface environment

5.3.6 The management systems concept

A system consists of inputs into a process in order to produce outputs within the confines of a specific environment along with a feedback loop to measure and correct deviations. This concept contributed greatly to the modern thinking on the management discipline. The organisation consists of many different systems that are dependent on one another for optimal performance. It is a system in itself. The individual as part of the organisation is predominantly operating in a group and is in this respect analogous to a cell in the human body (refer section 2.5.1.2 (c) and figures 2.14 and 5.5).

A business could be seen as a system and therefore each department, section, unit, operation and employee in it is a system and forms an integral part of the larger system or organisation. The system provides the framework within which the employees, individually and in teams, can best work together to realise individual, team and organisational objectives. The system implies that there is a continuous process of input, processing and output.

Every system also contains the facility of measuring work and identifying and correcting deviations. It must use performance standards against which it can measure and evaluate work in progress or completed. The business should in reality be built from the bottom up to the eventual larger

operational unit. The building consist of the development or design of the tiniest task elements into logical systems each requiring specific inputs in order to produce specific results.

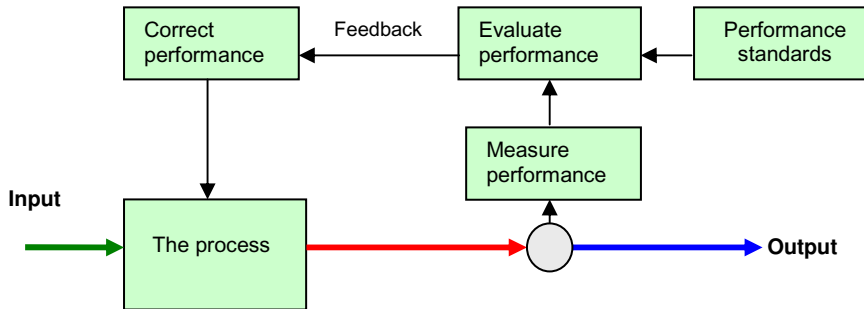


Figure 5.5: The management system

The systems concept recognises the principle of dependency between production factors, results required, objectives and the processes or work to realise these objectives. In itself it can not support a comprehensive, practical and integrated management method. It would, however, largely be utilised in the development of the new theory.

5.3.7 The administrative management approach

In the administrative management approach the management discipline is seen as a process consisting of the four management functions of planning, organising, leading and controlling. These functions constitute the functions of management work where the: planning function is the predetermining of a course of action, the organising function the arranging and relating of work, the leading function the influencing of people to act to accomplish objectives, and the controlling function the assessing and regulating of results (refer section 2.5.1.1.(d)).

This approach was, since Fayol developed it during the 1880s, increasingly practised in France. With the translation in English by Constance Storrs and publishing by Pitman in 1949 of Fayol's book this approach spread rapidly right through the Western countries (Rue and Byars, 1989:48).

The administrative management approach is generally accepted and practiced by most management practitioners. It is the predominant management approach applied in the South African mining industry (refer section 4.3.2). It acknowledges the reality of the systems concept (refer section 5.3.6). It would also form an important component in the development of the theory of the comprehensive, practical and integrated management method. In this thesis it would be proved that it can not entirely be utilised as is but that it needs to be adapted and supplemented by additional newly developed management theory in order to be efficiently utilised in the development of the comprehensive, practical and integrated management theory (refer section 5.4.).

The basic shortcomings with the process management approach are that it:

- 5.3.7.1 still does not enable the employees to manage in a comprehensive, practical and integrated manner,
- 5.3.7.2 would appear that some of the activities of the organising, leading and controlling functions should logically form part of the planning function,
- 5.3.7.3 does not support the logical classification of management work and the development of a logical practical planning process, and
- 5.3.7.4 does not support a logical practical management method to efficiently implement management in practice.

5.3.8 The scientific management approach

The scientific management approach utilised scientific methods in studying and analysing individual tasks and establishing optimal working methods and the associated performance standards to maximise efficiency. It focused on individual competencies and the machines and tools that workers use (refer section 2.5.1.1(b)).

In this chapter it would be utilised specifically with the development of tasks and the determination of the total resources required as part of the development of the comprehensive, practical and integrated management theory (refer section 5.4). It would be applied from the top right down to the smallest tasks required to efficiently achieve the required results of the individual employees, sections, departments and the organisation.

The theory of the scientific management approach would be utilised to determine the 'one best way' of achieving a predetermined result on each level for each task of every employee. Eventually it would be utilised in order to optimise the individual and organisational performances.

Existing theory	Reasons for selecting the theory
1. The concept of management	1.1 Emphasises the universal truth that results are required in societies and organisations. 1.2 Results are achieved through the application of the principles of management. 1.3 Management realises the objectives of organisations.
2. What managers do	2.1 Managers get results through other people by applying the techniques of management. 2.2 Managers and the employees are responsible for realising the objectives of the organisation. 2.3 All employees must plan for the required results.
3. Management and stakeholders	3.1 Implies that employees have specific relationships, which they must manage efficiently. 3.2 Employees should determine exactly what all relevant stakeholders require.
4. The environment in which the management and the employees operate	4.1 Management and employees have to achieve optimal results at all times in the environments they operate. 4.2 These environments influence the outcome of results.



	<p>4.3 Management and employees must forecast the impacts of environmental influences.</p> <p>4.4 Environmental influences can be managed.</p>
5. The multiple interface concept	<p>5.1 Various interfaces exist within the same organisation.</p> <p>5.2 These interfaces require specific management interactions.</p> <p>5.3 All employees in these interfaces must interact where required.</p> <p>5.4 All employees must integrate and co-ordinate the relevant management tasks.</p>
6. The management systems concept	<p>6.1 The organisation consists of many dependent systems.</p> <p>6.2 Each of these systems has inputs, which are processed in order to deliver outputs or results.</p> <p>6.3 Each system has the facility to measure and correct sub standard performance.</p>
7. The administrative or process management approach	<p>7.1 Postulates that management is a process.</p> <p>7.2 The process consists of:</p> <p>7.2.1 planning for the desired results,</p> <p>7.2.2 developing the most functional organisational structure,</p> <p>7.2.3 utilising the leading activities in order to influence the subordinates to act favourably,</p> <p>7.2.4 instituting the necessary control measures to ensure the achievement of the planned results, and</p> <p>7.2.5 the basic philosophy of this approach is planning, organising, leading and controlling.</p>
8. The scientific management approach	<p>8.1 Utilises scientific methods to study and analyse individual tasks.</p> <p>8.2 Establishes the most optimal working methods.</p> <p>8.3 Maximises efficiencies.</p>
9. Activity – based management	<p>9.1 Concentrates on the cost aspects of each activity.</p> <p>9.2 Breaks work down into the smallest elements.</p> <p>9.3 Cost of the activities is regularly checked.</p> <p>9.4 Is not a comprehensive method on its own.</p>
10. The management planning processes	<p>10.1 Consists of different steps to compile a plan.</p> <p>10.2 The existing planning processes are inadequate.</p> <p>10.3 Many versions of this process are proposed.</p>
11. Management classification	<p>11.1 No uniform classification exists.</p> <p>11.2 The Allen classification is the only one but is not practically applicable.</p> <p>11.3 It is not a logical systems directed process.</p>

Table 5.1: Selection of the relevant theory

5.3.9 Activity-based management

Activity-based management concentrates mainly on the activities or tasks and the associated cost aspects of each activity only. It is normally utilised to break the work down into elements or activities in order to determine whether the specific activity is required in the production process. If not necessary or if ineffective to the judgment of the project team it is either eliminated or replaced by a more effective activity. The cost of each activity is controlled on a regular basis (refer section

2.5.2.4). This management technique is basically a sub-component of the work breakdown structure management technique (refer section 2.5.2.3). It was not derived from or a logical outflow of a comprehensive, practical and integrated management method. It recognises the relationship between work and costs and the effect that it could have on the total results of the organisation. It was for this reason utilised in the development of the new theory.

5.3.10 Management planning processes

The management planning processes in the literature invariably vary and differ from each other. They apparently depend on the preference of the specific management author or practitioner. They normally consist of different steps that differ from author to author. None of the planning processes, described in the available literature, consists of a complete logical comprehensive sequence of steps that could be utilised or modified to serve as guidelines for the planning function in a comprehensive, practical and integrated management method (refer section 2.6.2.1).

It would appear that a uniform planning process does not exist at present (refer table 2.4 and section 2.6.2.1 (c)). Where the primacy of the planning function is strongly emphasised and practised respectively by most if not all management theorists and practitioners this shortcoming became a matter of grave concern (refer section 2.6.1 and figure 2.21). Some of the terminology of present planning processes would be utilised in the development of the new theory.

5.3.11 Management classification

The logic or set of rules to systematically classify management work in order to develop and manage an organisation at present does not exist. The analysis of the management philosophies of the twelve management theorists indicated that they were only in agreement as far as the activities of the controlling function of the management discipline were concerned (refer table 2.4). On the activities of the planning, organising and leading functions there were major differences among them (refer section 2.6.2.6).

Fayol was the first to see the need for the classification of management work (refer section 2.5.1.1 (d)). He concluded that management is a process and as such the activities of management should support this view. He classified management work into the four main management functions of:

- planning,
- organising,
- leading, and
- controlling.

Some theorists developed these functions further, into management activities. Allen (1973:47) developed a hierarchy for management work and classified it into:

- classes,
- orders,

- functions,
- activities,
- segments, and
- elements.

This classification was and still is at present widely accepted by many mine managers (refer section 2.6.2.8 (d) and table 2.6). It is in fact the predominant management classification in the mining industry (refer section 4.3.2). The problem, however, was and still is that the classification was not derived from a practical workable management logic. Consequently serious difficulties were and are still being experienced to logically implement management practices and structures from the top down through the different levels to the last employee in the hierarchy and finalise it from the bottom up to the top. This classification makes it impossible to logically develop the organisational structure and the associated technical work. It does not allow for the comprehensive application of management in practice.

More recently Dr W J de Villiers, the chief executive officer of the General Mining and later the General Mining Union Corporation mining groups respectively, published his book 'Principles of Decentralised Management'. In this book he proposed a more practical approach to the challenge of implementing management principles in the practical situation. He specifically differentiated between, what he termed the mechanics and the dynamics of management. Under the mechanics he included the management functions of investigating and forecasting, planning and organising. Under the dynamics of management he included the management functions of commanding, coordinating and controlling (De Villiers, 1973:10-11).

This distinction was based on the reasoning that the mechanics of management deal with the requirements, which need to be established or put into place before the human, capital and material resources could be efficiently utilised. The dynamics of management are concerned with the people doing the work. This classification emphasised the important truth that one must plan the results one requires, in other words one would need a plan, the means to achieve the planned results, implement the plan and control the performance.

It is important that one should plan, implement and keep the management process in motion (refer section 5.5.1). This simply implies that every employee should be adequately involved in the managing of the planned work necessary to achieve the results required from him. This philosophy was, however, equally as impossible as all the preceding ones to implement in practice mainly because it was rather a statement and not developed from a practical management logic point of view to its final conclusion.

Different views on the classification of management work were not new. It was in fact a controversial issue, which, over time, led to many arguments and discussions amongst many management theorists and practitioners. The existing classification of management work was not logically developed from the requirements of the management work and was of no or at best of little value in

the application of management work in practice. It is felt that a logical classification is necessary in order to ensure the uniform, consistent classification and efficient application of management work. It would be shown in the sections to follow that a significant proportion of the management work, traditionally classified under the organising, leading and controlling functions of the management discipline is and must in practice be performed as a logical development of the planning function. The reality is that management functions are so intertwined with the work of the other management functions that it is imperative to use a logic based on natural management requirements.

In the sections to follow it would be endeavoured to develop a management logic that would enable the management and employees in the organisation to logically analyse and develop management work from the start to its final conclusion. This logic should provide the rules or means to enable every employee to comprehensively manage for the results required from him.

5.3.12 Formulation of objectives

Objectives were defined as the end results that must be planned for, the leading guides toward the achievement of these results. They set the continuing directives for workers, sections, departments and organisations and represent the performance standards against which progress and deviations could be measured, evaluated and where necessary be corrected. Without objectives it would be impossible to integrate and coordinate management work in order to optimise the planned results of the organisation. Presently significant differences exist in the terminology and interpretations of management literature.

For the development of the comprehensive, practical and integrated management theory it would be necessary to establish a uniform logical terminology and definition of this important component of the management work (refer section 2.6.2.1 (d) (iii)). Objectives would throughout play an important role in the development of the new theory. The integration and coordination of objectives is a major corner stone in the establishment and maintenance of the perceived comprehensive, practical and integrated management theory.

5.3.12.1 Specific objectives

Different kinds of objectives are used in the existing management literature. This causes confusion rather than unity of effort. Objectives should be specific where results are to be achieved within a stated time frame. Specific objectives are the building blocks in the realisation of general objectives. It follows then that correctly formulated specific objectives would provide the required directives for the optimal realisation of individual, section, departmental and organisational objectives.

In formulating specific objectives the responsible employee should:

- a) identify each component of the results required,
- b) base the objective on the results required, and
- c) define each objective in futuristic terms (always start with "To").

5.3.12.2 General objectives

A general objective is an objective that defines the results required from a complete task. It is made up of the various specific objectives within that complete task. It is normally based on the achievement of longer-term results and should form the basis for the sections, departments and the organisation as a whole.

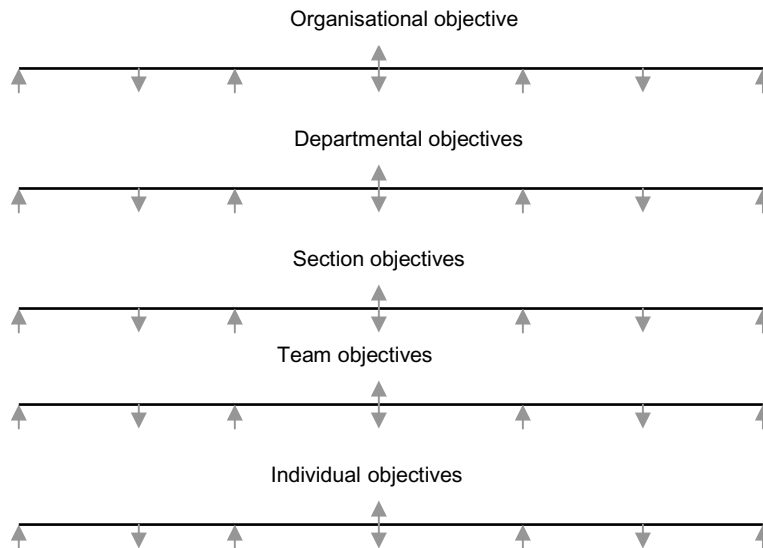


Figure 5.6: Hierarchy of objectives

5.3.12.3 Formulating challenging objectives

The relevant stakeholders must as far as is practically feasible formulate objectives jointly. Objectives should be formulated in terms of the systems concept (refer section 5.3.6). Figure 5.6 indicates that the defining, integration and coordination of objectives must commence at the top level and cascade down to the lowest levels and be verified up to the top level.

During the planning process objectives are summarised, coordinated and integrated upwards and horizontally. This will ensure that all objectives would eventually culminate in the general objective of the manager and the organisation as a whole.

In order to formulate the most realistic and challenging objectives it is important to:

- a) take performance of the past into account,
- b) establish realistic performance levels,
- c) take cognisance of competitors' performances,
- d) use measurable performance standards,
- e) include improvement factors where applicable, and
- f) ensure sufficient:
 - i) communication and participation,

- ii) Integration and delegation,
- iii) coordination, and
- iv) recognition.

5.3.12.4 The alignment of objectives

The alignment of objectives can best be achieved when the management logic is meticulously adhered to. From figure 5.6 and 5.7 it is clear that the objectives of the individual workers should jointly culminate into the objective of the team and also satisfy the objectives of all the stakeholders and sections in the specific situation. The objectives of the sections should in turn culminate into the objectives of the departments and again the objectives of the departments into the general objective of the organisation.

It is imperative that all the employees in the specific situation are fully involved in the:

- development of the most probable achievable results,
- formulation of the objectives,
- planning of the best method with which to achieve the most probable achievable results in the most efficient manner, and
- the means to control the work in progress and completed.

In figure 5.7 the principle that the organisation is a system and that the output of the subsystems must optimally contribute to the larger objectives of the system and the organisation as a whole is emphasised. Existing management practices do not facilitate a comprehensive company wide compilation, integration and execution of plans. Management by Objectives (MBO) is the management technique that is presently mainly being used for this purpose (refer section 2.5.3.1).

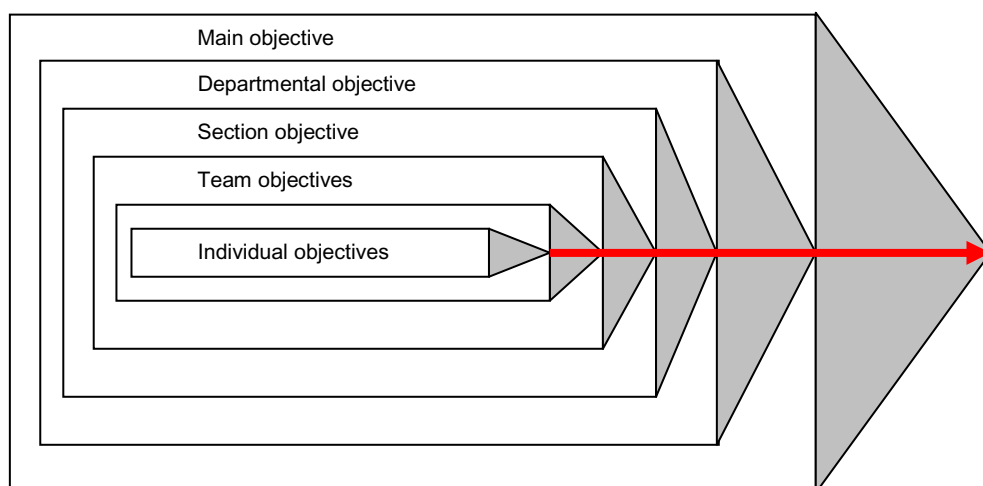


Figure 5.7: Alignment of objectives

The application of a comprehensive, practical and integrated management method would make it feasible to comply with these requirements. The more a comprehensive, practical and integrated management method is applied the more the objectives in the organisation would be aligned and the more the performance would approximate the optimal limit as illustrated in figure 5.7.

5.3.12.5 Optimisation of objectives

It would appear that due to the lack of a comprehensive, practical and integrated management method, the objectives of the individuals can not be optimally aligned and hence the sub-standard performance. In actual fact the organisation is mostly not even aware of the reality that the individual, sectional or departmental objectives are not properly aligned simply because the means for developing the most realistic aligned objectives and recognising substandard performance are inadequate.

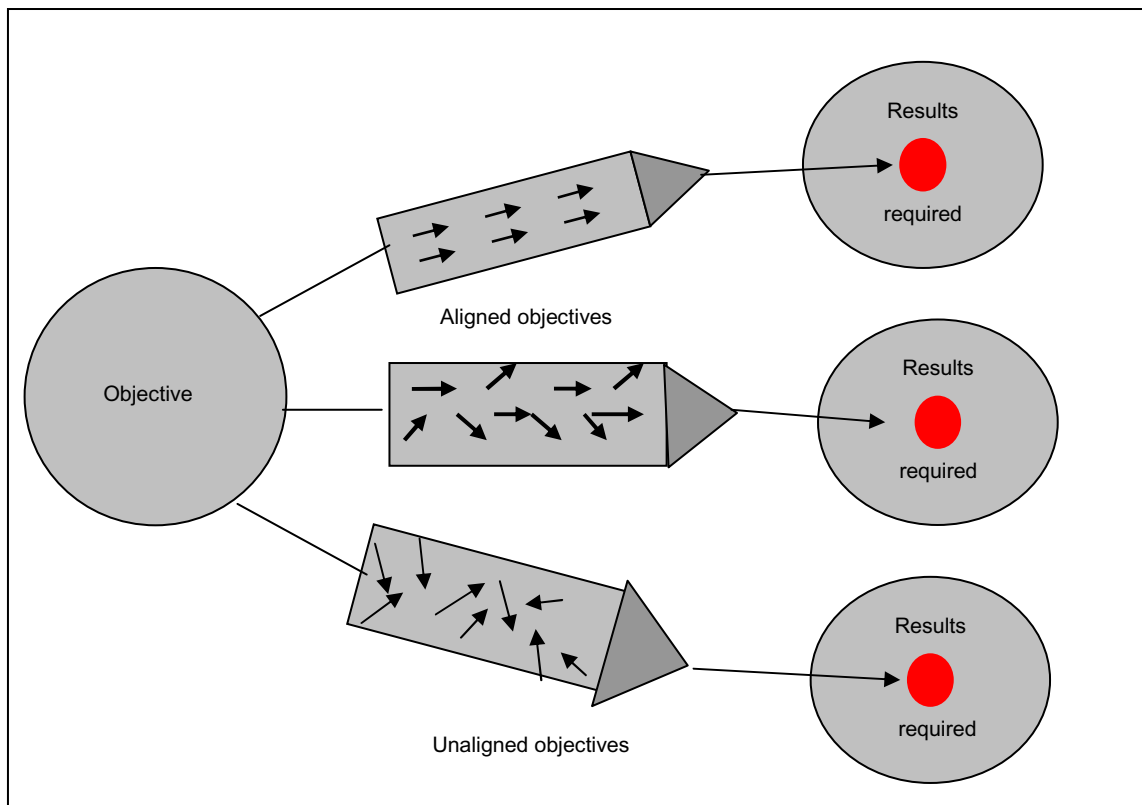


Figure 5.8: Optimisation of objectives

In an effort to overcome or compensate for this deficiency many organisations resort to programs such as benchmarking, managing by objectives, work breakdown structures and activity-based management to name just a few (refer section 2.5.2.3, 2.5.2.4 and 2.5.3.1.). These management programs and techniques, however, only serve at the most a few of the management functions and would therefore not solve the problem as a whole in the most efficient manner.

In figure 5.8 the tendency of production units and organisations in general to adjust or to plan their operations to the level of current performance is illustrated. Normally they plan at previous

performance levels (B) but more often than not end up underperforming on this budget (A). With the introduction of a comprehensive, practical and integrated management method they would be able to review their performance and revise the plan with a view to align their objectives in order to optimise the resources at their disposal (C).

With a comprehensive, practical and integrated management method it would be possible for the organisation to logically plan from the top down to the lowest position and the necessary task elements. This would facilitate the optimisation of each method to achieve optimal results from the top down to the bottom of the organisation. It would be possible to optimally align individual, departmental and company objectives.

5.3.13 Past attempts to develop a logic for and a system for classifying management work

Allen (1973:4-12) reasoned that the different human drives or urges in what he called the 'process concept of human behaviour' initiate specific actions by people. Human action is actually a process that follows a specific logic or principles of reasoning. All human action is motivated by the body's need to satisfy specific needs. Specific drives are safety, hunger, sex, desire to perform, achievement and self-protection.

He was of the opinion that in order to determine their duties managers should, as accurately as practically feasible, employ a clear and verifiable logic relevant to the specific field of management (Allen, 1973:45). This logic should be true for every employee who needs to achieve results. Note that he was theorising on what a manager should be doing but not on how he should be doing it. This reasoning again proved that at the time of developing his theory an all-inclusive management practice did not exist. The main deficiency was that management could not adequately organise management knowledge and information in a logical manner.

The sciences and other disciplines also, to some extent, experienced the problem of logical and consistent classification. Man started to classify the many different kinds of animals, plants, insects, chemicals, cells and atomic particles, to mention only a few, by developing a taxonomy or a system of classification, based on specific and unique characteristics of the specific discipline. This enabled science to classify new and recently discovered items within these categories. A taxonomy or system for the classification of management has as yet not been developed.

Allen (1973:46) came to the conclusion that:

"We can study management in an orderly and rational fashion only if we organize our information in a logical way. Applied to the work a manager performs, this means that he should have some system for dividing the work that he does into categories, which can be precisely defined. To the extent he uses the same system of classification used by other managers – both within and outside his organisation – he can compare his work with theirs."

Allen (1973:46) concluded that:

“However, this foundation has not been laid for management. We lack a system for sorting, categorizing, labelling, and defining new and old management information. A commonly understood classification of management work is a tool which will prove indispensable to the progress of the management profession. Such a taxonomy will facilitate the communication and dissemination of new management knowledge and will provide the basis for a logical definition of management terms.”

From chapter 2 it appeared that the logic he proposed still did not meet with the requirements for a comprehensive, practical and integrated management method (refer sections 2.2.1 and 2.6.2.8). His proposed logic failed to enable management to apply management work in a comprehensive, practical and integrated manner at all the levels in the organisation. He could not extend his classification of management work to the smallest tasks. Furthermore his attempt to classify and develop technical work in a similar way failed completely (refer section 2.6.2.8 (d) and 2.6.2.8 (e)).

None of the management theories depicted and discussed in table 5.1 constitute a complete comprehensive and integrated theory. They are basically sub-components of a complete comprehensive and integrated management method. They substantially differ from each other. It will not even be possible to combine these theories into a single comprehensive and integrated theory. It would, however, appear that they could partly to some extent, be modified and utilised in the development of a comprehensive management theory.

5.4 DEVELOPMENT OF THE COMPREHENSIVE, PRACTICAL AND INTEGRATED MANAGEMENT THEORY

In this section a management logic would be developed in order to develop the theory for the comprehensive, practical and integrated management method. The theory would then be evaluated against the performance requirements of this method (refer sections 2.2.1 and 5.4.2). Work is seen as consisting of mechanical and human work. Human work consists of management and technical work (Allen, 1973:48). Since human action is a process aimed at the satisfying of specific predetermined needs within a logical system some of the elements of the process or administrative and systems management approaches would be utilised in developing the required logic (refer section 2.5.1.1 (d) and 2.5.1.2 (c)).

5.4.1 Premises on which the comprehensive management logic is based

The comprehensive management logic is based on the premises that management:

5.4.1.1 is work that predetermines and achieves results,

5.4.1.2 is a science and should comply with specific logical reasoning,

5.4.1.3 depends on specific principles of human and organisational needs and behaviour, and

5.4.1.4 is a logical process aimed at satisfying specific needs.

5.4.2 Requirements of the comprehensive management logic theory

The developed comprehensive management logic theory should:

- 5.4.2.1 be based on or derived from a management logic that would facilitate the complete analysis and utilisation of management work,
- 5.4.2.2 enable all the employees on all the levels of the organisation and the organisation as a whole to manage at all times in a comprehensive, practical, integrated and coordinated manner in order to efficiently realise the objectives, utilise resources and accommodate all changes at all times (refer section 2.2.1),
- 5.4.2.3 facilitate the classification of management, logical planning processes and structures, and
- 5.4.2.4 eliminate all the deficiencies listed in section 2.8.

5.4.3. The comprehensive management logic

The comprehensive, practical and integrated management theory is developed from the teleological drive or the application of genetic energy to fix the ends to be achieved point of view. To put it more practical it is the drive to satisfy needs or to achieve results. It is therefore based on a specific logic. This reasoning should be true under all management conditions and circumstances. Every employee from the lowest to the highest level in any organisation from one-man concerns to ultra-large corporations should be able to understand and apply this logic.

Managers and employees have needs that:

- vary with time,
- vary with conditions and situations, and
- must be satisfied.

Needs are triggered by challenges, instincts, routine actions, opportunities, dissatisfactions, deviations or instructions to mention only a few. A need can only be satisfied by the required results. If a person is hungry that person has a need for food. The result that the person wants to achieve is to be not hungry anymore. The person therefore needs to eat enough food in order to completely still his hunger. Only then the person would be satisfied. Results do not just ‘happen’, - they must be ‘earned’ or acquired, preferably in the most efficient manner. The person, therefore, has to do something to acquire the food in order to move from the hungry or unpreferred condition to the preferred condition of not hungry.

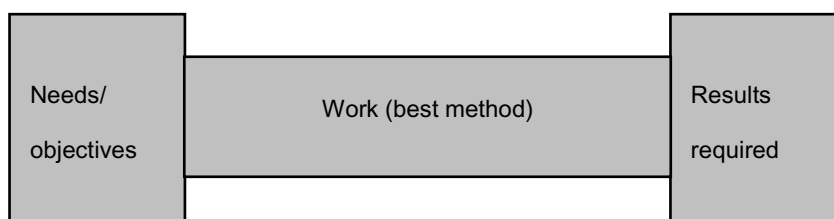


Figure 5.9: The Result – Objective – Work (Dog bone) concept

The unpreferred condition creates a need or objective. In the comprehensive management logic a need or objective and a result would be treated as synonymous. The only difference between a need and a result is time. The moment when the objective is satisfactorily realised it becomes the required result. It should be noted that there normally would be more than one method with which to achieve the required result. The best method should be determined and applied.

The comprehensive management logic reasoning could, therefore, be stated as follows:

- **The unpreferred condition creates a need.**
- **The need would only be satisfied by the appropriate results required.**
- **The required results, therefore, create an objective.**
- **The objective dictates that work should be performed.**
- **The work (best method) should produce the required results.**
- **Progress with the work should be adequately controlled.**
- **The results should satisfy the objective and therefore change the unpreferred condition to the preferred condition, and**
- **Where the results do not satisfy the objectives, timeous corrective action should be taken.**

This concept demonstrates the basic management truth, which developed as part of the evolution of mankind, that for any person to achieve the planned results that person must first determine what results would satisfy his needs and whether those results are in fact realistically achievable. Only then he would have a more realistic idea of what his guiding directive or objective should be and then he could develop the best method to achieve the results required (refer figure 5.9). Logically it follows then that for the most efficient management performance:

The results required, need to be stated first, thereafter the objective should be formulated, and then the work or the best method with which to achieve the results required should be determined and efficiently performed.

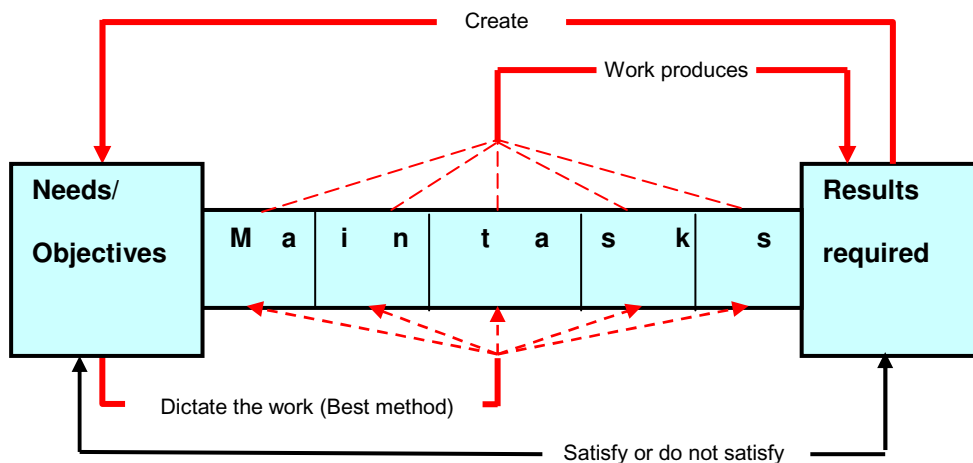


Figure 5.10: The comprehensive management logic development

The results required would become the standards of performance or output, which should be used to measure, evaluate and where and when necessary correct the work in progress or performed (refer section 5.3.6 and figure 5.5). It is important to realise that whenever the required results change the relevant objectives should be evaluated and where necessary be reformulated and the best method with which to achieve the changed results be developed and used.

From figure 5.10 it follows logically that:

- the required results create the needs or objectives,
- the needs or objectives dictate the work to be performed,
- the work produces the required results,
- the required results would or would not satisfy the needs or objectives, and
- management is a natural logical process.

When the results do not satisfy the needs or objectives the deviations must be measured, evaluated and the appropriate corrective action must be planned and instituted. The progress with the plan must be regularly controlled. In the practical situation the manager would determine the vision, mission, strategy and the general objective of the organisation. He would then delegate the results that he requires from his immediate subordinates and stakeholders together with the necessary authority and accountability to each subordinate and stakeholder. This procedure should be followed right through the organisation down to the operators (refer figure 5.11).

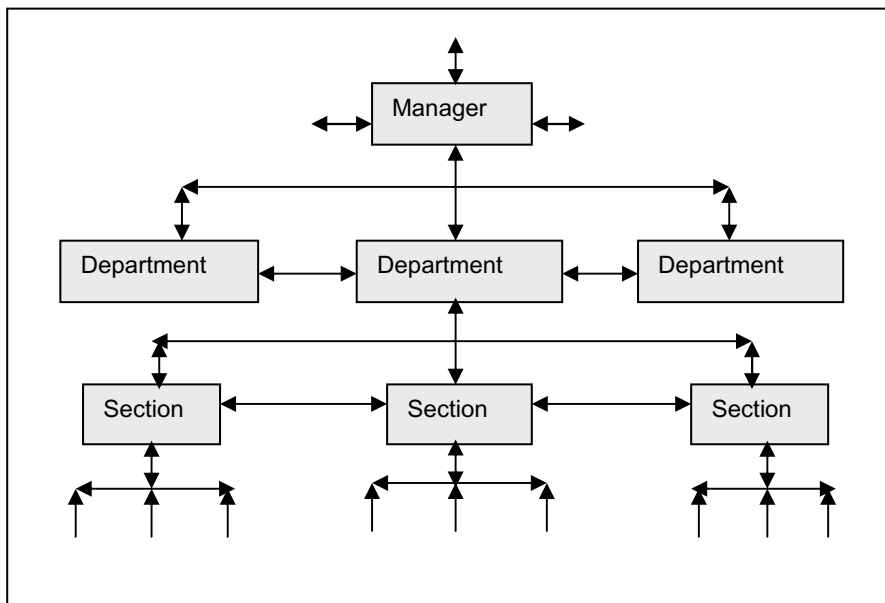


Figure 5.11: Organisational interfaces

Each employee must contribute to the realisation of his supervisor's objectives and must formulate his own objectives, develop his own work and coordinate and integrate his work with that of his immediate stakeholders and that of the organisation. It implies that he must develop and analyse the necessary tasks that would produce the results required from him. In the process he must liaise with his stakeholders (refer section 5.3.5, figure 5.3 and 5.4). He has to plan comprehensively for

the achievement of the results required from him and ensure that his stakeholders know and understand exactly what he in turn requires from each of them (Drucker, 1968:167).

Every employee must:

- know or determine exactly what results are required from him,
- have the necessary accountability and authority to take the necessary decisions to achieve the required results,
- have the competence to develop his own plan,
- implement the plan, and
- control the execution of the plan.

The tasks that the organisation requires must be developed from the top to the bottom of the organisation and then coordinated, integrated, optimised and finalised from the bottom upwards. The analysis has to commence with the results required by the manager. From this point the analysis determines step by step the required results, objectives and what work has to be performed.

Drucker (1968:169) stated that:

“What managerial jobs are needed and what each of them is should always be determined by the activities that have to be performed, the contributions that have to be made to attain the company’s objectives.”

For the achievement of results work has to be performed. Work is performed by people therefore the manager gets results through people. The more competent the people are the better the results would be. The best method performed by the most competent people should yield the optimum results. Diagrammatically it can be represented as depicted in Figure 5.12.

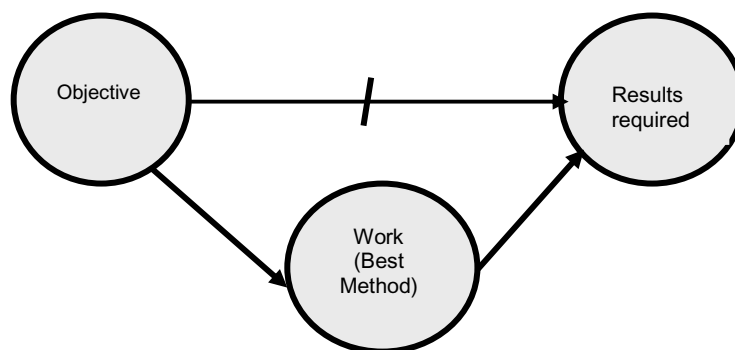


Figure 5.12: The Objective – Work – Results process

In view of the above reasoning it could be argued that when an employee is competent and has a clearly formulated objective and applies the best method then his performance would be the most efficient. Therefore one could reason that efficiency is the achievement of the most optimal results through the application of the best method. Efficiency is defined differently by most individual

management theorists. The most generally accepted definition is that efficiency is doing the right thing in the right way. In this thesis efficiency would be defined as the achievement of the optimal results through the efficient application of the best method, in other words maximum performance.

It follows logically that in order to finalise and organise the work of the organisation the management process must be initiated at the top and cascaded down to the bottom and then be coordinated, integrated, optimised and finalised from the bottom up to the top again. It is a process that could be repeated several times before optimal results have been established and complete agreement has been reached. The operators would perform the basic tasks in the organisation and therefore they would have to develop their own work flow down to the smallest tasks.

Drucker (1968:173) said that:

“Seen this way, the jobs of higher management are derivative, are, in the last analysis, aimed at helping the firing-line manager do his job.”

The comprehensive, practical and integrated management logic is a natural human law. It is a logical human reaction to satisfy human needs. Ackroyd and Fleetwood (2000:26) argued that to define management one should not look into the actions but rather into the logic of management.

The scientific management approach was developed and justified mainly from the need to improve productivity. It was and still is extensively utilised to this day with great success because it involves the systematic and scientific analysis of the basic work required (the best method) to produce the required results in the most efficient manner (refer section 2.5.1.1 (b), table 5.1, figure 5.6 and 5.7).

5.4.4 Basis of the development of the comprehensive, practical and integrated management theory

The management work initiates the management process and therefore the technical work must be a derivative or logical outcome of the development of the management work. Although the technical work is a derivative of the management work the two categories are intertwined in the management process. The logical development of the physical work and all other resources required would be developed from the correct application of the comprehensive management logic. The technical tasks must be developed down to the smallest task elements practically necessary in order to realise the objective efficiently. Management theorists and practitioners in the past and up to now have failed to develop a comprehensive management logic.

The comprehensive, practical and integrated management logic commences with the most probable achievable results. This rule is applicable to every employee in the section, department and organisation (refer section 5.4.3 and figure 5.9 and 5.10). The logic differs from the one proposed by Allen (refer section 2.6.2.8 (a) and (b)). Allen’s logic commenced with the objective to be realised. He did not clearly state how exactly the process should further be developed.

The comprehensive management logic consists of the following logical sequence of tasks:

- establish the most achievable results,
- formulate the objective,
- determine the best method with which to achieve the required results,
- implement the best method, and
- control the execution of the plan.

5.5 DEVELOPMENT AND CLASSIFICATION OF THE COMPREHENSIVE MANAGEMENT LOGIC THEORY

5.5.1 Development of the comprehensive management logic theory

The objective of any organisation is to achieve the most optimal results at all times. There could possibly be more than one method with which to realise the objective. Normally there would be only one best method. The challenge is to logically and scientifically determine this best method. From the preceding reasoning it could be concluded that the:

- required results would be the most probable achievable results under the specific circumstances,
- the objective would be to realise the most achievable results efficiently at all times, and
- best method would be the method that would result in the most efficient achievement of the required results.

Utilising the comprehensive management logic, developed in section 5.4.3, the logic could be depicted as in figure 5.13 below (refer figure 5.9 and 5.10). Every one of the selected alternative methods should be developed first into tasks and the tasks and resources determined and analysed before the best method could be selected.

In this thesis the following terminology would be used:

- main tasks instead of management functions,
- supporting tasks instead of activities,
- controlling tasks instead of elements, and
- tasks further down the line where and when necessary.



Figure 5.13: Development of the work flow of the best method

Planning is, according to most management theorists, the defining of the objectives for the future performance of the organisation, the determining of the resources required and the best method of how to go about realising these objectives in the most efficient manner over the planned period. It follows that a plan could only be effective if the main tasks of the best method is delegated to the relevant accountable employees and if it is successfully being carried out. This implies that the progress and performance should be periodically controlled or measured, evaluated and where and when necessary be corrected timeously (refer section 2.6.2.1).

Therefore the best method to manage is broken up into the following main tasks:

- plan,
- implement the plan, and
- control the progress with the plan.

The best method to manage could also have been broken up into the main tasks plan and operate the plan which would consist of the controlling tasks of implement and control the plan. The complete development of the both sets of main tasks should eventually result in the same results. This reasoning demonstrates that there could be more than one method to achieve the required results.

5.5.2 Development and analysis of the comprehensive management work

In order to analyse and classify the management work the work flow development or 'dog bone' concept would be applied (refer section 5.4.3 and figure 5.9, 5.10, 5.12, 5.13 and 5.14). The objectives with this concept are to:

- systematically determine the results required for each task and method,
- determine the performance standards for each task and resource,
- ensure that the objectives to guide the work necessary to achieve the required results are correctly formulated, and
- ensure that the work necessary to produce the required results would be developed logically, correctly and systematically.

In order to comply with the requirements stated in sections 5.2 and 5.5.2 above the work flow should be developed in the following sequence:

- identify the relevant triggers,
- evaluate the relevant factors,
- develop the most probable results,
- formulate the objective,
- determine the work or best method,
- develop the best method into main, supporting and controlling tasks, and
- develop tasks further down to the smallest tasks necessary (refer figure 5.14).

5.5.2.1 For each main task:

- a) determine the results required,
- b) formulate the objective,
- c) develop alternative methods with which to achieve the results required,
- d) select the best alternative method, and
- e) develop the selected alternative method into supporting tasks.

5.5.2.2 For each supporting task:

- a) determine the results required,
- b) formulate the objective,
- c) determine the best method with which to achieve the results required, and
- d) develop the method into controlling tasks.

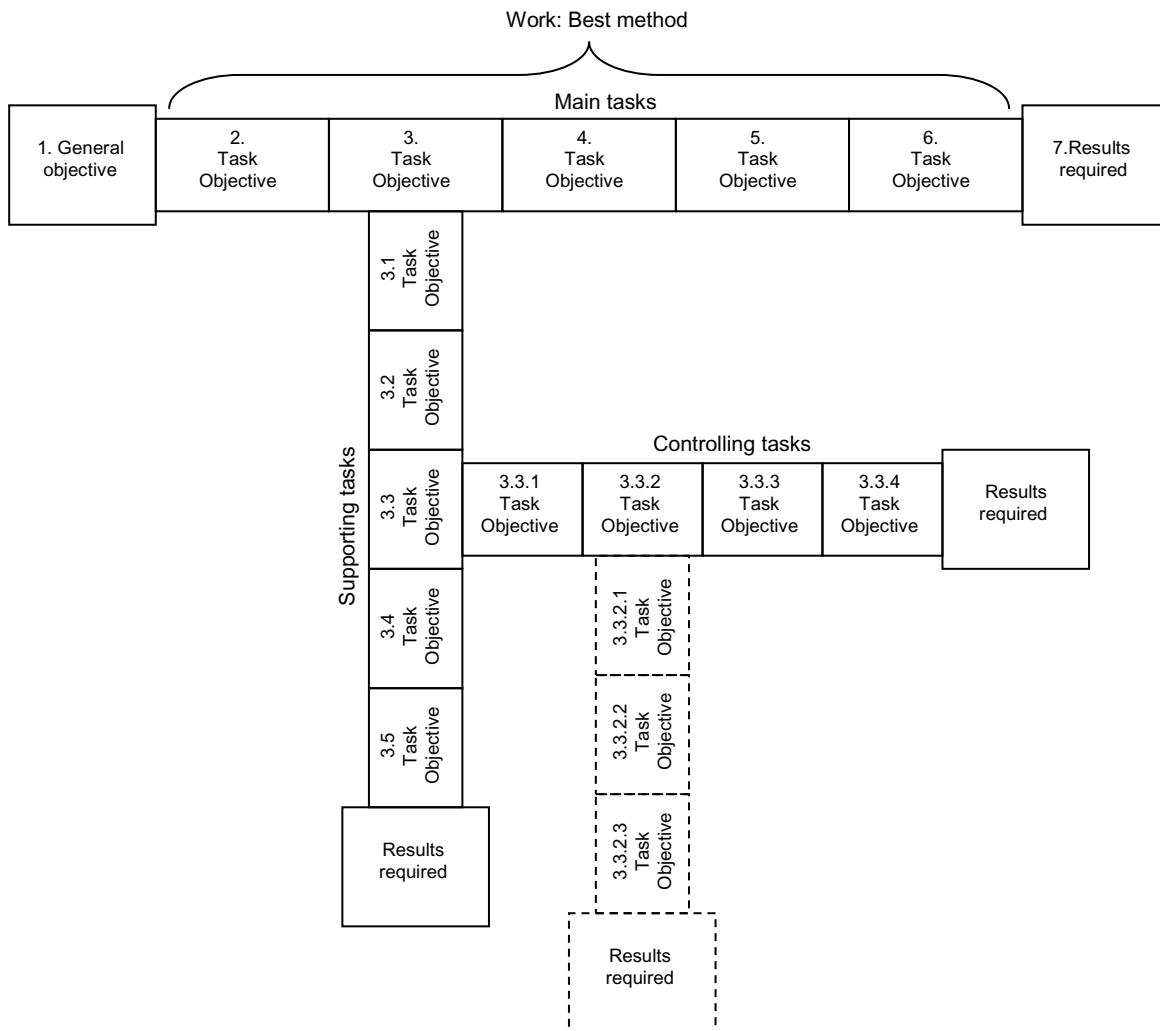


Figure 5.14: Development of the work flow

5.5.2.3 For each controlling task:

- a) determine the results required,
- b) formulate the objective,

- c) determine the best method with which to achieve the results required, and
- d) develop the best method into tasks and where necessary develop these tasks further down to the most elementary and smallest tasks required.

The sequence outlined above would ensure that:

- starting with the results required the work flow is developed systematically,
- work for each task would support a common objective,
- objectives ultimately would culminate into the general objective and results of the supervisor, department and the organisation as a whole,
- objectives are optimally aligned,
- work would be scientifically developed, integrated, coordinated and delegated, and
- required resources could be accurately established.

For the supervisory positions it would be sufficient to develop the work flow only down to the controlling tasks. The reasoning behind this statement is that the:

- main tasks represent the selected perceived best method in order to achieve the required results most efficiently,
- supporting tasks are necessary to ensure that each main task is being performed efficiently,
- controlling tasks ensure that adequate control is exercised for the efficient execution of the supporting tasks and that the optimum results are achieved through the execution of the main task, and
- supervisor could efficiently delegate work and accountabilities to the specific subordinates.

The extension of the work flow, indicated by the dotted lines in figure 5.14, suggests that in the situation where required the work flow must be developed further (refer section 5.5.2.3 (d)). It must be developed until full control is established for that specific post or at the lowest levels to continue the work flow to the smallest task component necessary and to perform the task and resources analysis in the required detail. Once this is completed the task and resources analysis must be summarised from the bottom upwards and grouped into posts, sections and departments.

5.5.3 Development of the work flow of the comprehensive management method

The management work to manage would be systematically developed in this section by applying the comprehensive management theory (refer section 5.4.2 and 5.4.3 and figure 5.9, 5.10, 5.13 and 5.14). The classification of management work should follow logically from the work flow development diagram (refer figure 5.15, 5.15 (a i), 5.15 a (ii), 5.15 (b), 5.15 (c), 5.15 (d) and table 5.2). The work flow of management work in figures 5.15 to 5.15 (d) is proposed as a general approach to develop and analyse management work. It could vary with the strategy, type of business, specific discipline, reasoning capability of personnel and discipline control. The steps as outlined in section 5.4.4 and 5.5 should be followed (refer figure 5.14).

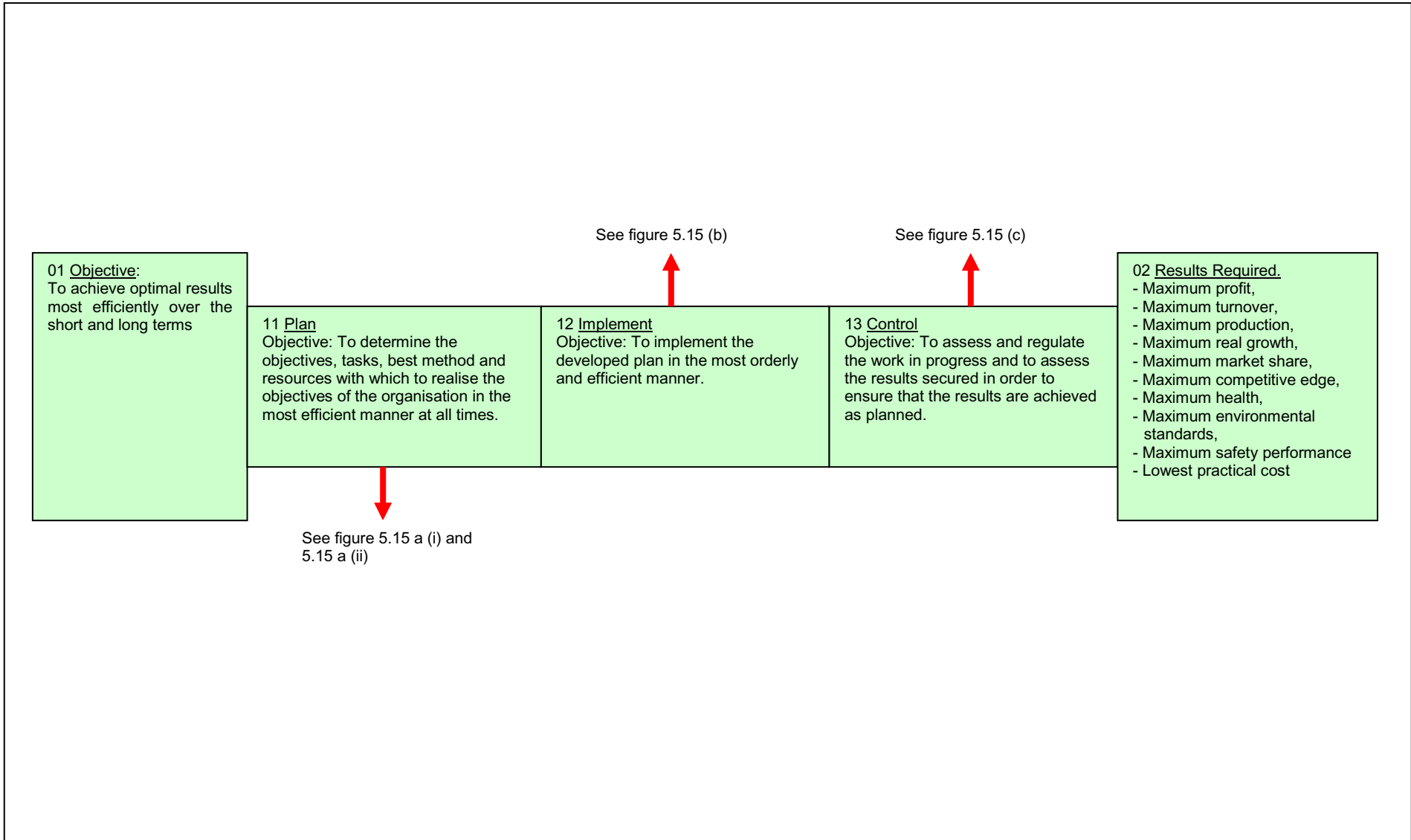


Figure 5.15: Detail work flow development of the alternative to manage with the comprehensive management logic

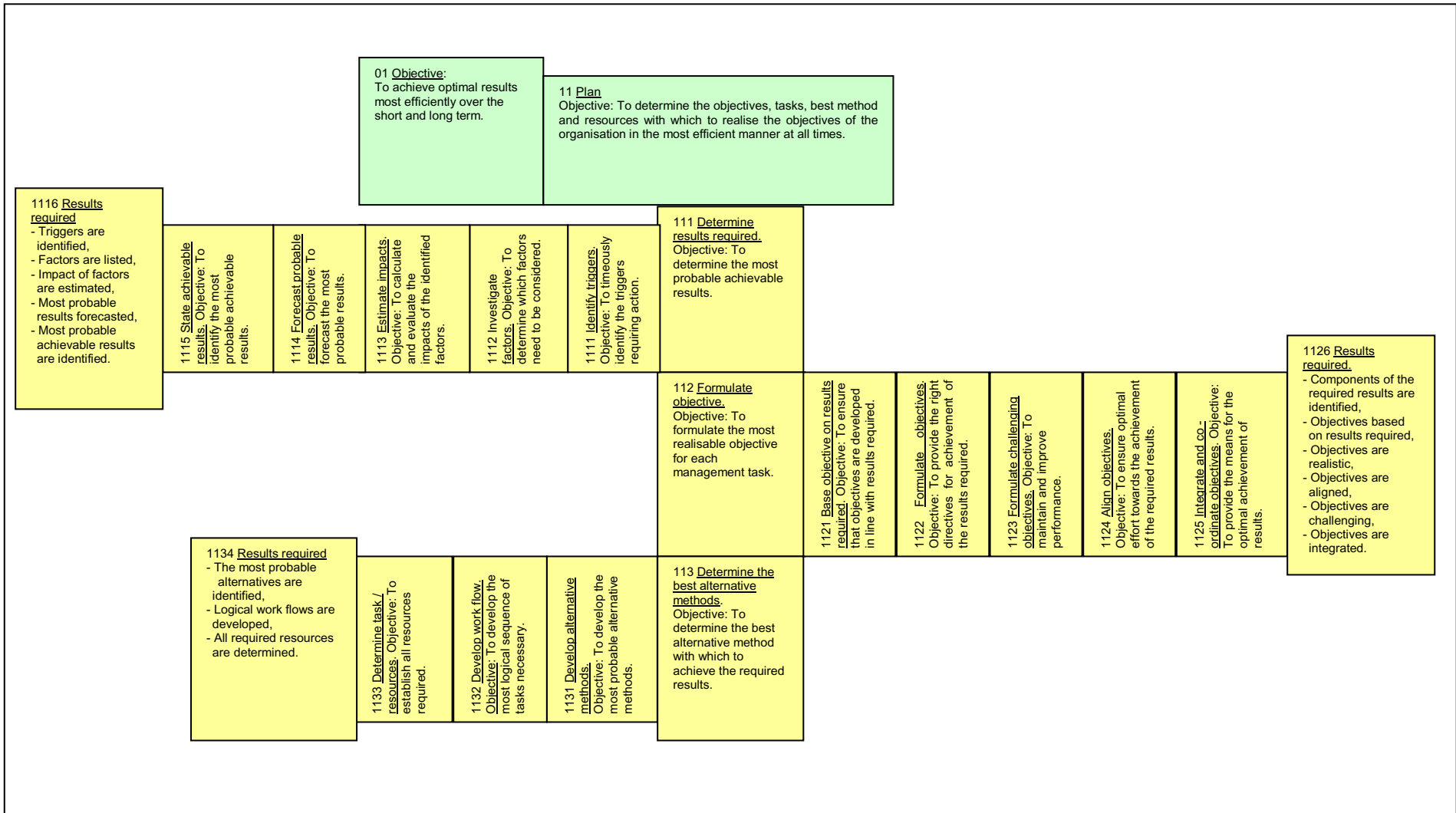


Figure 5.15 (a i): Detail work flow development of the main task to plan with the comprehensive management logic

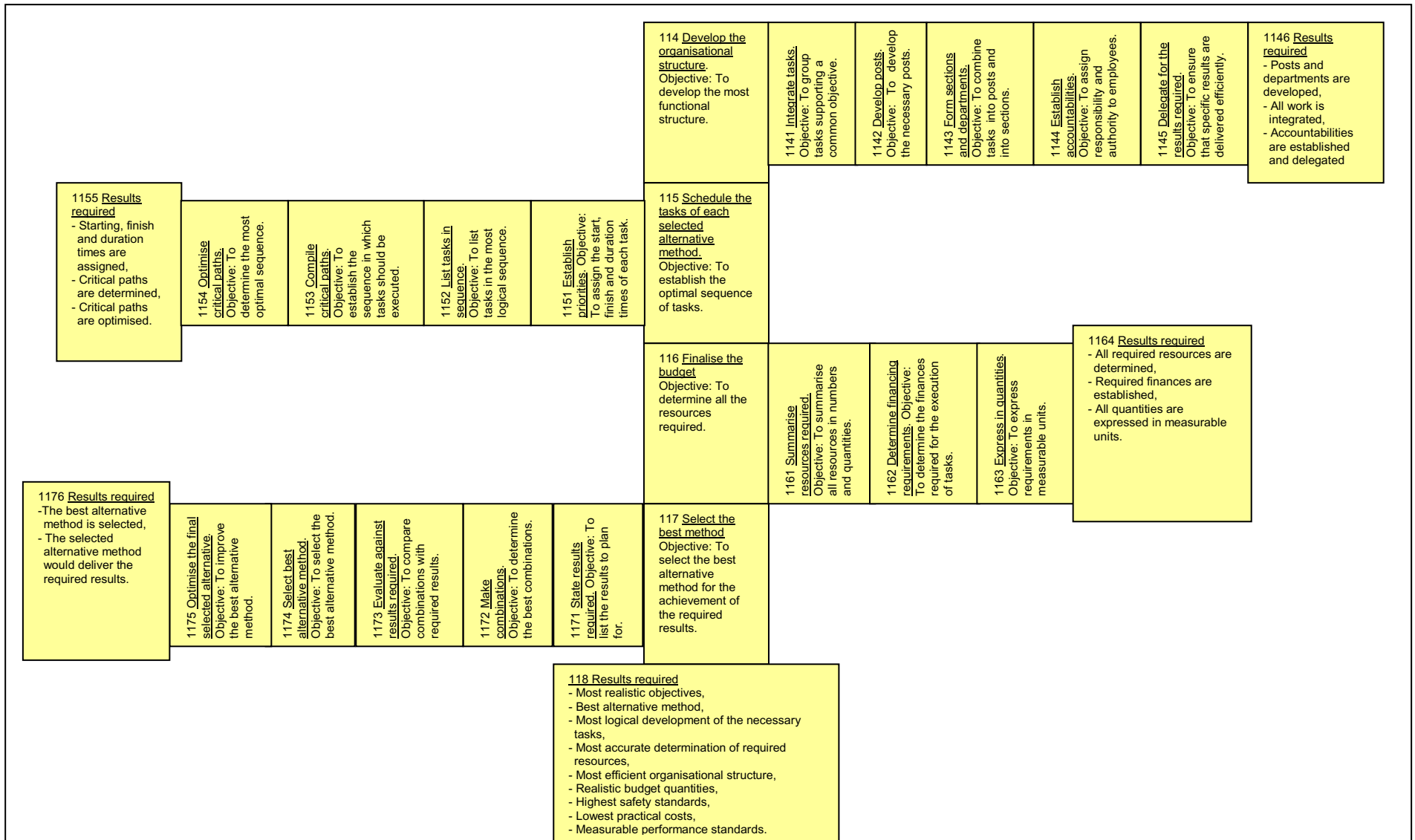


Figure 5.15 (a ii): Detail work flow development of the main task to plan with the comprehensive management logic

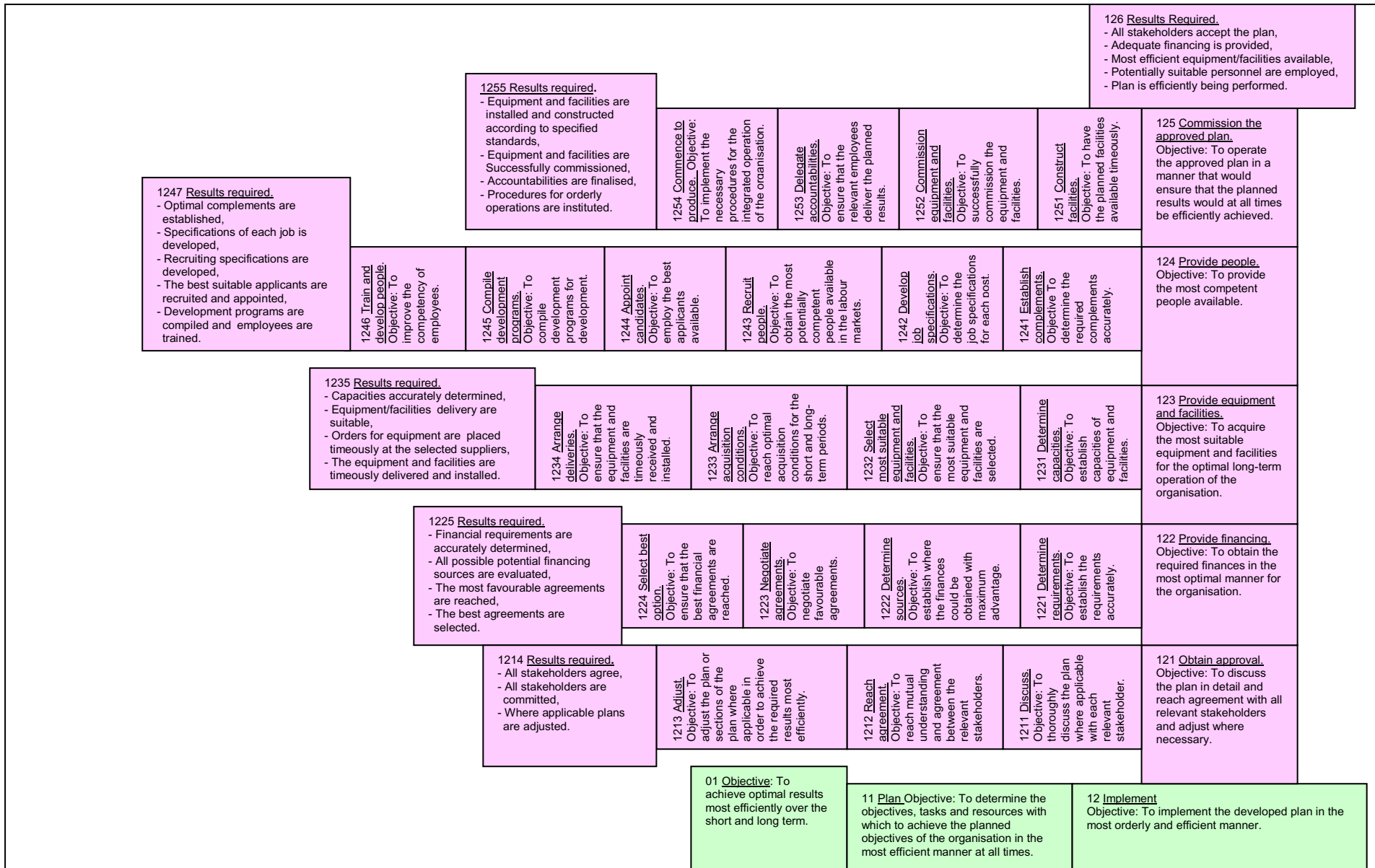


Figure 5.15 (b): Detail work flow development of the main task to implement with the comprehensive management logic

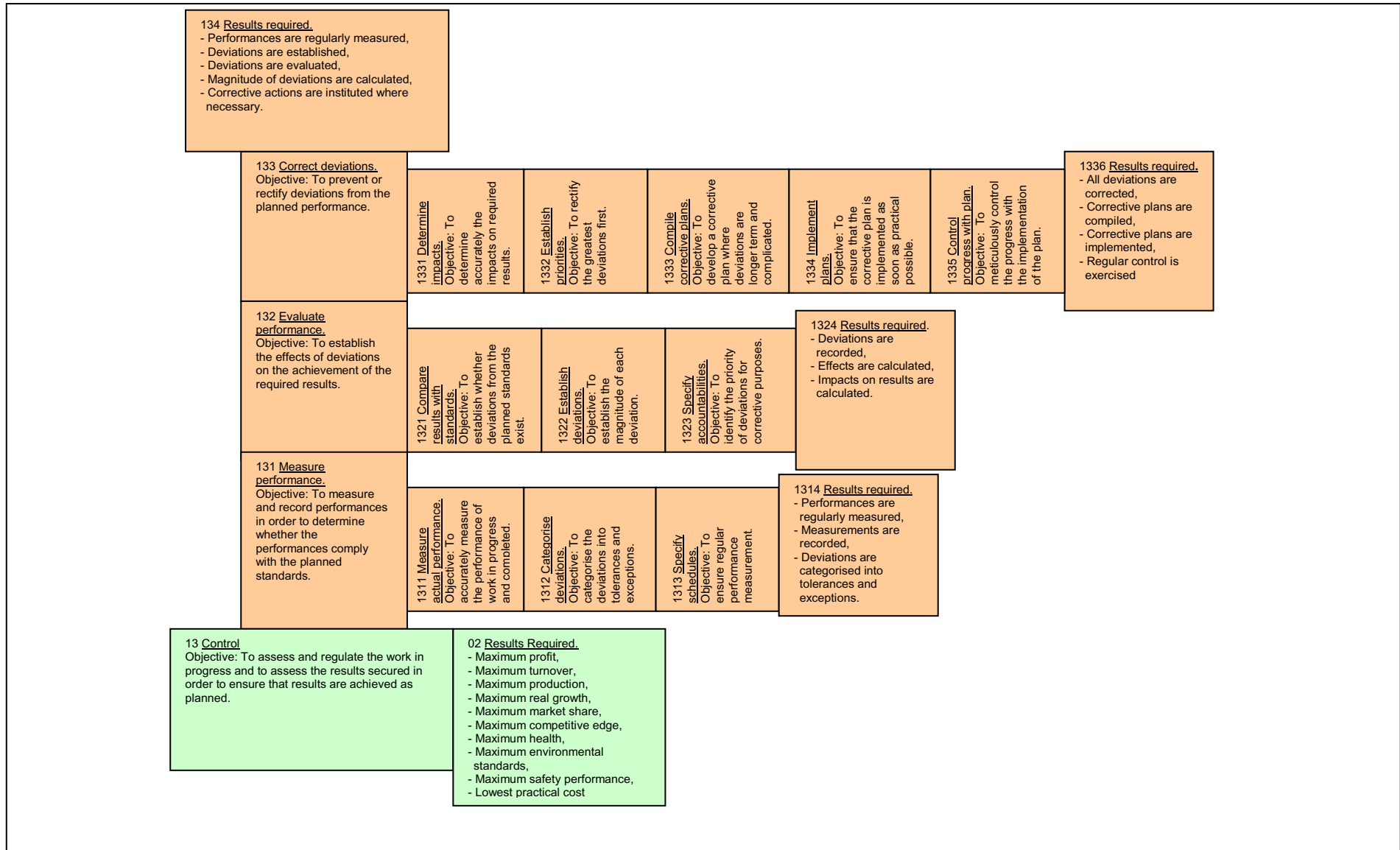


Figure 5.15 (c): Detail work flow development of the main task to control with the comprehensive management logic

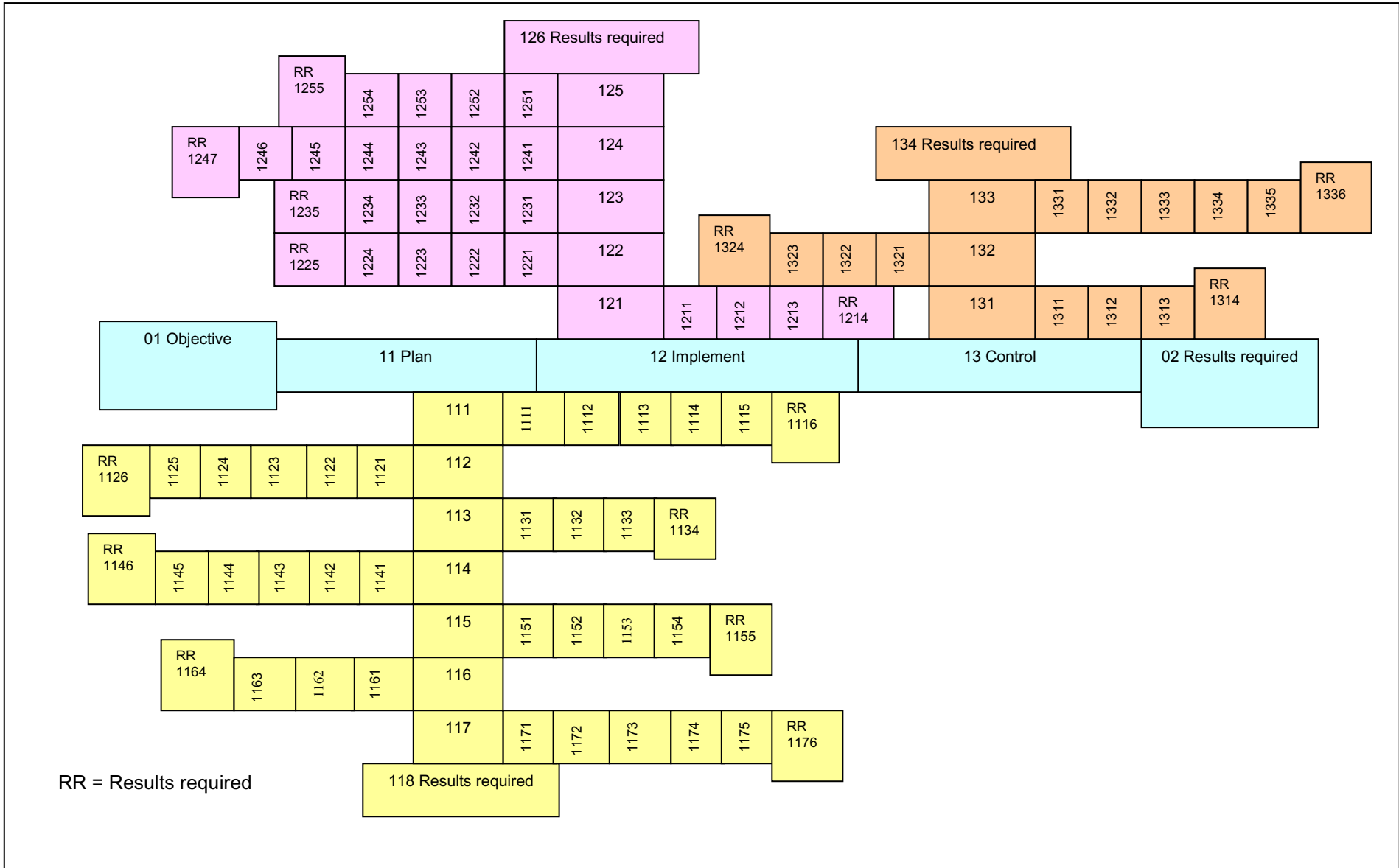


Figure 5.15 (d): Work flow development of the comprehensive management logic

In order to correctly implement the comprehensive management logic the employee should at all times endeavour to:

- develop the work (method) into the minimum logical number of necessary tasks,
- include all the necessary work in the subsequent development steps,
- develop the controlling tasks further where required (refer figure 5.14), and
- ensure that the process down to the last task is logical and supportive of the objective

Due to space limitations the development of the work flow for the management work to manage was demonstrated in six sections:

- one diagram on the main tasks of the alternative to manage (refer figure 5.15),
- two diagrams on the planning main task (refer figure 5.15 (a i) and 5.15 (a ii)),
- one diagram on the management work to implement (refer figure 5.15 (b)),
- one diagram on the management work to control (refer figure 5.15 (c)), and
- a general key plan/diagram of the whole flow diagram (refer figure 5.15 (d)).

From the logic it could be stated that:

- the main results required must satisfy the main objective,
- the results required for each main task must satisfy the objective of each main task and would become the standards of performance, and
- the results of all the main tasks must add up to the main results required for the general objective. It must be the total of the results required from each main task. For example the unit cost of production for the company would be the total unit costs of the main tasks.

The systematic and logical development would:

- facilitate the classification of management work,
- facilitate the development of a logical planning process,
- facilitate the development of a logical planning structure,
- establish the logical application of management principles, and
- ensure efficient delegation.

5.5.4 The comprehensive management classification

Classification of management is necessary in order to develop and practically apply management work. It would follow logically from the development of the comprehensive management logic work. The work flow of management work is proposed as a general approach to develop and analyse management work (refer figure 5.15 to 5.15 (c) and table 5.2). It could vary with:

- strategy,
- type of business,
- specific discipline, and
- reasoning capabilities of personnel.



Main tasks	Supporting tasks	Controlling tasks
Plan	- Determine the results required	<ul style="list-style-type: none"> - Identify the relevant deviations or triggers - Investigate and analyse the factors involved - Estimate the impact of these factors - Determine and forecast the most probable results - Discuss and state the most probable achievable results
	- Formulate the objective	<ul style="list-style-type: none"> - Base the objective on the results required - Formulate objectives in futuristic terms (start with "To") - Formulate challenging objectives - Align objectives - Integrate and coordinate objectives
	- Determine the best alternative methods	<ul style="list-style-type: none"> - Develop alternative methods - Develop the work flow for each selected alternative method - Develop the task and resources analysis for each selected alternative method
	- Develop the organisational structure	<ul style="list-style-type: none"> - Integrate the tasks supporting a single objective - Develop the required posts - Form sections and departments - Establish accountabilities - Delegate for the achievement of the required results
	- Schedule the tasks of each selected alternative	<ul style="list-style-type: none"> - Establish priorities - List tasks in sequence - Compile critical paths - Optimise critical paths
	- Finalise the budget	<ul style="list-style-type: none"> - Summarise the resources required - Determine financing requirements - Express requirements in measurable quantities
	- Select the best alternative method	<ul style="list-style-type: none"> - State the results required - Make combinations where applicable - Evaluate each against the results required - Select the best alternative method - Optimise the selected alternative method
Implement	- Obtain approval for the plan	<ul style="list-style-type: none"> - Discuss plan with stakeholders - Reach agreement - Adjust plan where necessary
	- Provide financing	<ul style="list-style-type: none"> - Determine the requirements - Determine potential financing sources - Negotiate acquisition agreements - Select the best option
	- Provide equipment and facilities	<ul style="list-style-type: none"> - Determine capacities - Select the most suitable equipment and facilities - Arrange acquisition conditions - Arrange deliveries
	- Provide people	<ul style="list-style-type: none"> - Establish complements - Develop job specifications - Recruit people - Appoint the most suitable applicants



		<ul style="list-style-type: none"> - Compile development programs - Train and develop people
	-Commission the approved plan	<ul style="list-style-type: none"> - Construct facilities - Commission the equipment and facilities - Delegate accountabilities - Commence to produce the results planned
Control	- Measure performance	<ul style="list-style-type: none"> - Measure actual performance - Categorise deviations - Specify schedules
	- Evaluate performance	<ul style="list-style-type: none"> - Compare results with standards - Establish magnitude of deviations - Specify accountabilities
	- Correct deviations	<ul style="list-style-type: none"> - Determine impact of each deviation - Establish priorities - Compile corrective plans - Implement the plans - Control progress with plans

Table 5.2: Classification of the comprehensive management work

From table 5.2 it was clear that:

- all the activities of the organising function of the administrative management approach are part of the main management task to plan. It is therefore more correct to perform this work during the planning stage. It would automatically result in the logical integration of the required management work,
- the activities of the leading function are utilised in management to maintain the tasks to plan, to implement and to control. They should be seen as management skills that should be utilised from the start to the end and during management work when and where required. It should not be seen as structural components or building blocks of the management structure but rather as the ‘tools’ to drive the management process, and
- the supporting task to develop performance standards is performed as part of the main task to plan.

The management discipline, similar to other scientific disciplines, would now fully comply with the requirements of a universal scientific developed norm of analysis. It is also a science and a profession (refer section 2.4.10).

5.5.5 The relative importance of the main tasks of the comprehensive management work

The relative importance of each of the three main management tasks of the comprehensive management work was established from the classification of management (refer section 5.5.4 and table 5.2). The relative importance of the management work to plan is confirmed by the analysis and classification of the comprehensive management method. From this classification it would appear that the main management task to plan is the most important component of management work (refer section 2.6.2.1). It represents 48 per cent of the total management work (refer figure 5.16 and table 5.2).

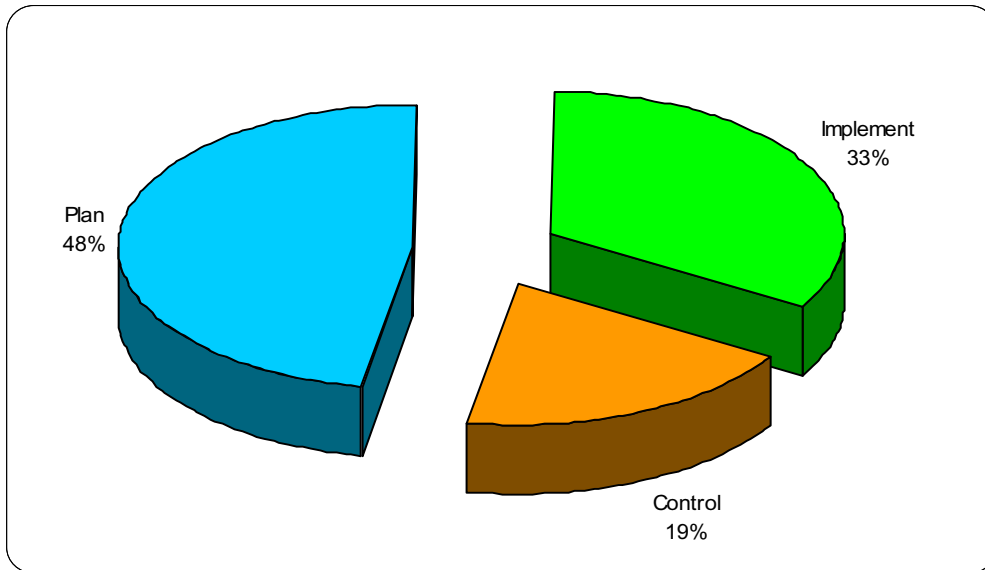


Figure 5.16: Relative composition of the main tasks of the comprehensive management logic

5.6 PROPOSED MANAGEMENT PLANNING STRUCTURE FOR THE MINING INDUSTRY

5.6.1 The planning process

The South African mining industry was from its inception extremely capital intensive. Mines are normally planned over relative long periods in order to justify the capital expenditure and remuneration to the shareholders for their investments. The planning process should accommodate these needs.

An efficient planning process should enable management to:

- 5.6.1.1 determine the required results
- 5.6.1.2 provide the direction and purpose for the company,
- 5.6.1.3 determine the best method with which to realise the objectives,
- 5.6.1.4 determine the necessary performance standards,
- 5.6.1.5 coordinate and integrate all work,
- 5.6.1.6 establish control and corrective measures,
- 5.6.1.7 delegate work efficiently,
- 5.6.1.8 reveal future opportunities,
- 5.6.1.9 identify all risks and threats,
- 5.6.1.10 efficiently accommodate any foreseen and unforeseen changes and risks, and
- 5.6.2.11 optimise the resources and performance of the organisation.

The planning process would follow logically from the development and classification of the comprehensive management work (refer section 5.5.4, figure 5.15 to 5.15 (d) and table 5.2). The process closely follows the sequence of the development of the supporting and controlling tasks of the management main task to plan and to implement the plan. From figure 5.17 it is clear that the

development of each alternative, as indicated in red in the block, is repeated in detail so that a more reasoned choice could be made as to which alternative method would be the best.

All employees on all the levels of the organisation should be trained to plan efficiently for the achievement of the results that each of them must deliver. The following planning process is proposed.

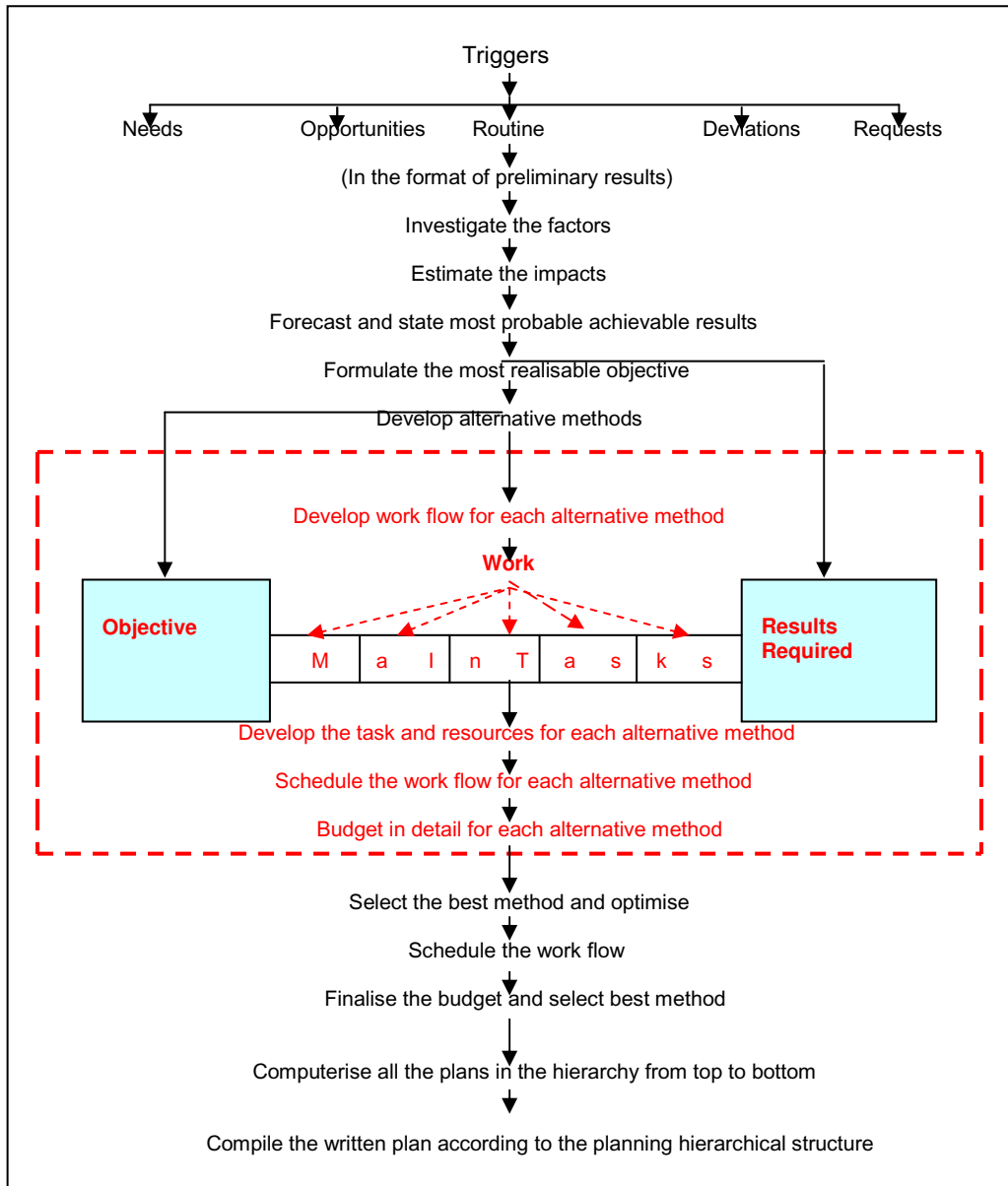


Figure 5.17: The comprehensive, practical and integrated management planning process

5.6.2 The planning structure

In order to maintain its competitive edge, flexibility and ability to respond rapidly to changing factors the industry should implement and utilise a logical comprehensive planning structure. It should consist of a series of plans capable of accommodating the demands of the industry's operations

(refer section 2.6.2.1, 5.6.1 and figure 5.17). It is imperative that each manager should compile his own plan, only utilising functional or staff departments, where really justified.

The planning framework or structure should facilitate the:

- optimal realisation of objectives,
- logical development of management work,
- optimisation of resources,
- optimal integration, and
- coordination and control of all the tasks of each employee on each level of the organisation.

The following practical and logical planning structure for the South African mining industry is proposed. Each mining house should decide whether to implement or reject it as proposed or to amend it for its own specific situation.

5.6.2.1 The strategic plan

The strategic management process commences when the executive team evaluate their current situation in view of the vision, mission, objectives and existing strategy (Daft, 1995 183). The strategic plan should be realistic, practical, general and aim to ensure that it realises its stated general objective with the selected method despite changing circumstances (refer figure 5.15 to 5.15 (d)). It should be developed in such a form as to guide the necessary managerial decisions and actions (Ansoff, 1968:101). The strategic plan has mainly to do with the main business of the mining company. In some cases, it could also be applicable to the mines, departments or sections.

The strategic plan should:

- a) be initiated by the chief executive officer of the organisation and his immediate subordinates
- b) be compiled in broad terms,
- c) include any policies relevant to the plan,
- d) state the vision or general objective of the organisation,
- e) state and describe the mission or best method with which to realise the general objective,
- f) specify the strategic resources required,
- g) be periodically compiled when changes in legislation, resources, threats, strengths, weaknesses, opportunities and risks occur,
- h) be maintained and regulated continuously for the effects of any changes, and
- i) be adjusted or totally recompiled when changes justify an adjustment or a new strategy.

5.6.2.2 The long-term plan

Mining is a long-term venture, normally from 20 up to 100 years and more. It requires huge capital investments and infrastructure. It would therefore be imperative to plan for vital resources such reserves, capital, labour and rehabilitation over long periods. It is also extremely important to plan for, opportunities, challenges and risks over an extended period. These resources, by its very

nature, are not short term. The long-term plan should be compiled for the mining house and the life duration of each mine.

It should:

- a) be compiled within the framework of the strategic plan,
- b) be compiled for the life of the mine,
- c) specify the general objective of the mining house, mine or department,
- d) be aimed at the realisation of the general objective of the mining house and mine,
- e) specify the best method with which to realise the general objective,
- f) develop the main, supporting and controlling tasks,
- g) establish the main resources required, and
- h) be utilised mainly by top management of the mining house and mine.

5.6.2.3 The medium-term plan

Whereas the long term plan should be compiled very broadly the medium term plan should be compiled in much more detail. It should cover a maximum period of up to five years.

It should:

- a) look in more detail into the allocation and development of resources and achievement of results for the first few years of the long-term plan,
- b) ensure that the development and management of vital resources such as labour, reserves, and capital, are adequately planned for and controlled, and
- c) ensure that in the event of unforeseen detrimental factors timeous action should be taken.

5.6.2.4 The short-term plan

The short-term plan should:

- a) cover the first year of the medium-term plan in as much detail as is practically feasible,
- b) plan for every type of resource (labour, equipment, material, stores etc) in detail,
- c) provide the performance standards for control,
- d) enable management to accurately determine the efficiency of output, and
- e) facilitate the measurement of work completed and in progress so that timeous corrective actions could be planned for and instituted.

5.6.2.5 Operational plans

An industry such as mining needs to set targets or 'calls' on an hourly or per shift basis. Due to the difference in shift lengths and the possibility of varying number of shifts per week and month it is essential to ensure that the hourly targets are being realistically planned and achieved in order to ensure the efficient achievement of the daily, monthly and annual results.

The results required must be set for each employee on each level in the organisation in understandable and measurable units or standards. The continuous miner operator for example would not necessarily have a clear perception of tonnage. The meters cut or the shuttle cars loaded per shift or even better per hour would be a much more practical control standard. The roof bolt operator would find it extremely difficult if not impossible to effectively comply with a performance standard such as tons per roof bolt. The distance between the rows of roof bolts and the number of roof bolts per row would be easily measurable and would ensure more efficient compliance, control and safety. He would now be fully empowered to efficiently measure, evaluate and control the compliance with the prescribed standards.

Operational plans should:

- a) be compiled by every employee,
- b) be compiled for each month of the short-term plan in the greatest detail practically feasible,
- c) be adjusted whenever required,
- d) be compiled for measurable periods such as per hour, shift, day, week and per month,
- e) plan for every resource (labour, material, stores, risks, etc),
- f) provide easily understandable and measurable performance standards for control, and
- g) facilitate the measurement of work completed and in progress so that timeous corrective action could be planned for and instituted.

5.6.2.6 Corrective action plans

A corrective action plan is a predetermined course of action to rectify deviations, eliminate or manage threats, optimise opportunities within a definite time period or to prevent catastrophes. In mining operations deviations from plans would basically occur on a regular basis. A sound approach therefore would be to plan for the means to timeously detect and correct these deviations if planned results are to be achieved.

The reporting mechanisms developed during planning by the departments and sections within the mining company must be developed to timeously identify the areas where current performance is not meeting planned performance standards. Priorities for action to correct these deviations or to take advantage of opportunities must be determined. Every employee should identify and correct any deviation in his area of accountability.

5.6.2.7 Contingency plans

Contingency plans are intended to minimise the negative effects of possible unexpected changes and occurrences. The mechanisms to timeously identify and report contingencies should be part of the planning and reporting systems. With the development of the task and resources analysis the identification of possible deviations are identified as part of the planning process. Preventative measures and procedures to manage it could then be compiled before deviations actually do occur.

5.6.2.8 Supporting plans

Supporting plans are plans that support the efficient realisation of the mine's objectives. This should include:

- a) plans to manage risks where necessary,
- b) plans to institute preventative measures,
- c) plans to support training schedules, and
- d) any other plan, however small, intended to keep the mine, department, section or individual employee on track towards the optimum realisation of the planned objectives.

Most of these plans could be identified during the planning process with the development of the task and resources analysis. Preventative action or procedures could then be developed and instituted for each task and responsibility.

5.6.2.9 Project plans

Project plans entail the planning and implementation of specific identified ventures to improve performance results, rectify deviations or initiate the more profitable utilisation of resources. Project plans could range in magnitude from a relatively insignificant amount of capital to billions of rand depending on the intention or nature of the project. The economical advantages to change from one type of support material or system to another would normally be handled and labelled as a project at moderate capital cost whilst the exploration and establishment of a complete multi-million rand mining venture may also be accorded with the same humble semantics.

5.6.2.10 Fixed plans

Policies, procedures, rules and regulations are all forms of plans but are also factors that influence, limit or facilitate the achievement of planned results. A mine has a need for planning to cater for repetitive types of problems and to ensure a uniform method for greater efficiency. There are normally many different types of fixed plans. The most common fixed plans in the South African mining industry are policies, procedures, rules and regulations and emergency plans. Each would be briefly discussed in the following sections.

a) Policies

Policies are broad guidelines issued by top-level management sometimes necessitated by external factors not necessarily directly related to the operations of the organisation. In the mining industry it is issued mainly by the head offices to govern main aspects such as safety, employment, training and development and compliance with statutory laws and regulations.

b) Procedures

Procedures are uniform or standardised methods of performing identified repetitive and risk related work compiled company, departmental and sectional wide or for specific posts with the aim of ensuring that the most efficient methods for greater efficiency, safety, employment, remuneration, training and induction are applied.

Procedures also ensure that repetitive tasks would always be uniformly performed according to the approved method. It serves as valuable training and control material. The authorised roof bolt installation procedure on a colliery serves as a typical example.

c) Rules and instructions

Lower level management normally issues rules and instructions. It is issued in conjunction with any legitimate aspect of the company or specific mine, department or section where the supervisor accountable, is convinced that it would be necessary in terms of productivity, safety, sound labour relations and the general image of the section and the company. A compulsory feedback meeting at the end of the shift to ensure that all equipment and material are parked and stored in the prescribed positions and places serves as a typical example.

d) Emergency plans

Emergency plans are compiled to minimise the possible effects of an emergency should it occur. Typical plans in this category on a mine are those plans that for example make provision for:

- i) fire fighting,
- ii) hazards,
- iii) underground escape routes,
- iv) emergencies,
- v) main water supply, and
- vi) main power supplies.

5.6.2.11 Main advantage of the planning structure

The main advantage of the planning structure, derived from the comprehensive management logic is that it would serve as a core management control system. It would direct the integrated action of all employees. According to Daft (1995:511) the core control system consists of all the different plans in the planning structure from the top to the bottom of the organisation, the control systems of the various departments, sections and the organisation as a whole. Any required change in any of the results could easily be accommodated throughout the entire organisation

5.7 CONCLUSION

The theory that would enable all employees, from the top to the lowest position, to manage their work efficiently was developed in this chapter (refer section 5.4.3, 5.6 and table 5.2). It differs significantly from the perceived requirements that were proposed in section 2.2.1. In the new management theory management is seen as work and is classified into main, supporting, controlling and up to terminal or end tasks. It is comprehensive, practical, integrated and coordinated. It commences at the top and goes down all the way to the last and smallest task elements and resources and again up to the highest level in the organisation where and when required.

The advantages of the new theory are that:

- it is derived from a practical logic,
- it is comprehensive, practical and integrated,
- it is possible to scientifically classify management work,
- it facilitates the development of a logical integrated management planning process,
- a practical planning structure for the South African mining industry follows logically from it (refer figure 5.17),
- the planning process is applicable to each plan whether small or large or long or short term,
- it can be applied on all levels of the organisation, and
- it recognises the reality of and the need for every employee to plan for his results.

For the efficient application of it by all employees it is imperative that it should be correctly applied at all times. The proposed planning structure would ensure the logical development; integration and coordination of plans and the optimisation of resources in the entire organisation from the top to the bottom (refer section 5.6.2)

In the next chapter the procedure to apply the comprehensive, practical and integrated management theory in the practical situation would be developed and presented. Practical examples would be used as far as possible to demonstrate the application of the method.

CHAPTER 6

DEVELOPMENT OF THE PROCEDURE FOR THE APPLICATION OF THE THEORY OF THE COMPREHENSIVE, PRACTICAL AND INTEGRATED MANAGEMENT METHOD

6.1 INTRODUCTION

In the previous chapter the theory for the comprehensive, practical and integrated management method was developed (refer section 5.4). A logical integrated planning process and a planning structure for the South African mining industry were developed from the new theory (refer section 1.5.2.3, 1.5.2.8, 1.7.2.4, 1.7.2.8 and 5.6). Throughout this thesis the prerequisite was that the theory must be completely understandable and applicable in practice by every employee on all the levels of the organisation. The author is of the opinion that all employees on all the levels of the South African mining industry would understand and be able to apply the theory presented in chapter 5. It is imperative that the theory should be, meticulously, systematically and correctly applied.

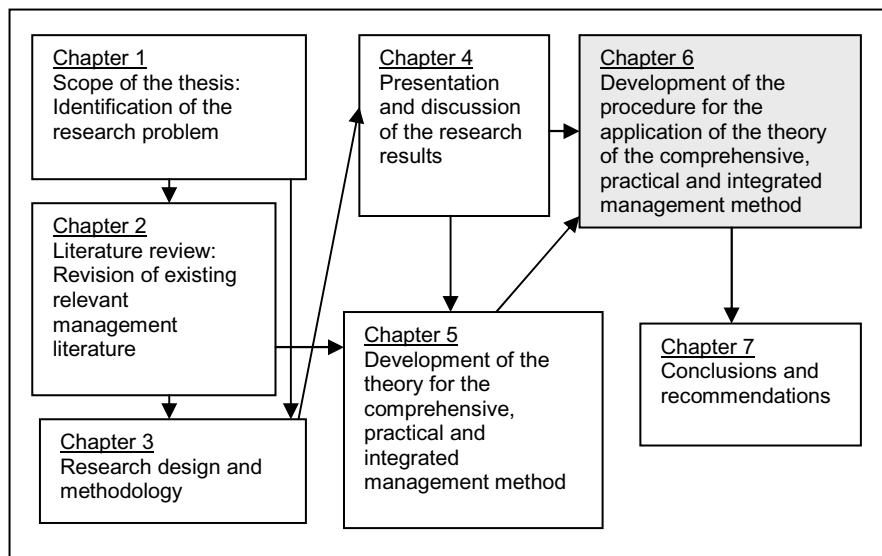


Figure 6.1: Chapter 6 in context to the overall thesis

In chapter 1 it was hypothesised that a procedure to implement the developed comprehensive, practical and integrated management theory could be developed (refer section 1.5.2.8). It was also perceived that this procedure would be sufficient to enable management to successfully implement the developed theory in the South African mining industry on all the levels of the organisation (refer section 1.5.2.9). The objective with this chapter is to develop the procedure for the application of the proposed comprehensive, practical and integrated management theory and to evaluate it against the requirements and classification of the comprehensive, practical and integrated management method (refer section 5.4, 5.5 and table 5.2).

6.2 DEVELOPMENT OF THE IMPLEMENTATION PROCEDURE FOR THE COMPREHENSIVE MANAGEMENT THEORY

It was established in chapter 4 that 96.34 per cent of the mining organisations in South Africa utilised the process or administrative management approach (refer section 2.5.1.1 (d) and 4.3.2). Today the vast majority of management thinkers, supports the administrative management approach and accepts the classification of management work into the four functions of planning, organising, leading and controlling as the most representative approach of the management discipline (refer section 2.6.1). In chapter 2 it was concluded that this management approach lacks the theory to support a comprehensive, practical and integrated management method fully (refer section 2.2.1, 2.8.1, 2.8.3 and 4.4.2). The industry generally does not follow a uniform standardised integrated planning process and hierarchy with the result that the most optimal plans were not necessarily compiled and the best results were not planned for (refer section 4.2.2.1 b).

In chapter 5 it was accepted and proved that management work is a logical natural process and consists of the main tasks of planning the results required, implementing the plan and controlling the management and technical work for the achievement of the required results of an organisation (refer section 5.5 and table 5.2)). This approach formed the basis for the classification of the theory for the comprehensive, practical and integrated management method (refer section 5.5.2, 5.5.3 and 5.5.4).

The supporting tasks proposed in section 5.5.4 were seen as the correct logical steps for an efficient planning process for the South African mining industry (refer table 5.2 and figure 5.17). It is imperative that all employees on all the levels of the organisation are trained to plan efficiently and compile the necessary plans when required. It is a fact that the results of the organisation are mainly being achieved on the ground level – on the shop floor level and in the production faces.

Drucker (1968:173) argued that the jobs of higher management are just the sum total of the jobs of the ground floor employees. This statement would be proved in the development of the procedure for the implementation of the comprehensive, practical and integrated management method (refer figure 6.4 (a) to 6.4 (f)).

In the ensuing sections of this chapter the comprehensive management theory, the classification of management work, the logical planning process and the proposed planning structure as discussed in chapter 5 would form the basis for the development of the implementation procedure for the theory of the comprehensive, practical and integrated management method (refer section 5.4, 5.5 and table 5.2). It would be imperative that the steps proposed are meticulously applied and adhered to by every employee in the organisation.

The following practical example was proposed to be utilised in order to demonstrate the development of the procedure for the application of the comprehensive, practical and integrated management theory. The steps identified and proposed in chapter 5 would be applied (refer sections 5.4, 5.5 and table 5.2).

A mine was recently awarded a contract to supply 5 million tons of coal per annum (mtpa) to a customer at a quality of not less than 22.5 Megajoule per kilogram (MJ/kg). The proposed unit cost of R75.18 per ton in real terms was accepted by the customer when the contract was awarded. It was agreed that the unit cost could mutually be adjusted annually with the prevailing rate of inflation. The tons are to be delivered on time safely with maximum efficiency and at legally approved environmental standards. The contractual period is 20 years. The mine is contractually obliged to supply 5 mtpa for an additional period of ten years should the customer require such an extension.

The mine is located approximately 100 kilometers (km) south of the city of Johannesburg and 40 km south–west of the present town of Witbank in the Mpumalanga Province of the Republic of South Africa. The coal seam is fairly flat and even. The mineable section of the seam is on average 3.6 meters thick with a specific gravity (sg) of 1.5. The mine is to be planned as a totally mechanised mine utilising mechanised continuous miners to produce the coal. The underground roadways are to be developed on an average of 6.5 meters wide and 3.6 meters high.

The tons are to be sourced from eight production sections on a double shift per day, 22 days per month basis. The line of command is similar to that depicted in the typical organisational structure for underground collieries in South Africa (refer figure 6.3). One production manager reports to the mine manager, two mine overseers to the production manager and two shift bosses per shift to each of the two mine overseers. One miner per shift is in charge of one production section shift and each section employs one continuous miner operator per shift. The production targets (results required) per period are depicted in table 6.1 below. For better control the target of the continuous miner operator is expressed in meters cut per shift (35 tons per linear metre).

Occupation	Results required (tons)			
	Per shift	per day	per month	per annum
Mine manager	10 080	20 160	443 520	5 322 240
Production manager	10 080	20 160	443 520	5 322 240
One Mine overseer	5 040	10 080	221 760	2 661 120
One Shift boss	2 520	2 520	5 5440	665 280
One Miner	1 260	1 260	27 720	332 640
One continuous miner operator	36 m	36 m	792 m	9 504 m

Table 6.1: Production targets per occupation per time period

6.2.1 Plan

The objective of planning is to determine the most probable achievable results, the formulation of the objectives of the organisation and the best method with which to realise the objectives. The supporting and controlling tasks as set out in table 5.2 would be used as guidelines to develop the planning procedure. In the practical situation the controlling tasks should, where necessary, further be developed (refer section 5.5.3 and figure 5.15, 5.15 (a i) and 5.15 (a ii)).

6.2.1.1 Determine the results required

An efficient method to determine the most probable achievable results for planning could not be ascertained from the existing literature. In the comprehensive, practical and integrated management theory the supporting task to determine the most probable achievable results consist of five controlling tasks, which should be meticulously adhered to in order to ensure that the best decision with regard to the required results for planning purposes is arrived at (refer table 5.2).

a) Identify the relevant deviations or triggers

The planning process is normally initiated by events, called triggers (refer figure 5.17). Triggers by definition are events that would result in the initiation, adjustment, change, rejection or revision of a plan. In the example above the trigger was an official invitation by the customer to tender for the delivery of 5 mtpa.

The most common types of deviations and triggers are:

- i) performances below or above the stated standards,
- ii) needs,
- iii) opportunities, strengths, threats and weaknesses,
- iv) routine actions,
- v) special requests,
- vi) challenges, and
- vii) initiatives.

Any one of these triggers, depending on its magnitude and importance, could set the initiation, compilation, adjustment or revision of a plan in motion. It could also result in the adjustment or total change in the future business strategy of the organisation. It is important to realise that triggers would always exist. The manager, supervisor or employee should, therefore, always be conscious of this fact and ensure that the necessary management controls are in place to timeously detect any significant trigger. A sound management practice is to adequately ensure that the best persons to act upon triggers should be able to timeously detect them. The worker busy producing the items should be the first to be able to react to a trigger applicable to his work results. Timeous identification of triggers would minimise losses, optimise returns and eliminate or minimise catastrophes. This management method would enable the employee to identify any deviation (refer section 2.2.1.1 (a), 5.4.3, 5.5.2, 5.5.4, figure 5.9, 5.10, 5.17 and table 5.2).

Methods to ensure that triggers are timeously identified and acted upon could vary from post to post, from department to department or mine to mine. The comprehensive management logic theory would enable all employees on all the levels of the organisation to institute the necessary means to enable them to be timeously 'informed' of triggers that would necessitate action.

Internal control reports must be developed with a view of timeously detecting triggers to indicate whether results are being achieved or not. Where significant triggers, based on predetermined criteria, do occur, they should be treated as factors, which could either be a threat to the achievement of the results or an opportunity for the improvement of the results.

Each employee, section, department and organisation should at all times have the management means to develop reporting systems in order to monitor the relevant internal and external factors. Mechanisms to timeously detect external and internal deviations, threats, opportunities, strengths and weaknesses must be the logical outflow of the management method.

In order to timeously identify triggers the employee should:

- use an appropriate management method that would facilitate the development of the required performance standards and the reporting systems,
- utilise existing plans,
- obtain the input of the relevant stakeholders,
- compile and scrutinise performance reports,
- perform personal observations,
- utilise company magazines,
- scrutinise external reports and relevant technical magazines,
- carry out investigations, and
- conduct relevant researches and surveys where and when necessary.

b) Investigate and analyse the factors involved

Once the trigger or triggers that warrant action had been identified, the responsible employee must investigate the conditions or situation. He must:

- i) identify the factors or reasons that resulted in the deviations or triggers,
- ii) determine the potential impacts of these factors on the planned results,
- iii) identify the most important factors,
- iv) establish the relationships and interactions between the important factors,
- v) calculate the impact of the factors on the results required, and
- vi) list the most important factors in order of priority.

The relationships between factors could also present specific opportunities. It is therefore important that the relationships and interactions be considered and where applicable hypotheses be compiled for further consideration and evaluation.

c) Estimate the impacts of these factors

At this stage the employee would have a list of the most important factors but not a final list yet. In order to ensure that the most relevant factors are identified, evaluated and selected the responsible employee should systematically evaluate these factors.

The employee should:

- i) for evaluation purposes state the decisive criteria such as costs, risks, safety implications etc.,
- ii) calculate the impacts of each relevant factor on the required results,
- iii) rank each factor in terms of the criteria, stated in i) above, and
- iv) select the final factor or factors.

d) Determine and forecast the most probable results

It is important that the employee should first investigate, evaluate and forecast the most probable results (refer section 2.2.1.1 (b), 5.4.1, 5.4.3, 5.5.2, figure 5.9, 5.10, 5.12, 5.13, 5.14, 5.15, 5.17 and table 5.2). The objective with forecasting is to establish the most probable achievable set of results that the individual or organisation should strive for. Taylor (2007:667) defined forecasting as a prediction of what would occur in the future.

Many management decisions are long-term decisions and therefore management has no other choice than to anticipate the future in order to realise the short and long-term objectives. In the example proposed the specific period was contractually 20 years with the possibility of an additional extension of 10 years.

Drucker (1968:113) argued that:

"Predictions concerning five, ten or fifteen years ahead are always 'guesses'. Still, there is a difference between an 'educated guess' and a 'hunch', between a guess that is based upon a rational appraisal of the range of possibilities and a guess that is simply a gamble."

Every employee, from the operator to the chief executive officer of the organisation, must perform the management work of forecasting on his own level. The information needs of each stakeholder in the specific situation must be satisfied. Without full involvement in the forecasting process the stakeholder would not be optimally informed, committed and motivated. He would most probably not plan adequately for the work required to ensure that the results required from him are achieved efficiently (Albers, 2005:93).

e) Discuss and state the most probable achievable results

For optimal results it is important that agreement on the most probable achievable results and the probability of success of achieving it be reached between all the relevant stakeholders in all the teams, sections, departments and the organisation as a whole (refer section 5.3.12.4 and figure 5.7). The selected results would form the basis for further planning for the specific employee, section, department or organisation. The most probable achievable results must, at this stage be specifically stated and qualified in the most exact terms possible (refer section 2.2.1.1 (c), 5.4.1, 5.4.3, 5.4.4, 5.5.2, figure 5.9, 5.10, 5.12, 5.13, 5.14, 5.15, 5.17 and table 5.2).

The responsible manager or employee must:

- i) compare the most probable results with the provisional results required,
- ii) discuss and reach mutual agreement with all stakeholders,
- iii) finalise and state the most probable achievable results,
- iv) ensure that the results required are expressed in measurable units as far as practical,
- v) set performance standards for each required result,
- vi) put the most probable achievable results in writing,
- vii) set time limits,
- viii) set tolerances,
- ix) specify exceptions,
- x) discuss in group meetings and where necessary adjust it, and
- xi) delegate for results required.

The steps above are necessary to ensure that all stakeholders are fully informed and involved in the determination of the results required from each of them. Only after the relevant stakeholders have made their respective inputs can the supervisor abandon, adjust or accept and state the most probable results which would then become the most probable achievable results that he would use to formulate his objective (refer figure 5.17).

The final agreed-upon results may differ from those originally required or forecasted. Once agreement has been reached between all stakeholders each employee must establish the necessary control measures applicable to his area of responsibility. Mutually agreed-upon most probable achievable results form the basis for effective planning, delegation and controlling. The objective is to ensure that the results that would make the greatest contribution to the performance of the employee, section, department and company are selected for planning. These results should be in line and complimentary to the final results required from the organisation.

The results required from the mine manager in the example can therefore be stated as follows:

- Quantity: ≥ 5 mtpa.
- Quality: ≥ 22.5 MJ/kg.
- Unit cost: $\leq R75.18$.
- Safety: Accidents: Nil.
- Environmental pollution: Nil.
- Health cases: < 5 Cases per annum.

6.2.1.2 Formulate the objective

Objectives are the leading guides toward the achievement of the most probable achievable results agreed upon. Objectives must be seen as the end results that must be planned for and are the specific results to be achieved within a stated time frame (refer section 2.6.2.1 (d) (iii)). Each employee must define the objectives for the results required from him. Once the most probable achievable results had been established the objectives or guiding directives could be formulated

(refer section 2.2.1.1 (d), 5.4.3, 5.4.4, 5.5.2, 5.5.4, figure 5.9, 5.10, 5.12, 5.13, 5.14, 5.15 to 5.15 (d), 5.17 and table 5.2).

For the successful realisation of organisational objectives the individual employee must know and understand the objectives he has to realise and to what extent these objectives would contribute to the realisation of the greater objective of his supervisor and those of the other stakeholders (Fritz, 2001:5). All objectives must be formulated, integrated, coordinated downwards, horizontally, vertically and finally upwards and verified with all the stakeholders during the planning process (refer section 5.3.5 and figure 5.3 and 5.4).

The objective is normally formulated as a concise summary or definition of the results required. It is extremely important to ensure that the objective includes the main components of the results required so that it could, for the period involved, serve as a clear directive to achieve the results required. It is necessary that all objectives in a company are formulated in futuristic terms, support each other and in turn support the general objective of the company.

The alignment of objectives is therefore imperative. It would result in a strong 'management force' directed towards the most optimal realisation of the company objectives as is illustrated in figure 5.6, 5.7 and 5.8. For any progressive company to stay ahead of the competition it would be imperative to always formulate challenging objectives and integrate and coordinate these objectives.

Depending on the results required the objectives could either be specific or general. A clear distinction should at all times be made between these two types of objectives where necessary. The process to formulate objectives is discussed in more detail in the following sections.

a) Base the objective on the results required

The components of the required results must be utilised in order to guide the employee to formulate the objective correctly. The objective therefore would only consist of the components of the required results because they are already expressed in measurable units against which the performance would be measured (refer section 6.2.1.1 (e) (iv)).

b) Formulate objectives in futuristic terms (start with "To")

Because an objective is a guide to direct the employee in his effort to achieve the required results it must be stated as a target – something that should be realised in the future. The future or period could be minutes or years depending on the nature of the specific plan or components of the plan. Objectives would have to be formulated for each task.

The objective for the mine manager in the example stated in section 6.2.1.1 (e) could for instance be formulated as follows:

To deliver the required quantity and quality of coal to the client timeously, economically and safely.

In this example the components of the results required are identified. The objective is based on the results required and it is formulated in futuristic terms.

c) Formulate challenging objectives

Many organisations resort to programs such as benchmarking, work breakdown structures, activity-based management and managing by objectives in order to improve their performance and competitive position (refer section, 2.5.2.3, 2.5.2.4 and 2.5.3.1). These management practices, however, only serve at the most a few of the management tasks and would therefore not solve the problem as a whole in the most efficient manner.

For real and lasting improvement and performance the challenge should be transferred to the employees. Challenging objectives, formulated by them, would be a continuing inspiration for them to improve their performance and ultimately that of the organisation as a whole (refer section 5.3.5 and figure 5.4).

Employees must be trained to:

- i) understand what objectives are,
- ii) correctly formulate their objectives,
- iii) identify the contribution their objectives will make to that of their supervisors, departments and the organisation as a whole,
- iv) take the interests of stakeholders into consideration when formulating objectives,
- v) always formulate challenging objectives,
- vi) align their objectives with that of their stakeholders, and
- vii) adjust objectives where and when necessary.

d) Align objectives

Often companies neglect to ensure that objectives are aligned. This could easily happen between sections and departments. It could therefore happen that some objectives in one department, although formulated with the best intentions as challenges, are not necessarily integrating and supporting the objectives of another department and that of the company as a whole.

A typical example is the production and maintenance departments. The production department would, for understandable reasons, want to always have maximum use of the production equipment in order to deliver the maximum production. The maintenance department, on the other hand, would want to have the equipment for as long as possible to carry out maintenance in order to ensure they meet their availability objectives. Although the intentions of the two departments are, in terms of the objective to optimise the resources at their disposal, quite legitimate it could totally be counter

productive and in fact could be degrading the optimal achievement of the results required by the department and the organisation as a whole.

Objectives should, for optimal performance, always be fully aligned and optimised in sections, departments and organisations (refer section 5.3.12.4, 5.3.12.5, figures 5.6, 5.7 and 5.8). It is clear that the objectives of the individual workers should jointly culminate into the objective of the team. Not only the team objectives but also the objectives of all the stakeholders in the specific situation should jointly contribute towards the optimal realisation of the objective of the section. The objectives of the sections should in turn culminate into the objectives of the departments and again the objectives of the departments into the general objective of the organisation (refer figure 6.3).

e) Integrate and coordinate objectives

Without the integration and coordination of the objectives within sections, departments and the organisation the company can not hope to perform competitively. It therefore becomes imperative that the individual workers, sections and departments should discuss their objectives and concerns that they may have with each other where applicable. Some of these concerns could be valid and should therefore be evaluated and utilised in order to formulate the most realistic objectives. The integration and coordination of tasks would be necessary on every level and post in the organisation. All employees should conscientiously apply it as part of their management work.

6.2.1.3 Determine the best method

a) Develop alternative methods

Normally it would appear that there could be more than one feasible method with which to achieve the required results. Ultimately there should be only one best method with which to achieve the specific predetermined most probable achievable results. The most feasible methods must now be generated and evaluated. The objective is to develop the most efficient methods from which to select the one best method in order to achieve the optimal results (refer section 2.2.1.1 (e), 5.5.3, figure 5.15 to 5.15 (d), 5.17 and table 5.2).

The manager or employee must:

- i) state the most probable achievable results required in explicit terms (refer section 6.2.1.1 (e)),
- ii) formulate the objective (refer section 6.2.1.2),
- iii) develop alternative methods (refer section 2.2.1.1 (e)),
- iv) screen each alternative method in terms of strengths, weaknesses, opportunities and threats, and probable achievement of the results required such as profits, costs, safety, etc, and
- vi) select the three to five most 'promising' alternative methods.

At this stage there can normally be no final decision made as to which one of the initial selected alternative methods would result in the most optimal outcome. Each initial selected alternative

method needs to be developed in terms of costs, risks, available equipment and technical skills to name only a few. No intelligent decision or conclusion could be made before the work flow or logical sequence of the necessary tasks, the analysis of the tasks and the required resources, budget and scheduling of each alternative had been completed. Only then the bottom line quantities would become available and could the best method be selected (refer figure 5.10, 5.17, 6.4 (a) to 6.4 (f) and table 6.1 (a) to 6.2 (h)).

b) Develop the work flow for each selected alternative method

The development of the work flow is defined as the determination of the logical sequence of the necessary tasks to be performed for each alternative method, the performance standards required for each task and the objectives for each task, in order to achieve the results required in the most efficient manner (refer section 2.2.1.1 (d), 2.2.1.1 (f), 2.2.1.1 (g), 5.5.3, figure 5.9, 5.10, 5.14, 5.15 to 5.15 (d) and table 5.2). Taylor, in effect, utilised this principle of developing each task into the smallest elements to analyse and evaluate the components of the tasks in order to develop the most efficient method (refer section 2.5.1.1 (b)).

The development of the work flow consists of the following three main steps:

- state the results required for each main task (refer section 6.2.1.1 (e)),
- formulate the objective (refer section 6.2.1.2), and
- break the alternative method down into supporting tasks (refer figure 5.14 and 6.2).

Figures 6.2 and 6.4 (a) to 6.4 (f) demonstrate the logical development of the work flow. If the work flow is not developed in a logical sequence the possibility that the employee would get confused and loose track of the comprehensive management logic increases. The consistent development of the work flow is an absolute requirement for the optimisation of the results required.

i) Procedure for development of the work flow

For each of the selected alternative methods the following procedure must be strictly adhered to at all times (refer section 6.2.1.3 (a) and figure 5.10, 5.17 and 6.2):

- commence with the results required (refer section 6.2.1.1(e)),
- formulate the objective (refer section 6.2.1.2),
- develop the selected alternative method into main tasks (refer section 6.2.1.3 (a)),
- state the main tasks explicitly and as verbs (work), avoid over-elaboration,
- state the results required (performance standards) for each main task (refer 6.2.1.1),
- formulate the objective for each main task (refer section 6.2.1.2),
- develop each main task into supporting tasks,
- state the supporting tasks as verbs in a practical and logical sequence,
- state the results required (performance standards) for each supporting task,
- formulate the objective for each supporting task,
- develop each supporting task into controlling tasks,

- state the controlling tasks as verbs in a logical sequence,
- state the results required (performance standards) for each controlling task,
- formulate the objective for each controlling task,
- develop the tasks further where necessary until the end tasks are identified in situations where it is required,

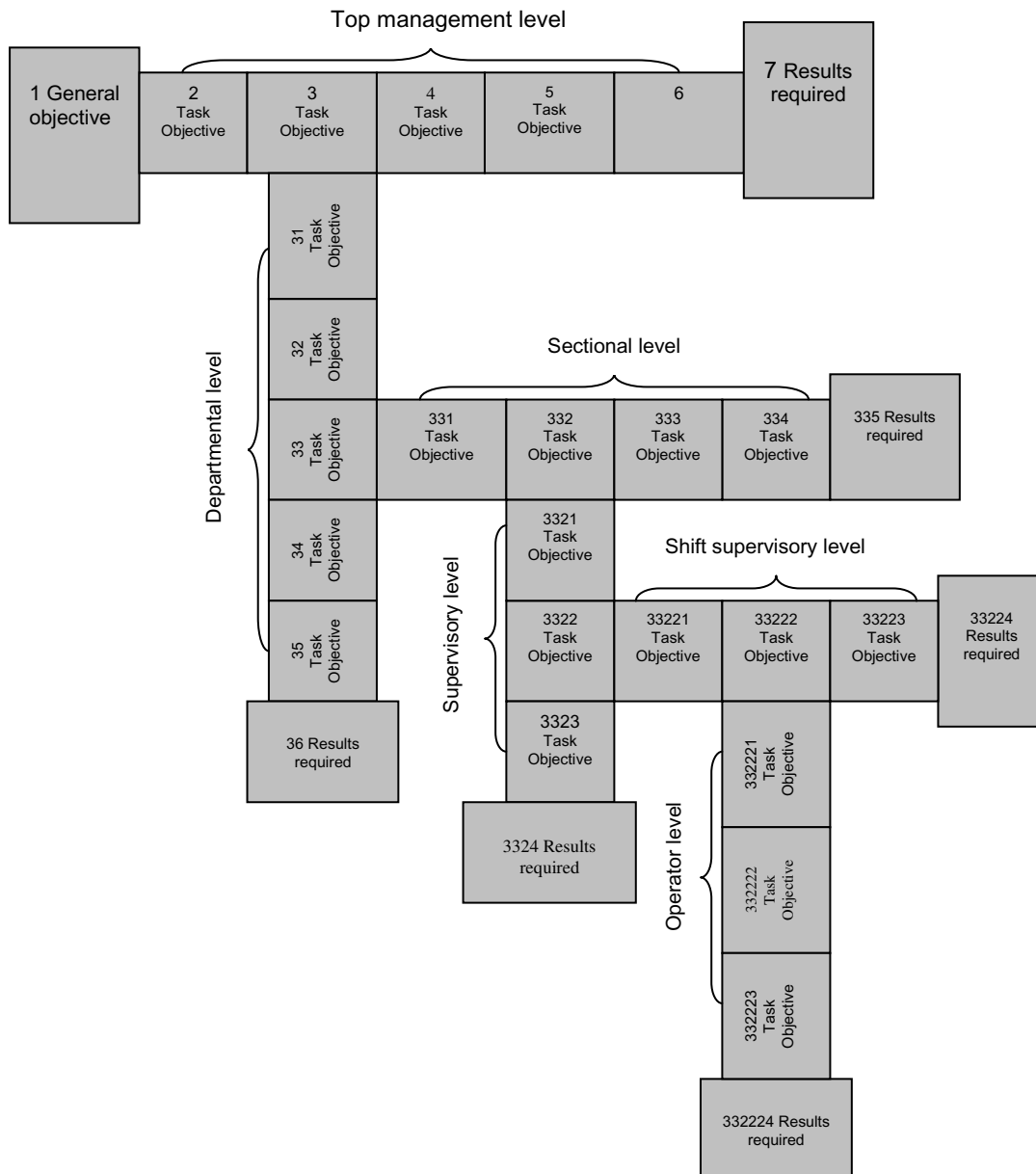


Figure 6.2: Example of the hierarchical development of the work flow in a typical mining organisation

- develop alternative methods for the achievement of each set of results required up to the last task, and
- consider optimisation at each level and for each alternative set of tasks at all times.

ii) Salient features of the work flow

The most salient features of the work flow are that it:

- logically describes the core business of the organisation and the employee,
- states the performance standards and objectives, aimed at the most efficient achievement of the results required,
- is the sum total of the results required or performance standards of the main tasks,
- is a perfect platform and vehicle for communication, decisionmaking and delegation,
- facilitates the development of the most efficient and functional organisational structure,
- is the ideal platform for participation, coordination, integration, creation of mutual commitment and acceptance of accountability (Gallie et al, 1998:90),
- facilitates the building in of the most productive work tasks (Walton, 1989:60),
- creates and develops trust (Barrat & Coppin, 2002:184),
- creates commitment and empowers employees,
- simplifies coding of the entire plan in the finest detail (refer figures 5.15 to 5.15 (d)),
- facilitates the adjustment and updating of plans and the development of what-if scenarios,
- enhances integrated hands-on management and control, and
- enables all employees and the organisation to comprehensively integrate and computerise individual, sectional, departmental and organisational plans.

iii) Development of the work flow of a mine manager

The developed theory and the procedure to develop the work flow would now be applied in order to determine the work flow for the mine manager and his subordinates down to the operator level (refer section 5.4.3, 5.5.2, 5.5.3. 6.2.1.3 (b), figure 5.14, 6.2, 6.4 (a) to 6.4 (f)). The mine manager should follow the steps as outlined in section 6.2.1.3 (b) and demonstrated in figure 6.2.

The results required were stated in section 6.2.1.1 (e). The objective was formulated in section 6.2.1.2 (b). The best method with which to achieve the stated results in the most efficient manner would now have to be determined. The manager must determine the best alternative with which to achieve the required results and develop it into main tasks.

For the purpose of developing the most probable alternative methods the following three alternative methods were considered:

- Buy the coal in,
- Utilise a contractor to supply the required quantity and quality of coal, or
- Mine the coal self.

For the purpose of developing the work flow of the mine manager and each Head of Department (HOD) reporting to him the alternative to mine the coal self would be developed. This alternative is developed into the following logical practical main tasks for the mine manager (refer figure 6.4 (a)):

- Provide reserves,
- Provide financing,
- Provide equipment and facilities,
- Provide manpower,
- Obtain the coal, and
- Deliver the coal.

The manager would now have to state the results that he requires from each of the main tasks and then formulate the objectives and develop the main tasks into supporting tasks and each supporting task again into controlling tasks. The main task to provide reserves (in tan) would be utilised as an example to further demonstrate the rules of the work flow development. The total unit costs of the departments could be less or equal to but not in excess of the unit cost of R75.18 of the mine manager (refer section 6.2.1.3 (b) (i) and figure 6.2 and 6.4 (a)).

The results required from the main task to provide reserves are:

- reserves in excess of 150 million tons,
- coal quality of not less than 22.5 MJ/kg,
- cost not exceeding R3.
- 55 per ton mined, and
- accidents = Nil.

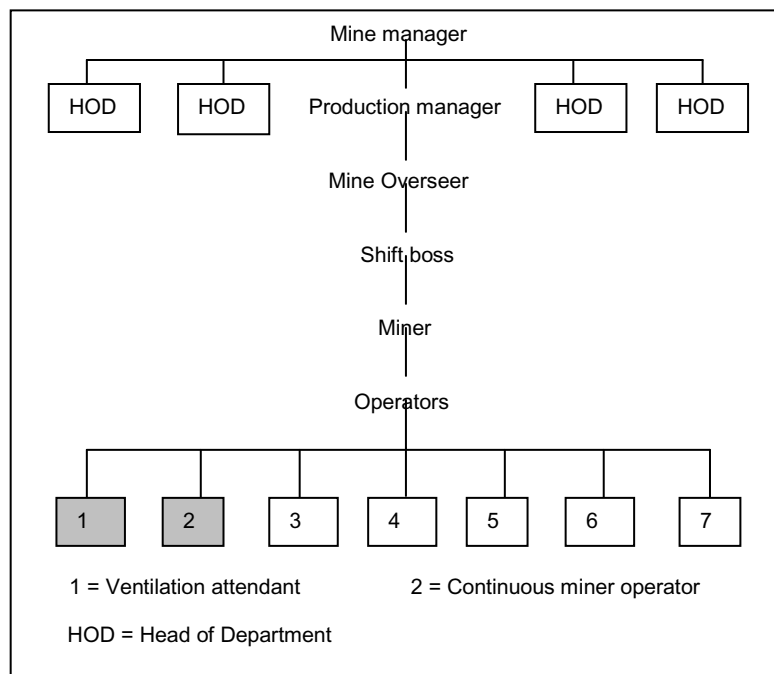


Figure 6.3: A typical colliery production organisational chart

The objective should be based on the results required from this main task. It can be formulated as follows:

To ensure that adequate reserves are available at all times to satisfy the customer's contractual needs in compliance with statutory and legal requirements.

Mine organisational structures could differ between the different mineral sectors and mining groups. Normally on underground collieries the structures would be very similar. A generalised underground colliery organisational structure is depicted in figure 6.3.

Alternative methods to realise the objective should now be developed and then the best alternative method should be selected. To provide and control the reserve base self is selected as the best alternative method to achieve the stated results.

It can now be developed into the following supporting tasks:

- reconcile reserves,
- utilise reserves, and
- acquire additional reserves when necessary.

The main requirements of the supporting tasks are that:

- they should adequately ensure the efficient achievement of the main tasks,
- they should be of a relative long-term nature,
- the total results required or performance standards of the supporting tasks should add up to the results required or performance standards of the main task, and
- the sum of the unit costs of the three supporting tasks should not exceed R3.55 per ton which is the unit cost of the main task to provide adequate reserves.

Each of the supporting tasks should be developed into controlling tasks. The main features of the controlling tasks are that:

- they are used to ensure the efficient execution and achievement of the supporting tasks,
- they would also be of a long-term nature,
- they are more subject to change or adjustment,
- the total results required or performance standards of the controlling tasks should add up to the results required or performance standards of the supporting task,
- the sum of the unit costs of the two controlling tasks of the supporting task to reconcile reserves should not exceed R1.43 per ton, and
- they control the execution of the supporting task in order to ensure the efficient achievement of the results of the supporting task.

The steps described above must be used to develop the main tasks and the work flow of the mine manager. The procedure would be applicable for all work flow developments. Once the work flow of

the mine manager is developed satisfactorily he would be in a position to delegate for the results required to his subordinates.

In the coal mining industry the main tasks of the mine manager are normally delegated as follows:

- provide reserves to the technical manager,
- provide financing to the financial manager,
- provide equipment and facilities and to deliver the coal to the resident engineer,
- provide manpower to the human resources manager, and
- supply coal to the production manager.

The delegation of results would be subject to the requirement that the work flow should be the optimum to deliver the most optimal performance. It is the first step in the development of the organisational structure. The heads of departments would go through the same steps as the mine manager and then in a feedback session jointly discuss their work flows with the mine manager and their colleagues.

The work flows of the heads of departments (HODs) reporting to the mine manager should commence or 'kick off' with the results required as delegated to them by the mine manager and could differ significantly from that of the mine manager. Once agreement had been reached the process should continue right down to the last levels in the organisation and to the last smallest tasks necessary. The task and resources analyses should be summarised and finalised from the lowest levels upwards to the top levels.

In the example the mine manager's main tasks to obtain and deliver the coal (in light green) would be used to demonstrate the flow and logic of the development of his work flow. It would also indicate the route of delegation from the mine manager to the production manager, mine overseer, shift boss, miner, continuous miner operator and the ventilation attendant and to the last tasks (refer figure 6.3, 6.4 (a) to 6.4 (f), and table 6.1).

After the completion of his own work flow the mine manager must develop his task and resources analysis as far as practically possible at this stage. It would enable him to identify the control measures for each task of his work flow. It would facilitate the delegation and controlling of the results he requires from each of his subordinates and the logical development of the work flows of his subordinates.

The potential total production of the eight production units is calculated at 5 322 240 tons per annum. At this volume the unit cost would also be less than the agreed upon R75.18 per ton. It is a sound approach that the mine plans on this higher volume. Extra production is always easier to cope with than below budget production.

In this example the process of developing the work flows and task and resources analyses of the line employees would be as follows:

- The mine manager should delegate the results to provide him with 5 322 240 tons per annum (443 520 tpm) of coal at a quality of not less than 22.5 MJ/kg and a unit cost not exceeding R21.93 to the production manager (refer figure 6.4 (a)).
- The production manager should delegate the results to provide him with 2 661 120 tons per annum (221 760 tpm) of coal at a quality of not less than 22.5 MJ/kg and a unit cost not exceeding R14.53 to each one of the two mine overseers in the production department (refer figure 6.4 (c)).
- Each mine overseer should delegate the results to provide him with 665 280 tons per annum (55 440 tpm) of coal at a quality not less than 22.5 MJ/kg and a unit cost not exceeding R11.53 to each one of the shiftbosses per shift in his department.
- Each shiftboss should delegate the results to provide him with 332 640 tons per annum (27 720 tpm) of coal at a quality of not less than 22.5 MJ/kg and a unit cost not exceeding R8.35 to each miner in his production section.
- Each miner should delegate the results to provide him with 1 260 tons of coal per shift (36 meter per shift) or 27 720 tpm (792 meter per month) and at a quality of not less than 22.5 MJ/kg and a unit cost not exceeding R5.35 to the continuous miner operator.

The rule is that the total results of the immediate subordinates of a particular supervisor should add up to but not exceed the results required from that specific supervisor. The production tons and the unit costs in the example used were taken to illustrate this point. This would apply to all the other results required where applicable.

The procedure should be continued with down the line as far as is necessary. This implies that:

- the best alternative method is developed into the most logical sequence of main tasks,
- each task necessary to achieve the results required is identified and included in the work flow,
- all resources and risks are identified,
- the necessary policies and procedures are compiled,
- the required control measures are compiled,
- all work are delegated,
- regular reporting on progress is instituted
- adequate corrective action is timeously taken, and
- the organisation can be scientifically designed.

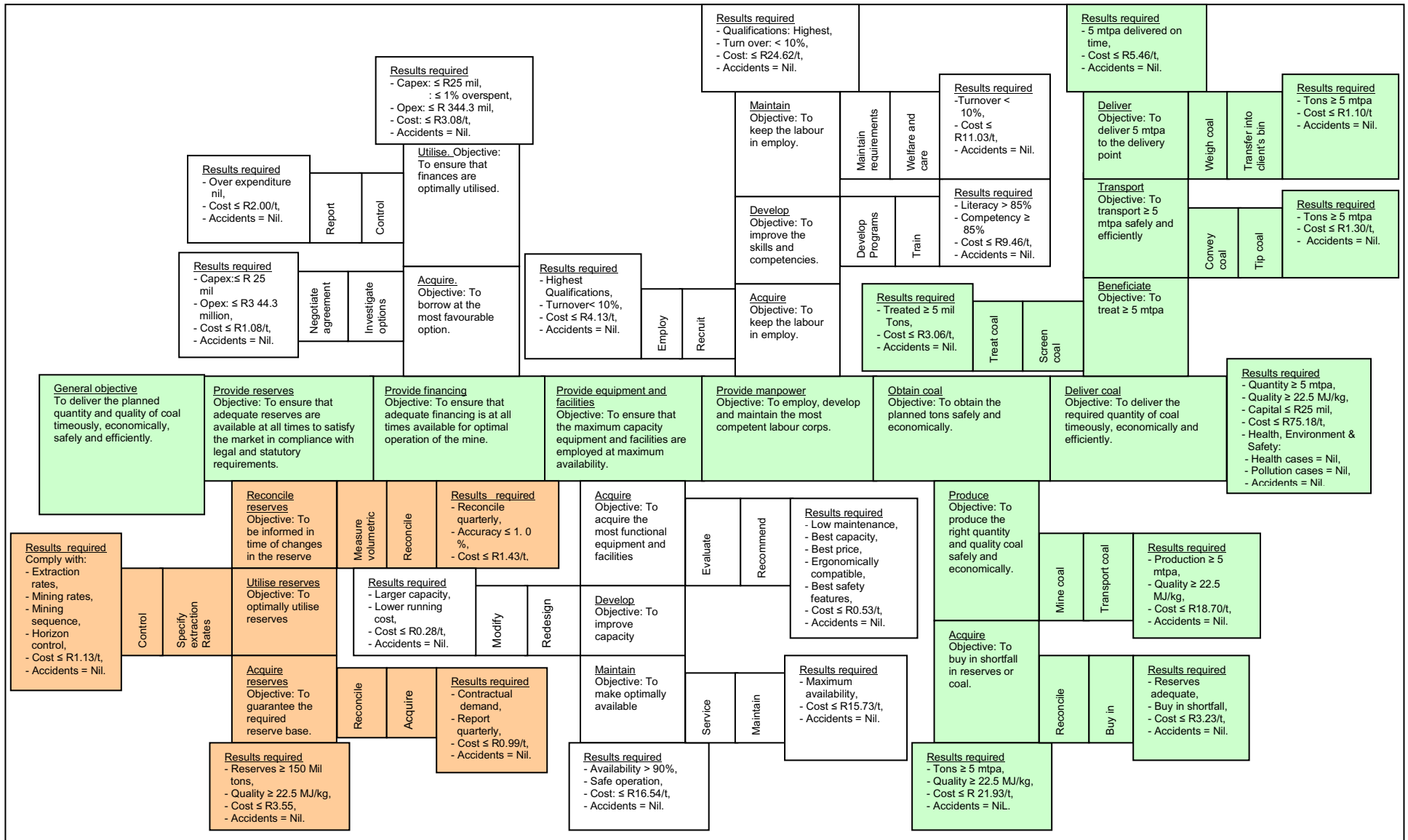


Figure 6.4 (a): Example of the work flow development of a mine manager

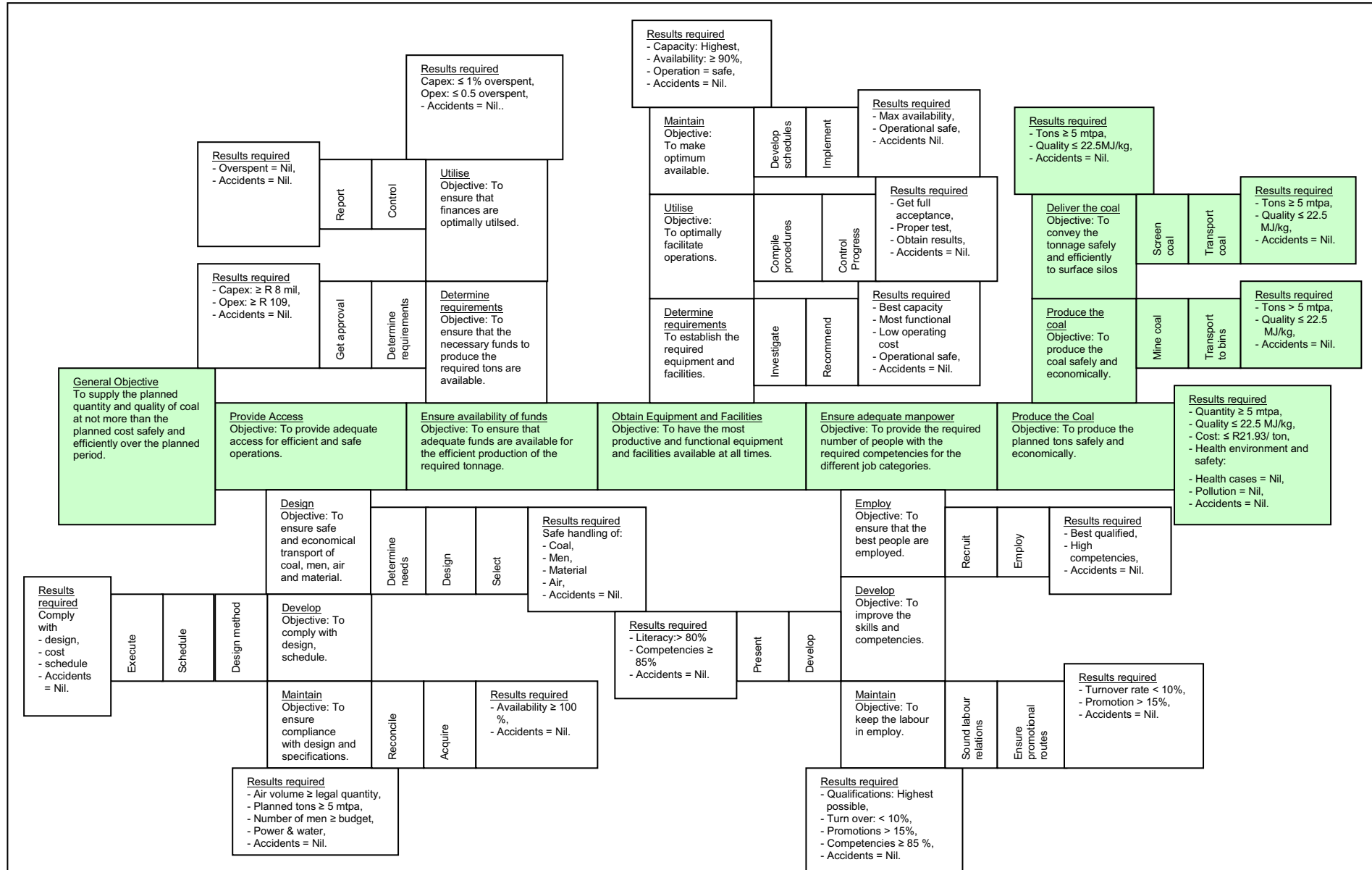


Figure 6.4 (b): Example of the work flow development of a production manager

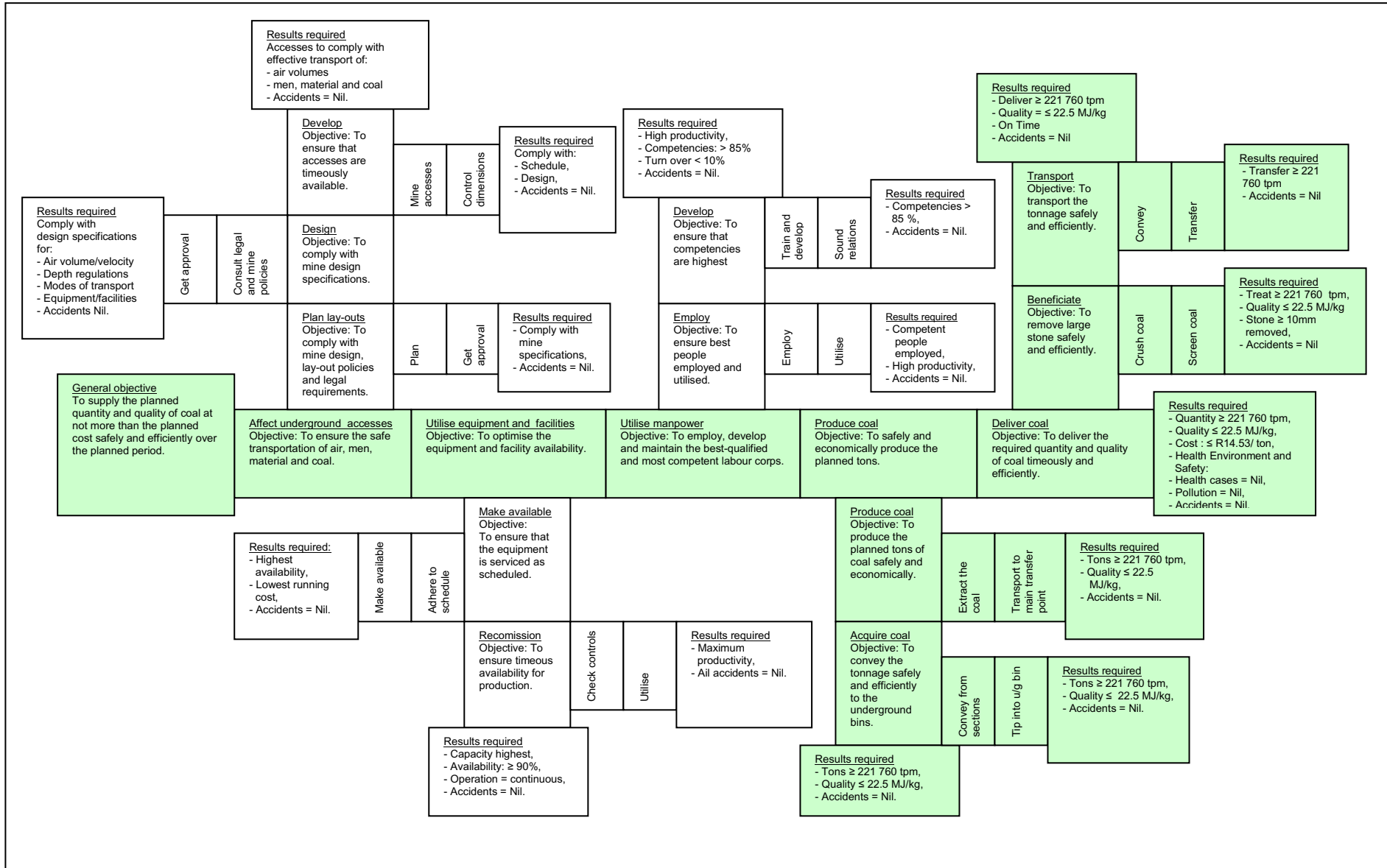


Figure 6.4 (c): Example of the work flow development of a mine overseer

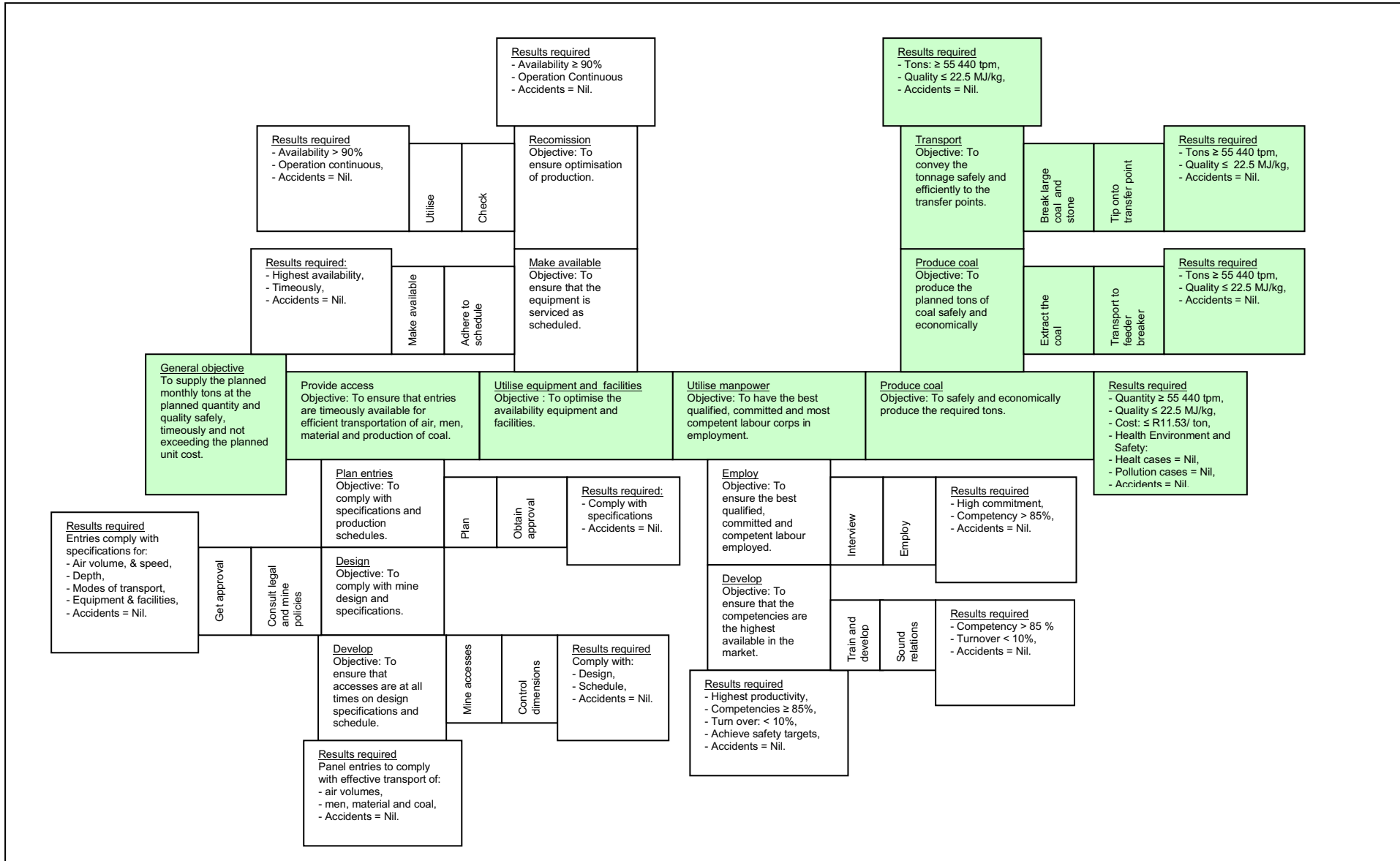


Figure 6.4 (d): Example of the work flow development of a shift boss

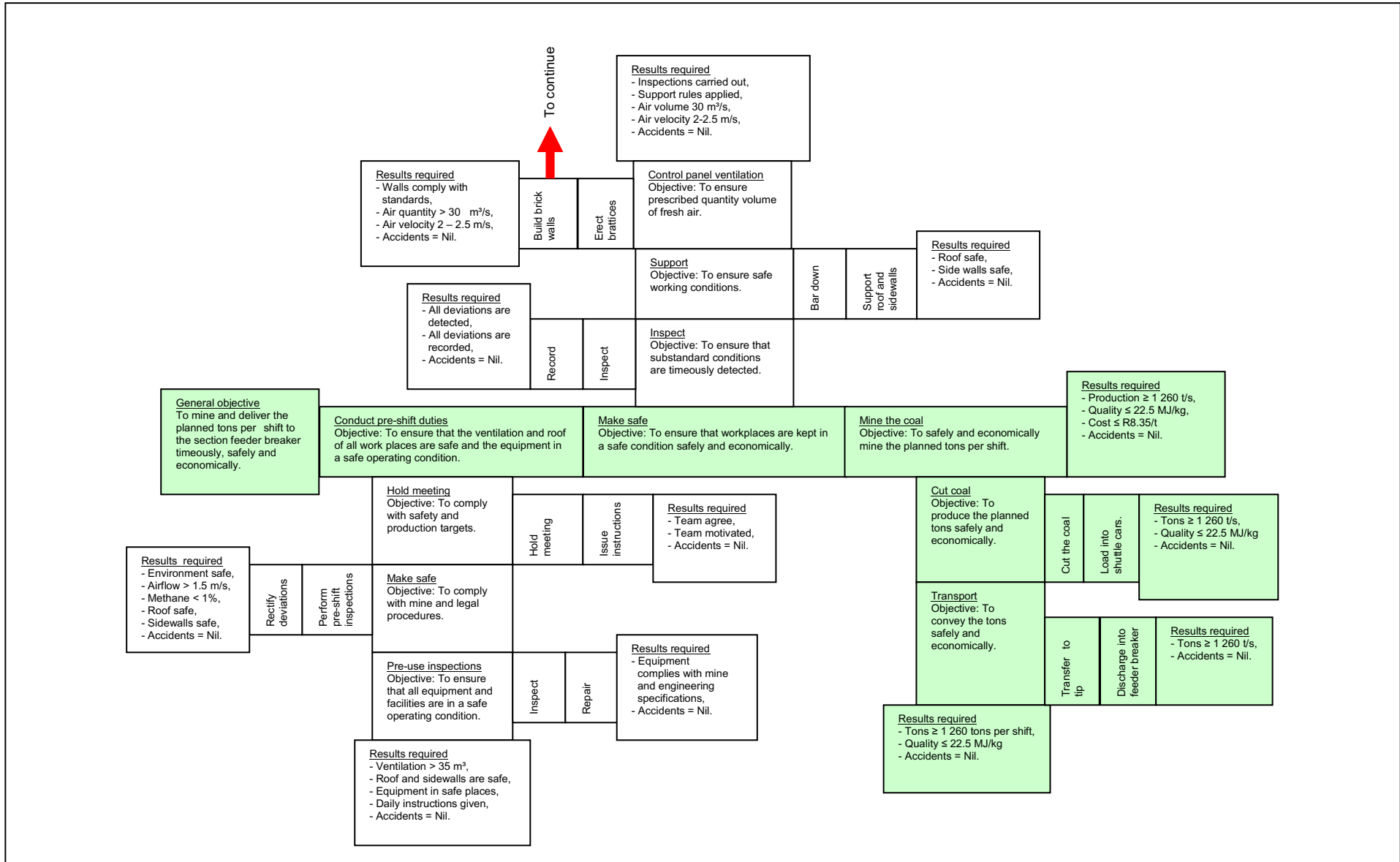


Figure 6.4 (e): Example of the work flow development of a miner

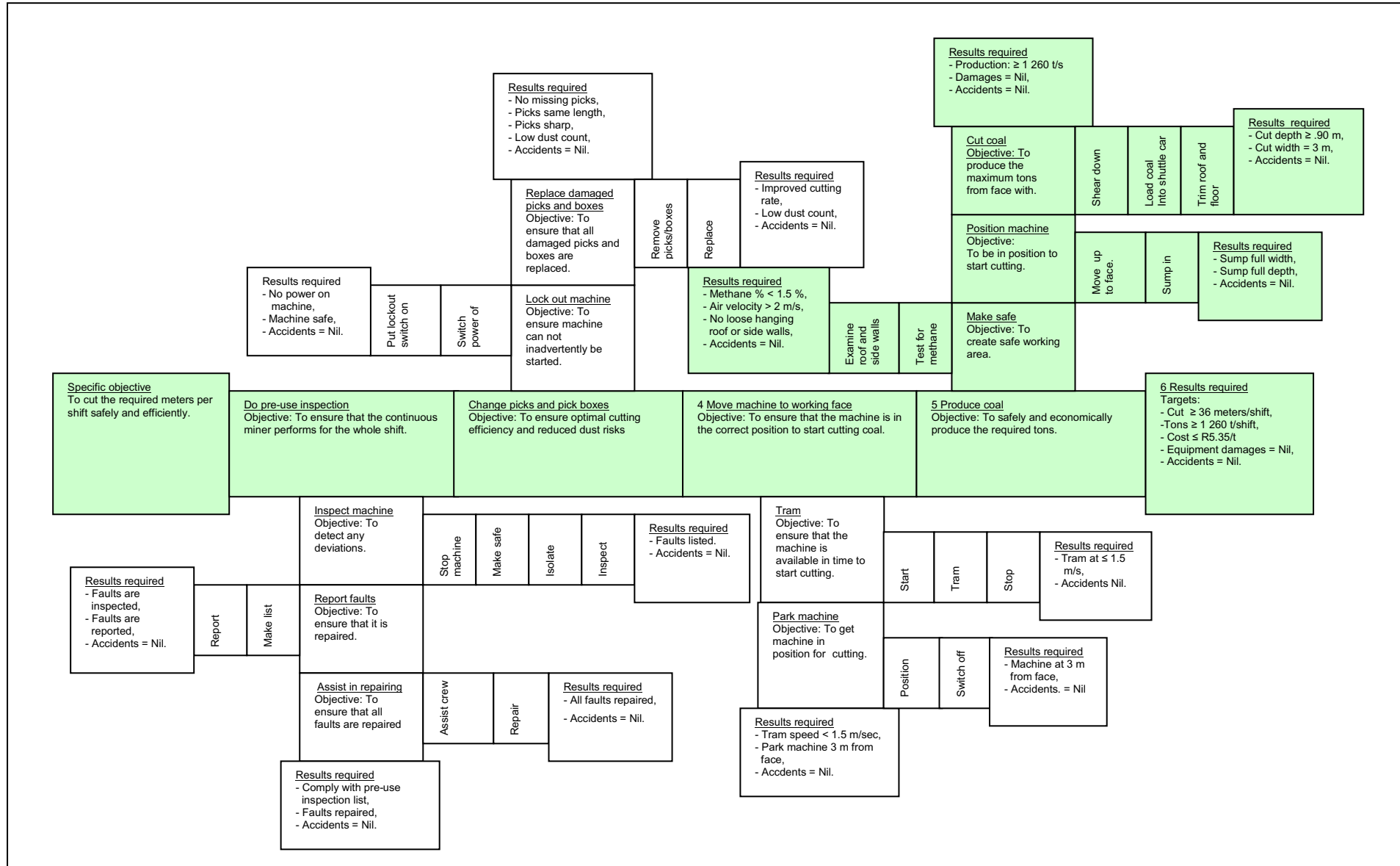


Figure 6.4 (f): Example of the work flow development of a continuous miner operator

c) Development of the task and resources analysis for each selected alternative method

Many management theorists are of the opinion that to organise the manager's job one has to start from the bottom up (Drucker 1968:173). The theory of the comprehensive, practical and integrated management method, however, maintains that the manager can only efficiently develop his job by commencing with the results required from him by his supervisor, working progressively down to the last task necessary and then progressively up.

The development of the task and resources analysis commences from the top and is finalised from the last task of the work flow of each operator, working progressively upwards (refer section 2.2.1.1 (h), (i) and (j) and table 6.2 (a), 6.2 (b) and 6.3 (a) to 6.3 (h)).

From the work flow diagram the following procedure should be followed:

i) identify tasks

- list each task
- assign an intrinsic code to each task,
- state:
 - > the performance standards, company policies and rules,
 - > statutory regulations, and
 - > any other applicable laws, regulations, agreements or restrictions applicable to each task,
- state the objective for each task,

ii) determine the resources required,

- state the labour,
 - > state the number, and
 - > the unit cost.
- Determine and state the equipment and facilities,
 - > type,
 - > number,
 - > required capacity of each,
 - > capital required, and
 - > unit operating cost.
- Determine and state the time,
 - > starting time,
 - > finishing time, and
 - > duration.

iii) list the performance,

- identify possible deviations, and
- determine the possible resulting consequences,

iv) identify the most probable hazards,

- establish what can go wrong, and
- what the possible consequences could be.

v) assess all risks,

- determine the probability,
- the possible severity,
- the severity rating, and
- the type of risk.

vi) develop preventative measures

- state the type and method, and
- establish the responsibility.

vii) determine the control measures

- establish the inspections
 - > determine the method,
 - > the frequency of inspections, and
 - > the accountability.
- Establish the supervision measures
 - > determine the accountability, and
 - > the type of supervision.

viii) establish the reporting procedures

- determine the accountability,
- the frequency, and
- the type.

The budget for each alternative method would follow logically from the task and resources development. It is important to remember that the total of the costs, capital, equipment, manpower and other resources must be calculated from the bottom upwards. Table 6.3 (a) to 6.3 (h) represents the specific items depicted in tables 6.2 (a) and 6.2 (b) in a larger and more practical workable format for ease of application in the practical situation. The meticulous development of the task and resources analysis is an absolute requirement for efficient planning.

Task Analysed (Part 1)																
1.				2.									3.			
Task Identification				Resources									Performance			
1.1	1.2	1.3	1.4	2.1			2.2					2.3			3.1	3.2
				Labour		Equipment					Time					
				2.1.1	2.1.2	2.2.1	2.2.2	2.2.3	2.2.4	2.2.5	2.3.1	2.3.2	2.3.3			
Code	Task	Perf. Stand	Objective.	No	Cost	Type	No	Capacity	Capt Cost	Unit Cost	Start	Finish	Duration	Probable Deviations	Probable Consequences	
Summary																

Legend							
P	Probability	S	Severity	R	Risk rating	T	Type of risk

Table 6.2 (a): Example of the task and resources analysis breakdown sheet (Part 1)



Task Analysed (Part 2)															
4		5				6		7					8		
Hazard Analysis		Risk Assessment				Preventative Measures		Control					Reporting		
4.1	4.2	5.1	5.2	5.3	5.4	6.1	6.2	7.1			7.2		8.1	8.2	8.3
								Inspections			Supervision				
What can go wrong	Consequences	P	S	R	T	Type	Responsibility	7.1.1 Method	7.1.2 Frequency	7.1.3 Accountability	7.2.1 Accountability	7.2.2 Type	Accountability	Frequency	Type



Legend						
P	Probability	S	Severity	R	Risk rating	T Type of risk

Table 6.2 (b): Example of the task and resources analysis breakdown sheet (Part 2)

2. Resources									
2.1		2.2					2.3		
Labour		Equipment/facilities					Time		
2.1.1	2.1.2	2.2.1	2.2.2	2.2.3	2.2.4	2.2.5	2.3.1	2.3.2	2.3.3
Number	Cost	Type	Number	Capacity	Capt. cost	Unit cost	Start	Finish	Duration

Table 6.3 (b): Components of the task and resources analysis sheet

5. Risk assessment			
5.1	5.2	5.3	5.4
Probability (P)	Severity (S)	Rating (R)	Type (T)



Table 6.3 (e): Components of the task and resources analysis sheet

7. Control				
7.1			7.2	
Inspections			Supervision	
7.1.1	7.1.2	7.1.3	7.2.1	7.2.2
Method	Frequency	Accountability	Accountability	Type

Table 6.3 (g): Components of the task and resources analysis sheet

8. Reporting		
8..1	8..2	8..3
Accountability	Frequency	Type

Table 6.3 (h): Components of the task and resources analysis sheet



Resources could include all resources necessary such as reserves, cost, equipment, people, instruments and material. Each resource would be evaluated in terms of the steps in the task and resources analysis. The necessary supporting plans or procedures should be identified and compiled during the compilation of the task and resources analysis. The supporting plans would support the managing of risks, safety, integration of work, coordination, communication, purchasing, labour recruitment and training and other work where applicable. This would eliminate the present haphazard compilation and introduction of policies, procedures, instructions and rules in a rather unscientific manner. It would minimise the omission of risks and would optimise the operational efficiency of the organisation.

The adjusting of the plan, creation of what-if scenarios, optimisation and updating of the plan or any section or part of the plan becomes extremely simple, efficient and cost effective. It is important to note that the risks not only for the tasks but also for the tools, equipment, material, environmental factors, rules and statutory laws and eventually for the methods of performing the tasks can most logically and efficiently be determined with this management method.

With the development of the tasks and resources analysis the time element for each task is identified. Since the development of the tasks follows from the need to realise an objective and objectives need to ultimately support the objectives of the supervisors, tasks are grouped and eventually consolidated into posts based on the requirements of realising a common objective during a shift. Posts can now be developed. The required qualifications, recruitment specifications, job descriptions and training schedules follow logically from this. As part of the development of the work flow and the task and resources analysis the organisational structure would be automatically developed. All the required technical work is developed during the development of the work flow and tasks and resources.

The task and resources analysis development sheet should be used intelligently in order to obtain the maximum benefits from it. For example one task could normally have more than one performance standard that it has to comply with. More than one possible deviation, hazard evaluation, consequence, preventative and control measures would normally be developed for one task. It would, therefore, be wise to fully develop each task before commencing with the next task. The development of the task and resources analysis breakdown sheet would as a rule be developed from left to right and finalised from the right to the left of the sheet.

The legend should be organisation-specific and would depend on the personal choices, preferences and requirements of the employees and the tasks. The purpose with the legend is to facilitate the application of the task and resources analysis breakdown sheet and the computerisation of the planning and management process.

At the operator or worker level the work flow and the task and resources analysis must be developed into the smallest possible tasks and resources. This would form the basis for the comprehensive, practical and integrated management method, capable of optimising all the

resources of the organisation, the loyalty, dedication, commitment and ingenuity of the organisation's most valuable asset, people. Allen's problem to propose a meaningful logic or taxonomy for the classification and practical application of management and technical work would therefore be solved with the introduction and application of the comprehensive, practical and integrated management method.

The mining industry has lately expressed serious concerns over its continually deteriorating position in the competitive global environment (refer section 1.2.9.7). The author of this thesis is convinced that the mining industry would have much more success in achieving optimal safety and operational excellence if they implement and apply the comprehensive, practical and integrated management method on all the levels of the organisation.

6.2.1.4 Develop the organisational structure

Most of the development of the organisational structure would follow from the task and resources analysis (refer section 2.2.1.1 (p) and 6.2.1.3 (c)). The organisational structure is necessary for the determination of the number of posts and consequently the number of people. Only once the number of people had been determined the labour cost could be established and the budget finalised. The main elements of the development of the organisational structure would, for clarity, be briefly discussed in the following sections.

a) Integrate the tasks supporting a single objective

Commencing at the operator level right at the bottom of the task and resources analysis development the tasks supporting a single objective should be grouped and integrated. The average duration time of the tasks is available from the task and resources analysis. It should be added up in order to group tasks until the total time required for example of the realisation of the specific objective of 42 meters cut per shift of the continuous miner operator is determined. Should the total time be less than the average effective shift time of six hours, the possibility of including related tasks with the previous tasks could be considered. If the total time required completing the tasks to cut the target meters is about five hours then the feasibility should be considered to train the operator to, also in addition to his normal tasks, carry out the pre-use inspection tasks. On the other hand should the time required to realise the objective be more than the shift time the target should be revised and adjusted to comply with the available shift time limit (refer table 5.2).

b) Develop the required posts

The posts should be formed from the bottom up and combined to form the teams and the first lines of supervisory posts (refer section 2.2.1.1 (o) and table 5.2). This is achieved by applying the logic of combining tasks that support a single objective. The tasks should be combined until the time required to perform the tasks equals the average effective shift time. This process

should be followed to develop the middle management and top management posts. The final or main objective would also be the objective of the chief executive officer and the organisation as a whole (refer section 2.6.2.8 (a) and (b)).

c) Form sections and departments

Once the tasks had been grouped and integrated and the posts developed the different sections and departments can be developed. A section would be serving a predetermined objective such as the delivering of a certain production volume or the supplying of specific maintenance services. In other words a section would then be the unit that would have to realise a predetermined objective.

A department would consist of a number of sections that all contribute towards realising an objective such as the delivering of the total planned production of the mine, the supplying of all the maintenance services to all the departments in the organisation or the supplying of all the financial services of the organisation. The golden rule is that posts, sections and departments have to comply with the requirement of realising objectives that contribute to the realisation of the general objective of the organisation.

All the departments and sections must efficiently function together so that all the objectives and ultimately that of the organisation as a whole are realised in the most efficient manner. The objectives of the different stakeholders should be coordinated to ensure the maximum effort in the realisation of the specific objective.

In the production sections the objectives of all the operators should be coordinated to eventually culminate into the production department. Very important is that the objectives of the other stakeholders such as the maintenance people be coordinated with that of the production people in order to facilitate the optimisation of the operations within the sections. This argument would apply to all the different sections and departments in an organisation.

In order to optimise the results of the section, department or organisation the most functional relationships need to be established (refer section 2.2.1.1 (t)). Each employee must understand that the other stakeholders in the specific environment all have delegated results to deliver in order to achieve the total results required from the section, department and organisation in the most optimal manner.

Every employee therefore needs to understand and accept that he has to supply the information, services and support where necessary to the specific stakeholders. The relationships would be determined with the development of the posts during the development of the task and resources analysis.

d) Establish accountabilities

In this thesis accountability is defined as the obligation that an employee undertakes to deliver specific predetermined results within the agreed time and performance standards. The time and performance standards had been established initially during the development of the work flow and finalised with the development of the task and resources analysis (refer section 2.2.1.1 (c)).

e) Delegate for the achievement of the required results

The supervisor must now officially delegate the work to a specific subordinate (refer section 2.2.1.1 (q)). He needs to clearly specify the results he requires from the specific subordinate. He also needs to specify the standards of performance that the required results have to comply with. It would be extremely important that each subordinate should understand and accept the performance standards required by the supervisor. It should in fact be a negotiated and mutually accepted process.

Allen (1973:123) defined delegation as:

"Delegating is the work a manager does to entrust responsibility and authority to others and to create accountability for results."

Once the subordinate agreed to the results and the performance standards he accepts full responsibility and becomes accountable for the delivering of the results at the specified performance standards. He now should have the authority to take the necessary decisions to enable him to deliver the agreed-upon results.

6.2.1.5 Schedule the tasks of each selected alternative method

Scheduling the tasks of each selected alternative method is the establishing of the time sequence and logical arrangement of the tasks for the achievement of the planned results in the most efficient manner (refer section 2.2.1.1 (j)). Once the work flow and the task and resources analysis had been completed the tasks can be scheduled and the critical paths determined in order to further optimise the time duration in achieving the results required, eliminate duplication and enhance integration and coordination (Eppen & Gould, 1979:643). The schedule in itself is a major tool for the controlling of progress and should be adjusted when and where necessary.

a) Establish priorities

The development of the work flow must be seen as a reasoned decision-making process. The mine manager for example would, during the development of the best method to deliver the required results, not commence with producing the coal before he had established what the

expected geological conditions would be, how it should be managed and what the costs to do it to the specific department and company would be.

The main tasks of each alternative method should be developed in a logical manner. This is achieved during the development of the work flow. From the main tasks onwards all the 'best' methods to achieve the stated required results should be logically developed in terms of the priority of the tasks (refer section 6.2.1.3 (a)).

b) List the tasks in sequence

With the comprehensive, practical and integrated management method the order of tasks is a logical outcome of the work flow development. The tasks are automatically developed and listed in sequence during the development of the work flow and the task and resources analysis.

c) Compile critical paths

Time is a very important element in the planning and execution of plans. It costs money and is critical in the optimisation of the operations. It is necessary to determine for each task the:

- starting time,
- finishing time, and
- the average duration time.

The time elements would be established during the development of the task and resources analysis. With the initial implementation of the comprehensive, practical and integrated management method it would be advisable to utilise professional time and motion study experts where necessary.

Eventually it would be advisable to train all the employees to determine these time elements where and when required. The time elements of tasks would assist the employee in optimising a specific operation by introducing shorter and equally or more effective steps (refer table 6.1 (a) and 6.1 (b)).

d) Optimise critical paths

The aim of the critical path analysis is to optimise the time that an operation would take to be successfully completed. Without the critical analysis of each task and operation it would not be feasible to optimise the operation (refer section 2.5.1.1 (b)). It may prove more advantageous to replace long duration tasks by shorter duration tasks with no detrimental effects on the outcome and quality of the required results. Apart from the obvious advantages of optimising the time duration of operations and ultimately the specific alternative method, critical paths are also imperative for more effective control.

6.2.1.6 Finalise the budget for each selected alternative method

a) Summarise the resources required

The budget largely flows logically and immediately from the task and resources analysis. It reflects and interprets the resources in terms of the finances, labour, material, equipment, time and the facilities and tools necessary to efficiently achieve the results required (refer section 2.2.1.1 (k) and table 6.2 (a) and 6.3 (b)). Each manager is accountable for the budgets that are developed in his department. To ensure that the budget is compiled, as efficiently as practically possible, the manager must ensure that all the stakeholders are involved in the budgeting process, accountability is explicitly established and that the reporting responsibilities of the stakeholders are determined and accepted.

b) Determine financing requirements

The financial requirements are determined during the development of the task and resources analysis. It is imperative that management differentiates between capital and operating requirements. Each would require different acquisition and control measures (refer table 6.2 (a)).

c) Express requirements in measurable quantities

It is important for effective budgeting and controlling that the required results be expressed in practical, understandable and measurable units for each post. This would be performed during the development of the work flow and task and resources analysis.

6.2.1.7 Select the best alternative method

Up to this stage the work flow, task and resources analysis, schedule and budget for each selected alternative method were compiled. The manager now has at his disposal a number of result outcomes, which must be evaluated in order to select the best method (refer section 2.2.1.1 (l)). The best method would be the one that would enable the manager to achieve the results required most efficiently as far as is practically possible. The manager must therefore endeavour to select the best method by means of the planning work performed.

The main purpose with the selection of the best alternative method is to ensure that the results required are achieved in the most efficient manner. This step as one of the most crucial steps in the planning process is rarely performed in practice. In the case where attempted it was normally performed unscientifically. As a result the best course of action is in most cases not implemented. Although the proposed procedure involves a lot of work it would handsomely pay for itself simply because the best course of action would be taken. In order to make the best choice each employee in the organisation should follow the following steps:

a) State the results required

The manager must at this stage state the mutually agreed upon results required, arrived at in section 6.2.1.1. These are the results that he has to achieve. The alternative methods were all developed in terms of these results. The manager must compare the results determined for each alternative method with the results required. Should there be significant differences negatively or positively impacting on the required results he must identify the magnitude of these differences (refer section 6.2.1.1 e).

The manager must perform a SWOT (strengths, weaknesses, opportunities and threats) analysis on each developed alternative method. Normally every alternative method would have strong as well as weak points. Associated with each would most of the time be identifiable opportunities and threats. The manager must identify these features and optimise and minimise it where practically feasible.

b) Make combinations where applicable

It may well happen that some of the strong points and opportunities of each alternative method could be utilised in optimising the alternative method. In such an event the manager must endeavour to combine these strong points with the strong points of the other alternative methods. The task and resources analysis is particularly suited for the incorporation, combination and optimisation of the strong points of alternative methods. Once computerised it would be fairly easy and cost effective to 'play' around with different what-if scenarios.

c) Evaluate each alternative method against the results required

The results of each one of the alternative methods must be evaluated against the most probable achievable results (refer section 6.2.1.1. (e)). It is possible that some of the results could be better than some of those of the most probable achievable results. For example the total production output may be in excess of what is required but the unit cost could be considerably higher. It is also quite possible that all the results of one alternative may be much better than those originally estimated but that the risks involved could be totally unmanageable. In such a situation the responsible employee should endeavour to identify and incorporate those tasks which would contribute to the development of a better alternative method.

Although it would involve a lot of work it is the duty of every employee in the organisation to develop the best plan practically feasible. In the long run the best plan would pay for itself in many ways especially in profits and the safety of employees. The manager or employee needs to consider all the advantages and disadvantages in order to arrive at the best decision. It is not always possible to calculate the advantages in exact terms but then someone has to rely on past experience or 'gut feel' and opinions of the other stakeholders.

d) Select the most probable best alternative method

The most probable best alternative method and hence the most probable achievable results would be the outcome of the steps discussed up to this point. It would be wise to have a last look at the possibility of improving this choice further before making the final decision to implement it.

e) Optimise the selected most probable best alternative method

The manager must adjust the method, if necessary, with the strongest or most positive aspects from the other alternative methods in an effort to optimise the results required even further (refer section 2.2.1.1 (w)). This final adjusted method in actual fact should be the best method.

The manager would now be in the best position to select the most probable achievable results. These results and the method that supports it must then be selected. It must be fully developed in terms of the work flow, task and resources analysis, scheduling and budgeting and implemented as the plan. In practice mine management do not always develop different alternative methods and select the best method. In reality the management theory to develop and arrive at the logical best method does not exist at present.

6.2.2 Implement the plan

Normally the plan needs to be studied, discussed and approved before it could be implemented (refer figure 5.15 (b) and table 5.2). The process of implementation should consist out of the following tasks:

6.2.2.1 Obtain approval for the plan

a) Discuss the plan with the stakeholders

All stakeholders should be involved in the process of obtaining the final approval. Normally the manager accountable would discuss the plan with the stakeholders in his area of responsibility and adjust the plan where necessary.

b) Reach agreement

The discussion with the stakeholders would serve to ensure that any omissions of new ideas or legitimate concerns could be discussed and solved before the implementation of the plan. The manager should test the plan with probable what-if scenarios. The previous inputs to the plan from the stakeholders should be specifically tested. Complete association, acceptance and commitment with the plan should be obtained. Once all the stakeholders agree with the plan the manager should establish accountability with each one of them for the results he requires

with the plan. The plan now becomes the domain and accountability of the manager. Before he could present it to his supervisor for approval he should ensure that he is satisfied and prepared to commit himself with the results required from him.

c) Adjust the plan where necessary

The manager must at this stage present the plan to his supervisor. He must emphasise that this plan is the best to deliver the results required from him and also outline the contribution and improvements the plan would make to the supervisor's results and to the results of the organisation as a whole. He should ensure that the results of the plan fully comply with all policies, regulations and standards applicable to the organisation. Where it would affect the results of other stakeholders he must point that out and to what extent. If the plan needs to be approved higher up in the hierarchy it would be the responsibility of the supervisor of the manager to obtain the approval.

6.2.2.2 Provide financing

In most situations in the mining industry financing would involve third parties, usually in the form of loans, share issues, mergers, direct purchases, take-overs or in some instances the formation of new ventures between local and international industries for relative large capital requirements. Usually mining ventures are extremely capital intensive and the sharing of responsibilities is a method to reduce risks and to ensure commitment and continual support of the main interest groups.

Eskom, in the early years, preferred to supply the capital for at least a major share of the project. It then would stipulate specific conditions such as the sole right to the coal reserves for the life of the power station and surety of supply. Importers of coal would normally share in the financing of the project with exclusive rights of supply and price benefits. Operating capital requirements would form part of the budget and could be financed out of retained profits.

a) Determine the financing requirements

With the determination of the equipment and infrastructure, during the planning phase, the capital requirements would be determined. The mine would invite tenders for possible purchasing and evaluate these tenders for the best possible suppliers. A sound practice would be to visit the factories of the potential suppliers of equipment in order to evaluate the product quality, ergonomical features, production capacities and general record of supply and service to customers (refer table 6.2 (a)).

b) Determine potential financing sources

Once the suppliers of equipment and facilities had been decided upon and the final acquisition prices negotiated and confirmed the required capital would be finalised. The conditions of payment, delivery times and insurance of equipment would be negotiated and confirmed.

c) Negotiate acquisition agreements

Normally the partners would supply the major share of the financing requirements. Each partner would make its own arrangements as far as the acquisition of its share of the capital is concerned. Different financing sources have varying conditions and the specific partner would be wise to be on the alert for loopholes or potential problem areas in the agreements.

d) Select the best option

In the mining industry the financing arrangements are of a long-term nature and various factors such exchange rates, inflatory trends, labour stability and conditions of pay back need to be considered. The company should utilise various financial instruments to determine the best options. Regardless of the sophistication of the evaluation and forecasting instruments it remains at best a difficult and risky decision. Specific protection clauses to the company should be negotiated where possible.

6.2.2.3 Provide equipment and facilities

a) Determine required capacities

The determination of the capacities of the equipment and facilities would mainly be a factor of the:

- i) expected lifespan of the venture,
- ii) planned production requirements,
- iii) compatibility of equipment and facilities,
- iv) historical operating costs of the equipment and facilities,
- v) purchasing prices, and
- vi) availability of equipment and facilities.

b) Select the most suitable equipment and facilities

The decision to purchase specific equipment and facilities are mainly determined by:

- i) the required and available capacities,
- ii) the performance history,
- iii) potential of performance,
- iv) experience of other users,

- v) ergonomics,
- vi) suitability to be modified and upgraded,
- vii) compatibility with existing equipment and facilities in the company and group,
- viii) stockholding requirements,
- ix) delivery times of spares, and
- x) trade-in values.

c) Arrange acquisition conditions

Organisations use various economic techniques to determine the most favourable acquisition conditions. Various options are normally proposed but in the majority of situations suppliers prefer outright purchases or paying in instalments. Lately some suppliers prefer rental agreements. Each alternative has certain advantages and disadvantages that need to be evaluated carefully by the company in order to take the most economical decision.

d) Arrange deliveries

To meet planned due dates orders should be placed with a view to have the equipment delivered, inspected, installed and tested operationally in time for the commencement of production operations. That would mean that orders should be placed with realistic lead times in order to make reasonable allowance for possible contingencies. The effects on the company of too early or too late deliveries should always be considered as a factor with possible serious financial consequences.

6.2.2.4 Provide people

Provision of the most competent people available in the labour market remains a high priority of any plan. The company's results are directly related to the competency, commitment and loyalty of its employees. Labour costs had become one of the major components of the unit cost of production. It is imperative that the most competent and the correct number of employees be employed.

a) Establish complements

The type and number of labour is determined during the planning task (refer table 6.3 (b)). One of the objectives of the task and resources analysis would be to determine the type of employees, the skills and competencies and the number of employees required with which to realise the general objective of the company. One of the major selection criteria would certainly be the potential of employees to be developed technically and in the work of management. The higher the potential the sooner the employees would become qualified for advancement. The number of labour is determined by using an eight-hour shift time per day per employee as basis.

The time required to efficiently perform a task would also be an outcome of the task and resources analysis (refer table 6.3 (b)). The supervisory labour should be established in a similar manner. A supervisor or manager should be accountable for the realisation of a common objective. In the case of the determination of the supervisory labour factors such as complexity of the tasks and post, supervisory and reporting requirements, travelling distances, mode of transportation and the nature of the work should also be considered.

b) Develop job specifications

During the development of the work flow the tasks required for each post were systematically determined in detail. These tasks would constitute the basis for the specifications of the specific post (refer sections 2.2.1.1 (n) and table 5.2). The sophistication, competency, skills and physical attributes required for each post would be developed from the task and resources requirements.

c) Recruit people

The recruiting specifications are directly compiled from the work flow and task and resources development (refer section 2.2.1.1 (n) and 2.2.1.2 (e)). The academic and physical requirements for each post could be derived from the work flow and task and resources development. The specifications would form the basis for the interviewing, selection and appointment of the most competent candidates available in the market. The task and resources analysis would, to some extent, assist in deciding on the recruitment methods and procedures to be applied.

d) Appoint the most suitable applicants

It is commonly accepted that employees are the most valuable assets of companies. It would therefore be imperative to endeavour to appoint the best available people, train and develop and empower them to be optimally competent in their work (refer section 2.2.1.2 (f) and table 5.2).

e) Compile training and development programs

The training and development courses would largely be derived from the tasks and equipment and facilities developed during the work flow and task and resources development (refer section 2.2.1.1 (y), 2.2.1.2 (h) and table 5.2). Where and when required additional training courses should be developed or acquired.

Taining is normally of a repetitive nature. The periods required for training and development and repetitive training of each part of the post and the post as a whole would be a factor of the sophistication and physical and intellectual demands of the specific post as well as the possible

advancement possibilities. Organisations should as a rule exercise strict control over training because it could become a high cost item if not judiciously determined, applied and controlled.

f) Train and develop people

In competitive labour markets employers need to be fair at all times in order to acquire and retain the labour with the required competency. The lack of specific knowledge, skills and competencies with regard to each appointee could be established during applications and interviews. The necessary training and development could be given once the appointee commences with service (refer section 2.2.1.2 (h) and table 5.2). An important requirement is that the company should endeavour to retain his labour. It should, therefore, develop and practice realistic, fair and competitive conditions of service agreements.

6.2.2.5 Commission the approved plan.

a) Construct the facilities

Before the plan could be put into effect the planned facilities need to be constructed according to the planned specifications in order to meet the performance standards developed during the development of the work flow and task and resources analysis. Substandard installations would inevitably result in unnecessary stoppages, increased costs, losses in production, poor health and safety performance and environmental pollution problems (refer table 5.2).

b) Commissioning of the equipment and facilities

Once the equipment is available, constructed, operationally tested, approved and the specific employees trained in the operating of the equipment and the facilities production can commence. The incumbents to which the various posts were delegated need to take control of their specific posts and commence to deliver the results for which they would be accountable. The operating procedures for controlling risks, supervision schedules, control and reporting, identified during the development of the task and resources analysis must as a prerequisite be utilised in order to ensure optimal operation and performance (refer tables 6.3 (f) to 6.3(g)).

c) Delegate accountabilities

At this stage of the plan it becomes necessary to delegate fully to the specific selected accountable employees. In the first stage of the delegation the employee was entrusted with the obligation to plan for the results required from him. Once these results had been discussed with the relevant stakeholders and adjusted and approved the second stage of the delegation should be completed. The second stage entails the acceptance by the employee to deliver the results as approved with the planned equipment and facilities and labour within the specific environment. It would mean that he would have to comply with all the policies, rules and

procedures applicable to his area of accountability. The supervisor should finally, preferably in writing, instruct the employee to deliver the required results in the most efficient manner at all times and give him the necessary authority to take all the decisions necessary in order that he could perform his work efficiently. If in agreement the employee should accept his accountability in writing.

d) Commence to produce

The first phase of the commencement of production should be on a test basis. This means that each part of the organisation should be gradually brought into operation up to the full planned production performance. Any deviation should be investigated, evaluated and corrected until the total organisation is in the desired planned operational condition. Only then the operations could be synchronised with all departments and stakeholders and finally tested. One of the greatest mistakes that mining concerns are inclined to make is to start 'pushing for results' as and when facilities become available. The wise thing to do would be to plan for the gradual running-in of the organisation.

6.2.3 Control the performance

In this thesis controlling is defined as the management work of measuring, evaluating and correcting individual and organisational performance to ensure that the performance complies with the stated standards planned. Once the plan is implemented the performance of the operators, sections, departments and the organisation as a whole must be regularly controlled in order to ensure that the planned results are achieved (refer section 2.6.2.4, and table 5.2).

The time periods at which performance are measured would increase from that at the operator level up to that of the chief executive officer level. For example the performance of the continuous miner operator may have to be measured, evaluated and corrected several times during the course of the production shift. To produce a normal accepted target of 1 200 tons per shift and the legal limitation to a maximum of 20 metres length cut without through ventilation about three ends would have to be cut during the shift. Regular inspections by the miner, the immediate supervisor, should be conducted to timeously detect substandard performance in order to maintain and improve performance and safety.

Negative deviations would negatively impact on safety and the total production for the shift. If not timeously detected it could result in accidents, damages to equipment and facilities and a loss of life and production. Changes on the higher levels normally do not have immediate direct quantitative influences and would not necessarily reflect as an underperformance; however, on this level changes or triggers such as decrease in demand or production cost increases could be catastrophic.

Once the plan is implemented ‘things’ would start to happen and the performance need to be timeously measured, evaluated and corrected where and when required. It is imperative that strict procedures should be instituted and maintained in order to ensure that performance are timeously measured, evaluated and corrected where and when necessary. The performance standards and the inspection and supervisory procedures for each task and resource are determined and stated during the development of the task and resources analysis (refer table 6.3 (a), 6.3 (g) and 6.3 (h)).

Supervision is defined as the management work of overseeing a task or tasks carried out by subordinates to ensure that it is performed according to the planned standards. It would normally consist of direct and indirect over-supervision. The immediate supervisor carries out the direct supervision and his supervisor the over-supervision. For example the miner should carry out the inspection of the performance of the continuous miner operator and the shift boss would carry out the over supervision. Supervision should consist of accountability, the type of supervision and regular reporting (refer table 6.3 (g)).

Inspection is defined as the task of the physical observing, measuring, evaluating and correcting deviations from actual results to the stated standards (Dessler, 1982:557). The inspections should consist of the method of inspection, the frequency and accountability (refer table 6.3 (g)).

6.2.3.1 Measure performance

a) Measure actual performance

The performance of every task from the smallest to the largest task in an operation must be controlled in order to ensure that performance standards are achieved.

To ensure that performance is timeously controlled the employee should:

- i) compile performance standards,
- ii) specify the units in which to express performance,
- iii) record the measurements.
- iv) record the deviations,
- v) correct those that should and could be corrected on the spot, and
- vi) give feedback to stakeholders where necessary.

The results of the measurements and corrective action must be reported on a prescribed reporting form for record purposes and for possible further action by management. It is good management practice to measure performance results in order to control performance, determine trends and institute timeous corrective action even before substandard performances do occur (refer table 6.3 (h)).

b) Categorise the deviations

All deviations should be categorised into those that:

- i) should be corrected immediately,
- ii) could be managed,
- iii) could be corrected later,
- iv) should be classified into tolerances, and
- v) should be classified into exceptions.

c) Specify control schedules

Work in progress and completed should be regularly inspected on a predetermined authorised schedule of accountability in order to ensure that equipment are inspected timeously. Inspections of underground workings are statutory compulsory. All inspection schedules should be determined and compiled during the task and resources analysis (refer table 6.3 (g) and 6.3 (h)).

6.2.3.2 Evaluate the performance

The deviations should be used and evaluated in order to:

- a) compare actual results against performance standards,
- b) establish the magnitude of the deviations,
- c) correct the deviations, and
- d) specify the deviations into tolerances or exceptions.

6.2.3.3 Correct the deviations

All deviations must be corrected as soon as is practically possible. The occurrence of deviations could be limited by adequate training so that the minimum deviations from the actions would occur.

Where and when deviations do occur the operator and supervisor should:

- a) determine the impacts of each deviation,
- b) establish priorities,
- c) compile corrective plans,
- d) implement the plans, and
- e) control the progress and results with the corrective action plans.

6.2.4 Compile the written plan

All plans from the operator level to the top level must be integrated, computerised and converted into written plans. They should be utilised for control and record purposes.

The written plans should, where applicable state the:

- 6.2.4.1 vision of the organisation if preferred,
- 6.2.4.2 mission of the organisation if preferred,
- 6.2.4.3 strategy and main objective of the plan,
- 6.2.4.4 results required and the objective to be realised,
- 6.2.4.5 development of the work flow,
- 6.2.4.6 development of the task and resources analysis,
- 6.2.4.7 budget,
- 6.2.4.8 supporting plans,
- 6.2.4.9 assumptions made during planning for each decision, and
- 6.2.4.10 detail required for sound decisionmaking, record keeping and history in the future.

6.3 PRACTICAL EXAMPLE

It is normal practice that during the development of the main underground accesses to new production areas, the ventilation airways that would serve the production areas need to be prepared. These airways would have to handle the ventilation flow to and from the production areas for the life of that specific reserve block which could be several years. The proven method is to build strong air leakage-proof brick walls (stoppings) to serve as partitions between the fresh and foul airways during the development and during the future operational stages of the accesses. One of the miner's tasks is to develop and prepare these accesses.

The miner has, as part of his team, some workers who are also trained to build the brick walls (refer figure 6.4 (e) task indicated with the red arrow). Normally one brick wall has to be build per day shift. He has different alternatives in order to make these walls available. He could contract it out or build it himself. The miner would build the wall with the labour provided in his team.

The results required could be stated as follows:

- Brick wall = 1,
- Height = 4 m,
- Width = 6 m,
- Thickness = 0.220 m,
- Maximum time allowed \leq 6 hrs,
- Total cost \leq R5 500,
- Accidents = Nil, and
- Damages = Nil.

The objective could be formulated as follows:

To deliver the required brick wall in an effective production shift of six hours safely and economically.

The best alternative to build the wall is developed into the following three main tasks:

- Supply mortar,
- Provide bricks, and
- Place the bricks.

The requirement to have the specific brick wall completed and available at the end of the shift as specified in the results required would entail that this task must be developed by applying the rules as discussed up to this point. In practice the complete development of this task would entail many pages and detail. In the context of developing this thesis it would result in a large increase of volume of the document. It was therefore decided to use a very direct and simple line of approach in the application of the rules. A single vertical line of development was consequently applied (refer table 6.7).

The work flow is developed in sequence as follows:

- the first main task to supply mortar,
- the first supporting task of the main task to measure components,
- the first controlling task of the supporting task to place measuring flask, and
- the first supplementary task of the controlling task to mark the position,

The manner in which this line was developed would also be applicable to the rest of the other identified tasks (refer figure 6.5 (a) to figure 6.5 (d)). The other identified tasks would be developed similarly in a logical sequence up to the last task as indicated by the arrows in red (refer figure 6.5 (a) to figure 6.5 (d) and table 6.7). The other tasks would be developed similarly up to the smallest task and resource necessary. These tasks would then form the basis for the development of the task and resources analysis.

The task and resources analysis in turn would establish the basis for the codification of tasks and items, the determination of the time duration, capital and running costs of the tasks, hazard analysis, development of policies, budget, procedures, training schedules and supervisory and control schedules. Once the task and resources analyses had been completed the plan can be summarised, coordinated and integrated upwards into the total plan per employee, section, department and organisation as a whole (refer table 6.8 and figure 6.6). In the development of the work flow to build a brick wall it is proved that the procedure as outlined in section 6.2.1.3 (b) is strictly applied. It is also clear that the development diagrams comply with the logic of the comprehensive, practical and integrated management method.

From figure 6.5 (a) to figure 6.5 (d) it can be seen that:

- the results required for each task are specified,
- the results required for the the main tasks to build a brick wall add up to the sum of results required to build the brick wall,
- the objective for each task is formulated, and
- all objectives support the realisation of the main objective.

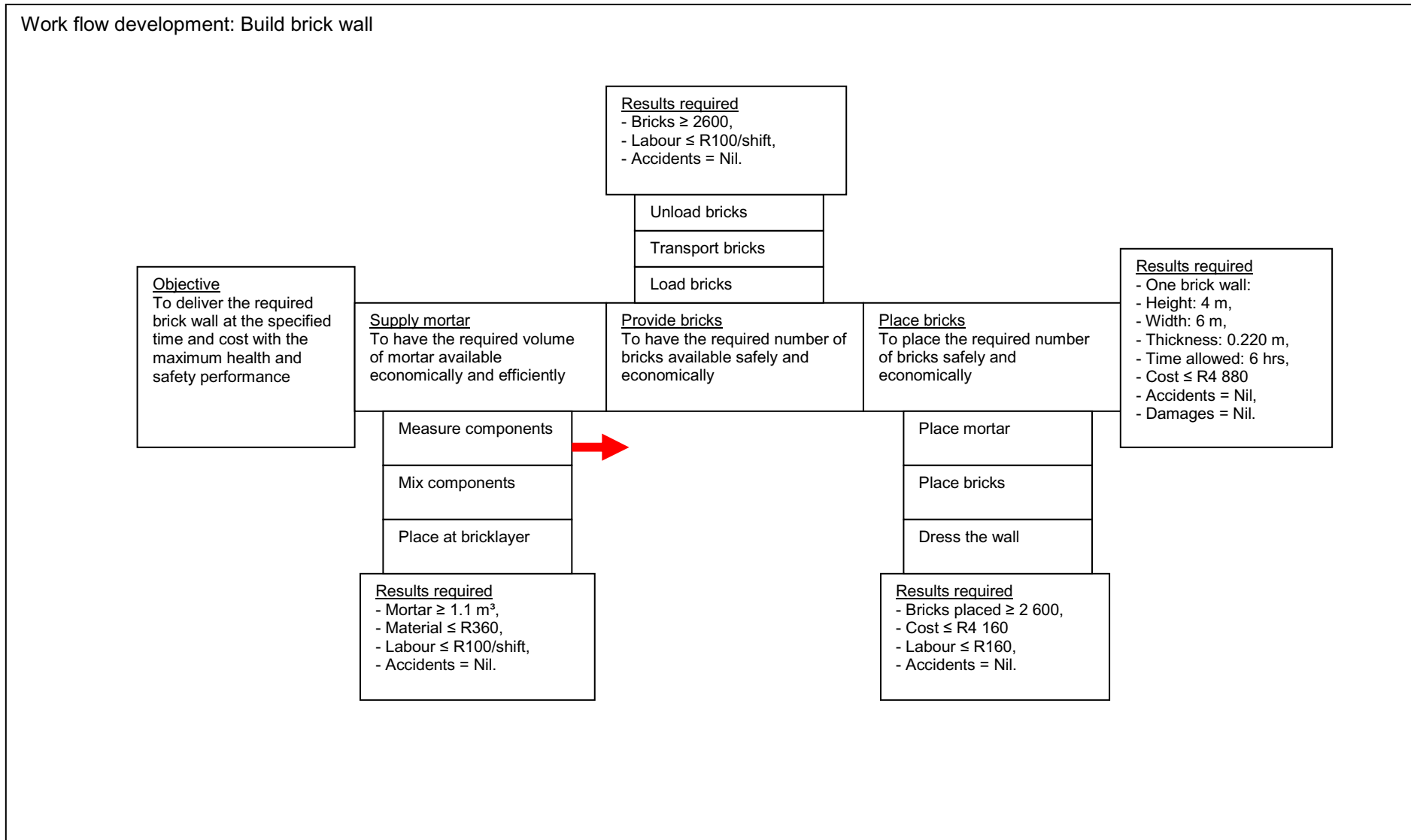


Figure 6.5 (a): Work flow development to build a brick wall

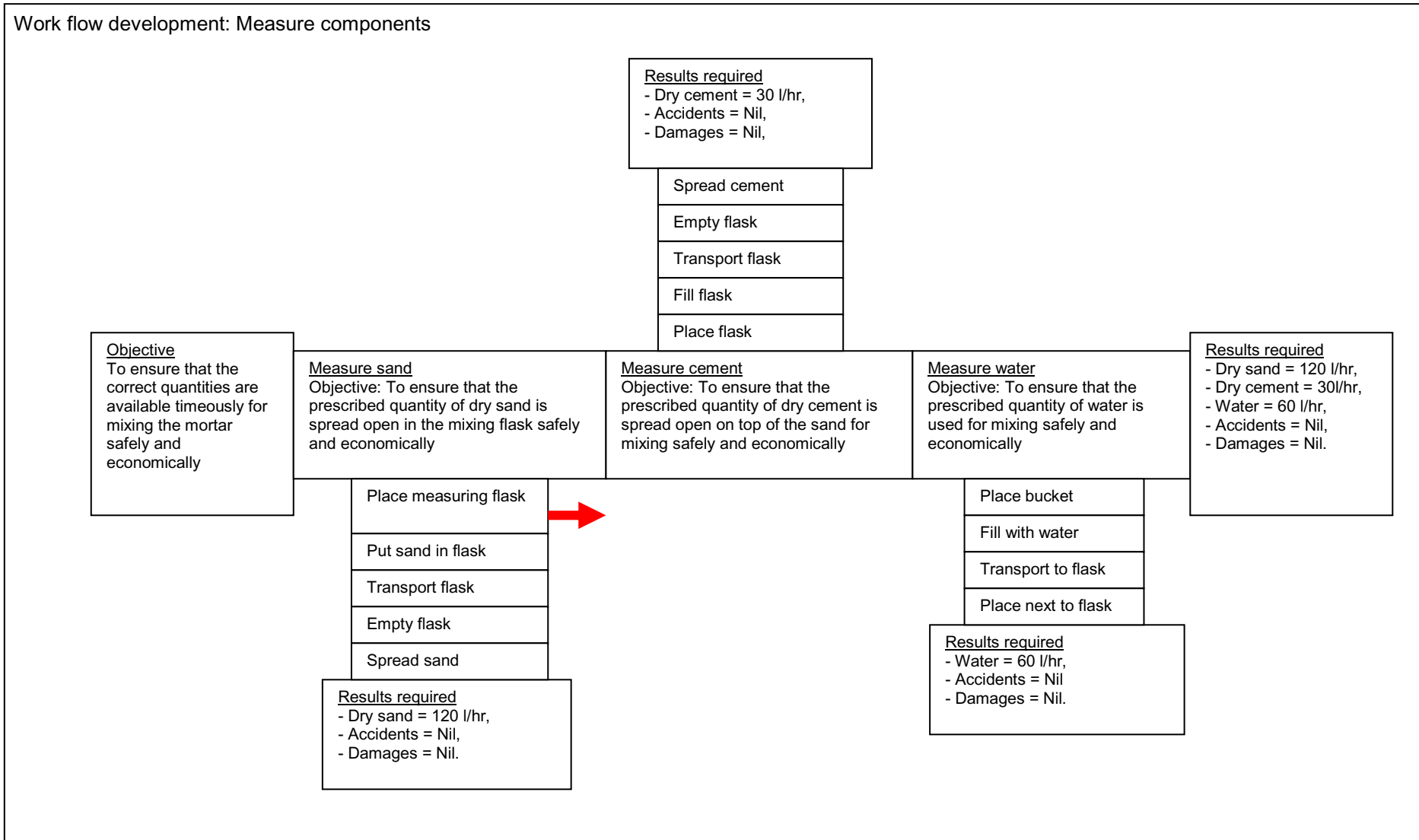


Figure 6.5 (b): Work flow development of the task to measure components

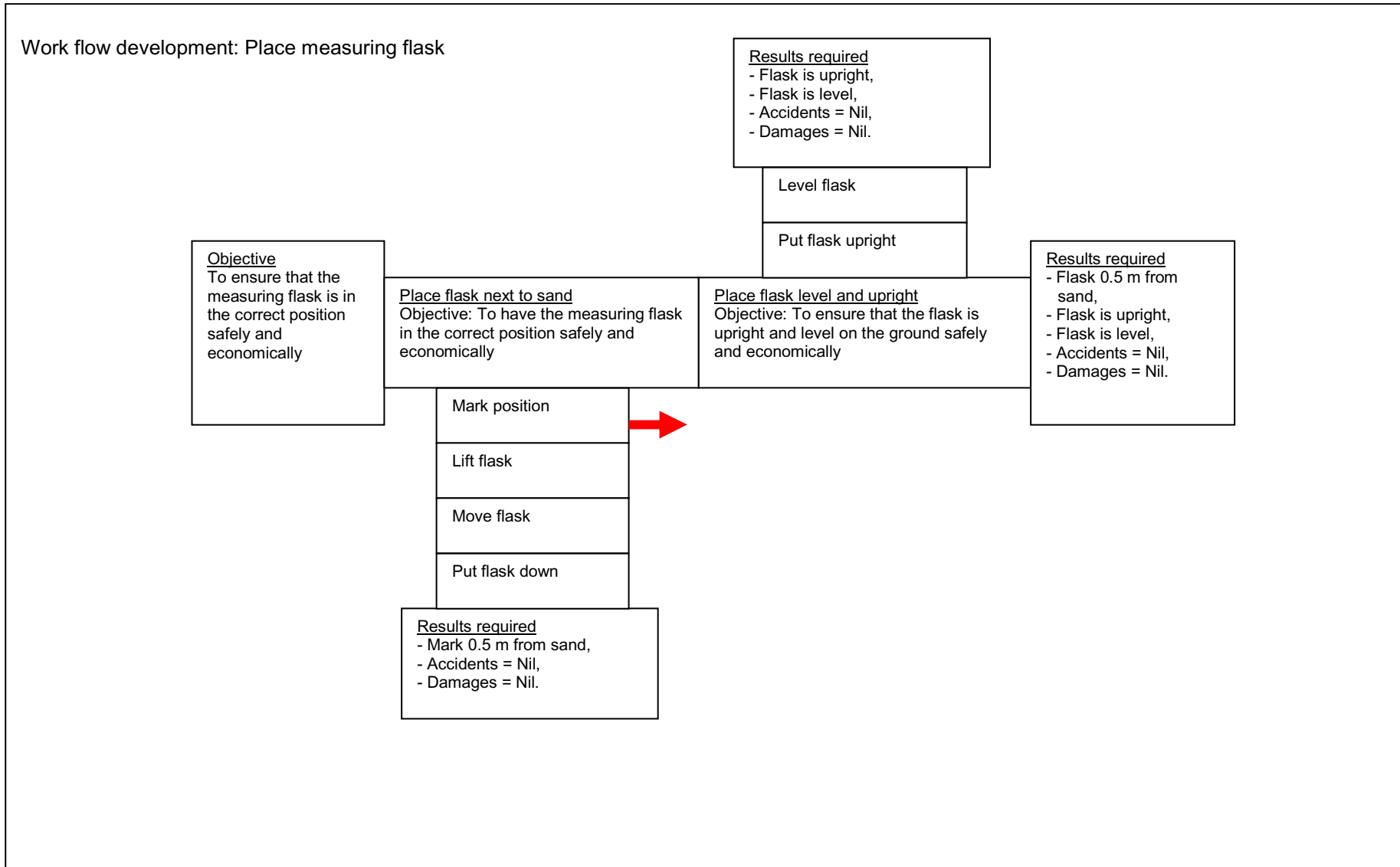


Figure 6.5(c): Work flow development of the task to place the measuring flask

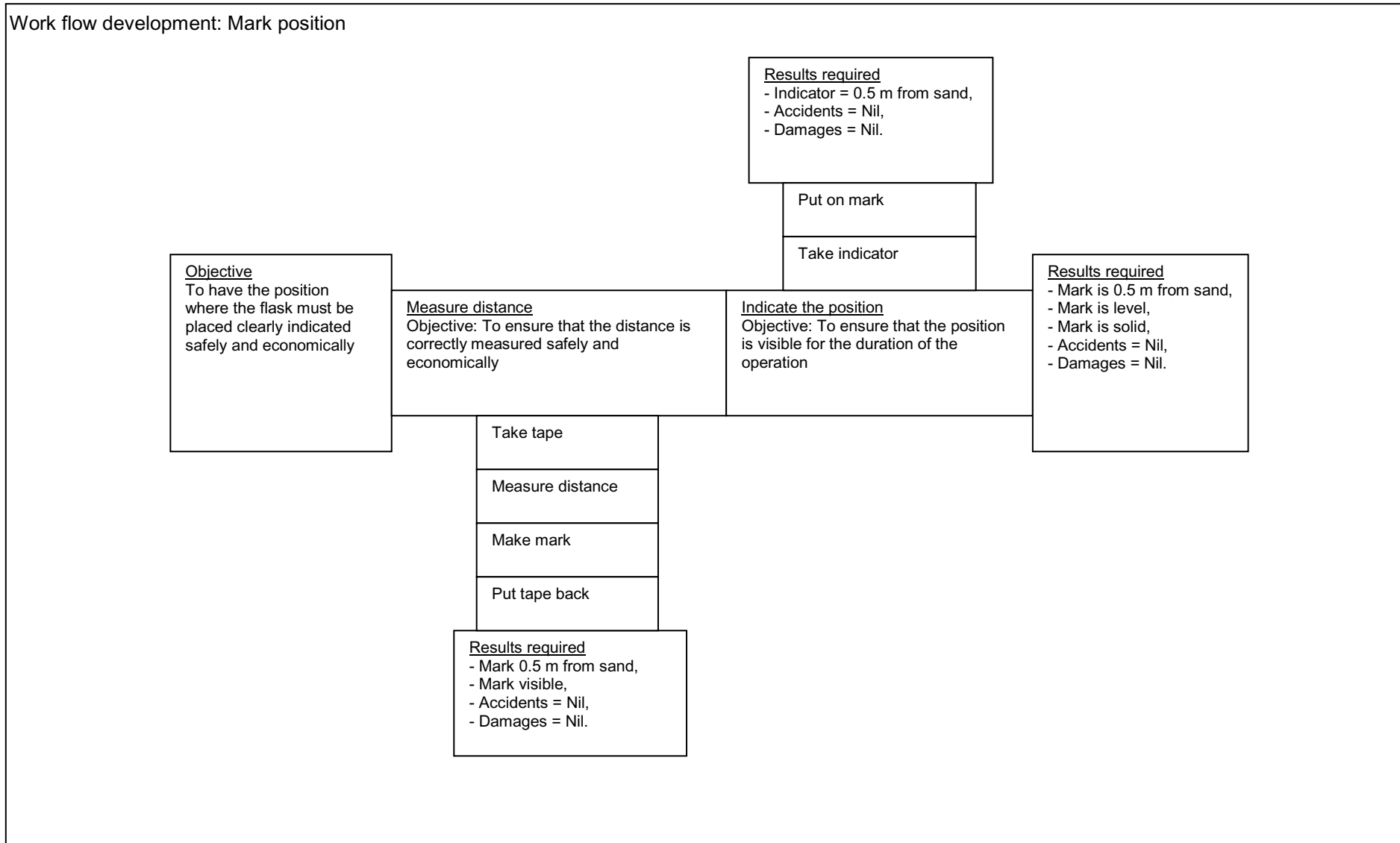


Figure 6.5 (d): Work flow development of the task to mark the position

The task and resources analysis would be compiled commencing with the last task of figure 6.5 (d) in this example. It should be realised that this exercise mainly serves to explain the application of the procedure to apply the comprehensive, practical and integrated management theory and is by no means intended to be complete.

The task and resources analysis would have to be developed in the following sequence (refer figure 6.5 (d) and table 6.4 (a) to 6.4 (h)):

- take indicator, and
- put on mark.

The total of the two tasks would represent the components of the task to indicate the position.

The next step of the task and resources development would be to develop the following tasks in the sequence as depicted below (refer figure 6.5 (d) and table 6.5 (a) to 6.5 (h)):

- take tape,
- measure distance,
- make mark, and
- put tape back.

The total of the four tasks represents the components of the task to measure the distance. In practice each of these tasks would be further developed into the smallest tasks practically feasible. All the required resources would be developed into the smallest components practical. The total of the tasks to measure the distance and indicate the position equals the tasks of the work mark the position. In this sequence the tasks to build a brick wall can be developed (refer figure 6.5 (d) and table 6.6 (a).to 6.6 (h)).

The comprehensive management logic makes it feasible to:

- develop work into the smallest tasks practically feasible,
- summarise tasks into jobs realising a specific objective,
- group jobs into posts and group posts into sections and departments,
- develop the most logical and practical organisational structure,
- identify and rectify the smallest risks,
- identify and rectify the smallest deficiencies or threats to performance and safety,
- compile the necessary procedures in order to efficiently manage operations,
- develop the required task-specific supervision methods and schedules,
- develop and institute effective reporting systems,
- develop a comprehensive, practical and integrated plan for each employee and the organisation as a whole, and
- computerise all the plans.

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1. Task identification: Indicate position			
1.1	1.2	1.3	1.4
Code	Task	Performance Standards	Objectives
	Take indicator	<ul style="list-style-type: none"> • Take with right hand • Mark on top • Mark is clear • Accidents Nil 	To ensure that the right indicator with the mark on top is firmly taken with the right hand
	Put on mark	<ul style="list-style-type: none"> • Indicator is on mark • Right side upwards 	To ensure that the indicator is placed at the mark on the right spot and at the right distance
Summary	1 x indicator	<ul style="list-style-type: none"> • Mark 0.5 meter from sand • Mark on solid surface • Mark is clearly visible • Accidents Nil 	To ensure that the position is clearly visible for the whole operation, safely, economically and efficiently

Table 6.4 (a): Task and resources analysis sheet of the task to indicate the position



2.1		2.2					2.3		
Labour		Equipment					Time		
2.1.1	2.1.2	2.2.1	2.2.2	2.2.3	2.2.4	2.2.5	2.3.1	2.3.2	2.3.3
Number	Cost	Type	Number	Capacity	Capt. Cost	Unit cost	Start	Finish	Duration
	R0.0232	Indicator	1	200 x 200 mm ²	R45.00		08:00	08:05	0:05
	R0.0232						08:05	08:10	0:05
	R0.0464	Indicator	1		R45.00		08:00	08:10	00:10

Table 6.4 (b): Task and resources analysis sheet of the task to indicate the position

3. Performance	
3.1	3.2
Possible deviations	Possible causes
Take with wrong hand	Carelessness
Indicator upside down	<ul style="list-style-type: none"> • Not properly trained • Lack of supervision • Carelessness

Table 6.4 (c): Task and resources analysis sheet of the task to indicate the position

4. Hazard analysis	
4.1	4.2
What can go wrong	Consequences
Could place it with mark at the bottom	Indicator would not be clearly visible
Mark not clearly visible	<ul style="list-style-type: none"> • May put mortar at the wrong place • Time loss • Unproductive

Table 6.4 (d): Task and resources analysis sheet of the task to indicate the position

5. Risk assessment			
5.1	5.2	5.3	5.4
Probability (P)	Severity (S)	Rating (R)	Type (T)
3	2	2	Unproductive Loss of time
2	4	4	Production loss

Table 6.4 (e): Task and resources analysis sheet of the task to indicate the position

7. Control				
7.1			7.2	
Inspections			Supervision	
7.1.1	7.1.2	7.1.3	7.2.1	7.2.2
Method	Frequency	Accountability		Type
Physical inspection	Three times per shift	Immediate supervisor	Supervisor of subordinate	Physical supervision
			Accountability	Test practically on job
Physical inspection	Three times per shift	Immediate supervisor	Supervisor of subordinate	Physical supervision
				Test practically on job

Table 6.4 (g): Task and resources analysis sheet of the task to indicate the position

8. Reporting		
8.1	8.2	8.3
Accountability	Frequency	Type
Immediate supervisor	Once per shift	Daily written report
Immediate supervisor	Once per shift	Daily written report

Table 6.4 (h): Task and resources analysis sheet of the task to indicate the position

1. Task identification: Measure distance			
1.1	1.2	1.3	1.4
Code	Task	Performance Standards	Objectives
	Take tape	<ul style="list-style-type: none"> • Tape in right hand • The correct length tape • Tape held firm 	To get hold of the measuring tape efficiently, cost effective and safely
	Measure distance	<ul style="list-style-type: none"> • Distance of 0.5 meter 	To have the flask put in the correct position
	Make mark	<ul style="list-style-type: none"> • Mark 0.5 meters from sand • Mark clearly visible 	To indicate the correct position clearly
	Put tape back	<ul style="list-style-type: none"> • Tape in belt pouch 	To keep the tape safe
Summary			

Table 6.5 (a): Task and resources analysis sheet of the task to measure the distance

2. Resources									
2.1		2.2					2.3		
Labour		Equipment					Time		
2.1.1	2.1.2	2.2.1	2.2.2	2.2.3	2.2.4	2.2.5	2.3.1	2.3.2	2.3.3
Number	Cost	Type	Number	Capacity	Capt	Unit	Start	Finish	Duration
	R0.023	Measuring tape	1	5 meter length	R85.00		08:00:11	08:00:15	00:00:05
	R0.023	Measuring tape	1	5 meter length	R85.00		08:00:16	08:00:20	00:00:05
	R0.023	Marking rod	1	0.30 mm x 12 mm	R12:00		08:00:21	08: 00:25	00:00:05
	R0.023	Belt pouch	1	80 x 80 x 50 mm	R25		08:00:26	08:00:30	00:00:05
	R0.092	Measuring tape	1	5 meter length	R122.00		00:00:11	08:00:30	00:00:20
		Marking rod	1	0.30 mm x 12 mm					
		Belt pouch		80 x 80 x 50 mm					
			3						00:00:20

Table 6.5 (b): Task and resources analysis sheet of the task to measure the distance



3. Performance	
3.1	3.2
Possible Deviations	Possible Consequences
Could have taken it with wrong hand	<ul style="list-style-type: none"> Carelessness Lack of adequate training
	<ul style="list-style-type: none">
Could over measure	<ul style="list-style-type: none"> Would increase distance Increase in time
Mark not 0.5 meter from sand	<ul style="list-style-type: none"> Would increase istance Increased time duration Retard task
Mark not clearly visible	<ul style="list-style-type: none"> Worker might not see it Might offload too far
Did not put tape in pouch	Might loose tape

Table 6.5 (c): Task and resources analysis sheet of the task to measure the distance

4. Hazard analysis	
4.1	4.2
What can go wrong	Consequences
Would have to switch it to the correct hand	Loss in time
Could let it have fallen	Increase in time duration
Longer time	Increase in costs
Longer time taken	Project duration would increase
Could loose time	Work is delayed
Could loose an asset	Additional unbudgeted expenditure

Table 6.5 (d): Task and resources analysis sheet of the task to measure the distance

5. Risk assessment			
5.1	5.2	5.3	5.4
Probability (P)	Severity (S)	Rating (R)	Type (T)
5	2	4	P
4	6	5	P
4	5	4	P
4	4	4	P
4	6	5	p

Table 6.5 (e): Task and resources analysis sheet of the task to measure the distance

6. Preventative measures	
6.1	6.2
Type	Responsibility
Institute a standard procedure how to take tape	Supervisor
Training	Training officer
Institute a standard procedure how to take tape	Supervisor
Training	Training officer
Institute standard procedure for making mark	Miner
Training	Training officer
Institute standard procedure	Miner
Training	Training officer

Table 6.5 (f): Task and resources analysis sheet of the task to measure the distance

7. Control				
7.1			7.2	
Inspections			Supervision	
7.1.1	7.1.2	7.1.3	7.2.1	7.2.2
Method	Frequency	Accountability	Accountability	Type
Physical inspections	Once per shift	Miner	Shift boss	Physical inspection
Physical inspections	Once per shift	Miner	Shift boss	Physical inspection
Physical inspections	Once per shift	Miner	Shift boss	Physical inspection
Physical inspections	Once per shift	Miner	Shift boss	Physical inspection

Table 6.5 (g): Task and resources analysis sheet of the task to measure the distance

8. Reporting		
8.1	8.2	8.3
Accountability	Frequency	Type
Miner	Once per shift	Miner's shift report
Miner	Once per shift	Miner's shift report
Miner	Once per shift	Miner's shift report
Miner	Once per shift	Miner's shift report

Table 6.5 (h): Task and resources analysis sheet of the task to measure the distance

2. Resources									
2.1		2.2					2.3		
Labour		Equipment					Time		
2.1.1	2.1.2	2.2.1	2.2.2	2.2.3	2.2.4	2.2.5	2.3.1	2.3.2	2.3.3
Number	Cost	Type	Number	Capacity	Capt cost	Unit cost	Start	Finish	Duration
	R0.0926	Measuring tape	1	5 meter long	R85.00		08:00:10	08:00:30	00:00:20
		Marking rod	1	300 x 12 mm	R12.00				
		Belt pouch	1	80 x 80 x50 mm	R25.00				
	R0.0463	Indicator	1	200 x 200 mm ²	R45.00		08:00:00	08:00:10	00:00:10
		1 Measuring tape			R85.00		08:00:00	08:00:30	08:00:30
		1 Marking rod			R12.00				
		1 Belt pouch			R25.00				
		1 Indicator			R45.00				
	R0.1389		4		R167.00				00:00:30

Table 6.6 (b): Task and resources analysis sheet of the task to mark the position

3. Performance	
3.1	3.2
Possible deviations	Possible reasons
Could take tape with wrong hand	Carelessness
Could over or under measure	Lack of training
Mark not 0.5 meter from sand heap	Would increase distance
Mark could be unclear	Task would take longer
	Worker might not see mark
Can take indicator with wrong hand	Carelessness
Indicator could be upside down	Not properly trained
	Lack of supervision

Table 6.6 (c): Task and resources analysis sheet of the task to mark the position

4. Hazard analysis	
4.1	4.2
What can go wrong	Possible consequences
Would have to switch rand hand	Loose time
Did not concentrate	Distance would increase or decrease
Did not read tape correctly	Would have to remeasure
Would have to remeasure	Would increase time
Would have to switch over to right hand	Project duration would increase
Would have to turn it around	Work is delayed

Table 6.6 (d): Task and resources analysis sheet of the task to mark the position

5. Risk assessment			
5.1	5.2	5.3	5.4
Probability (P)	Severity (S)	Rating (R)	Type (T)
4	6	5	P
3	4	4	P

Table 6.6 (e): Task and resources analysis sheet of the task to mark the position

6. Preventative measures	
6.1	6.2
Type	Responsibility
Institute standard procedure	Miner
Train	Training officer
Institute training procedure for marking position	Miner
Train	Training officer



Table 6.6 (f): Task and resources analysis sheet of the task to mark the position

7. Control				
7.1			7.2	
Inspections			Supervision	
7.1.1	7.1.2	7.1.3	7.2.1	7.2.2
Method	Frequency	Accountability	Accountability	Type
Physical inspection	Once per shift	Miner	Shift boss	Physical inspection
Physical inspection	Once per shift	Miner	Shift boss	Physical inspection

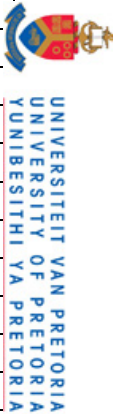
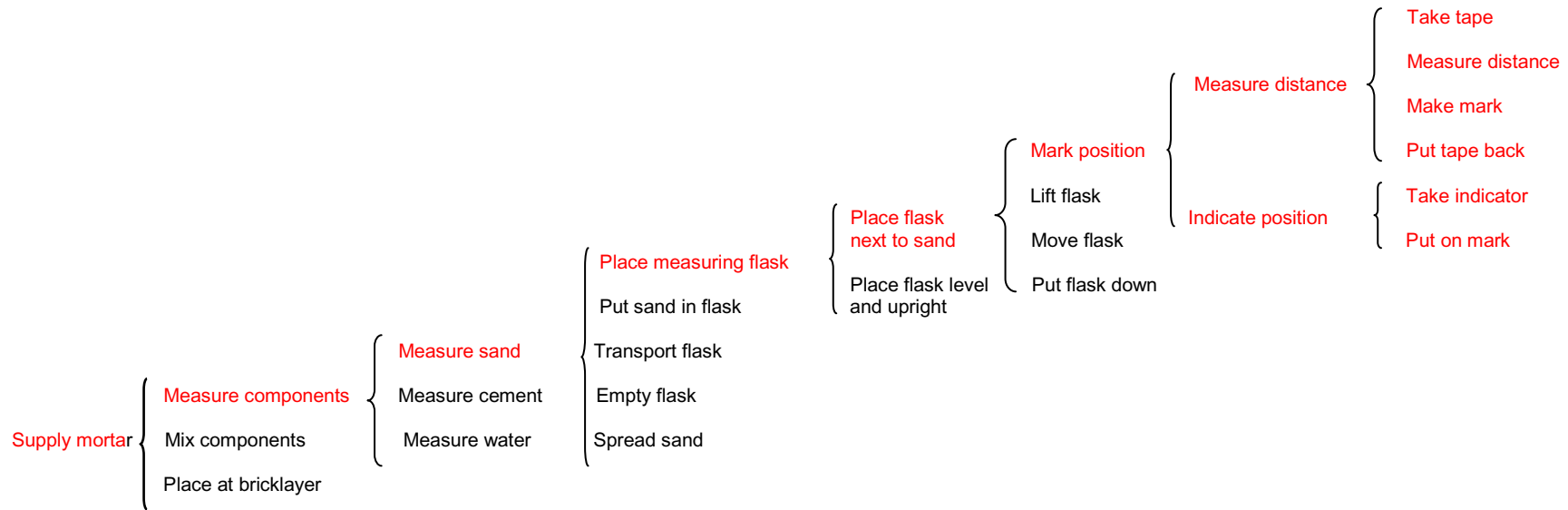


Table 6.6 (g): Task and resources analysis sheet of the task to mark the position

8. Reporting		
8.1	8.2	8.3
Accountability	Frequency	Type
Miner	Once per shift	Miner's shift report
Miner	Once per shift	Miner's shift report

Table 6.6 (h): Task and resources analysis sheet of the task to mark the position

Build a bickwall



**Table 6.7: Schematic flow diagram of work flow development and task and resources analysis
(refer figure 6.5 (a) – 6.5 (d) and table 6.4 (a) - 6.6 (h))**

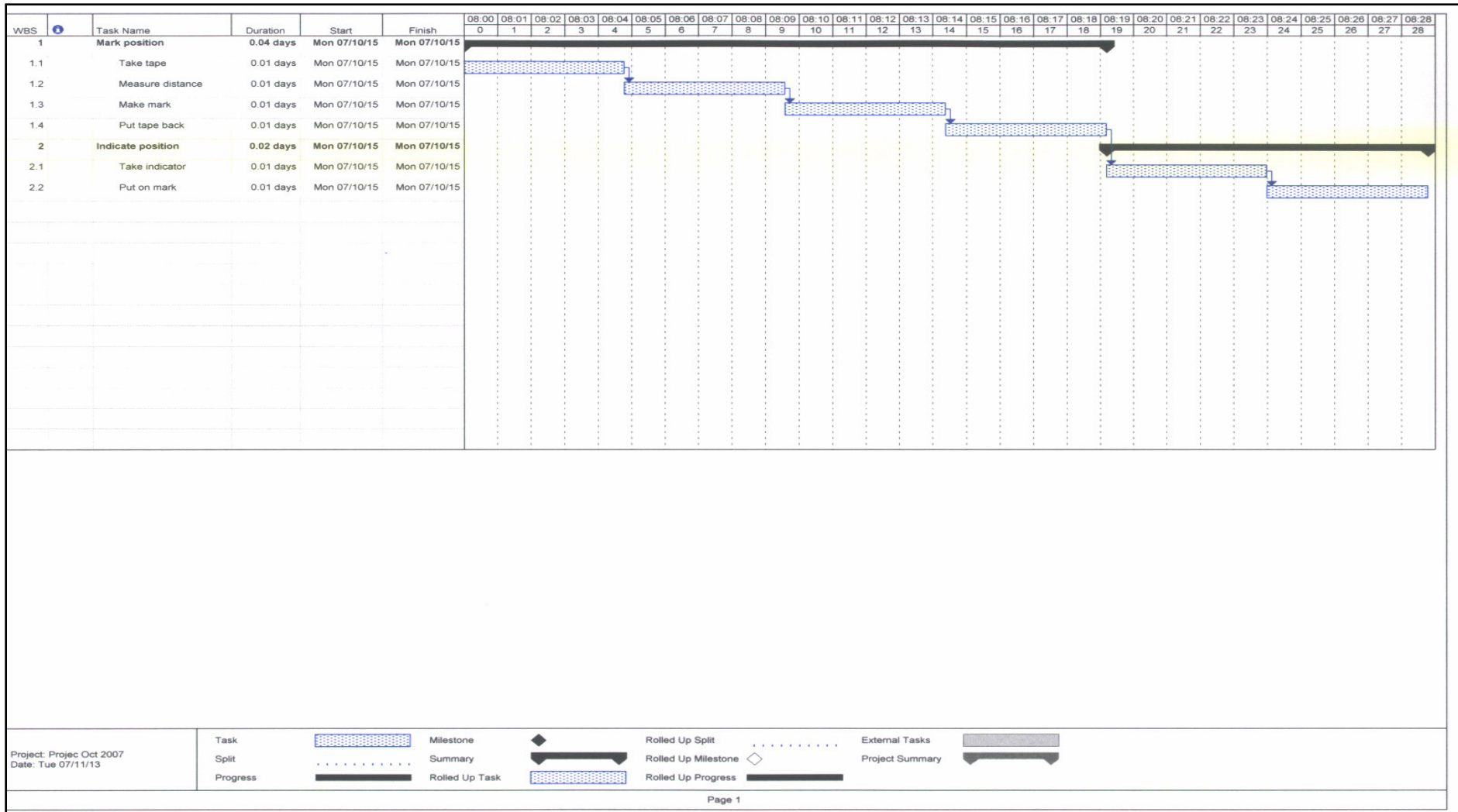


Table 6.8: Schedule of the work flow and task and resources analysis

6.4 IMPLEMENTATION OF THE METHOD

Training in the theory should immediately be followed by the implementation of it in the employee's specific work situation according to the proposed procedure (refer section 5.3, 5.4, 5.5 and 5.6). Initially the theory would be implemented from the top starting with the Chief Executive Officer and going right down to the last level employees.

The work flow diagrams of the supervisors need only to be developed up to the controlling tasks since that would enable the supervisor to determine the results required from him, the performance standards for each task and the objectives. It would enable him to delegate efficiently to each immediate subordinate and stakeholder and to control the work in progress or performed.

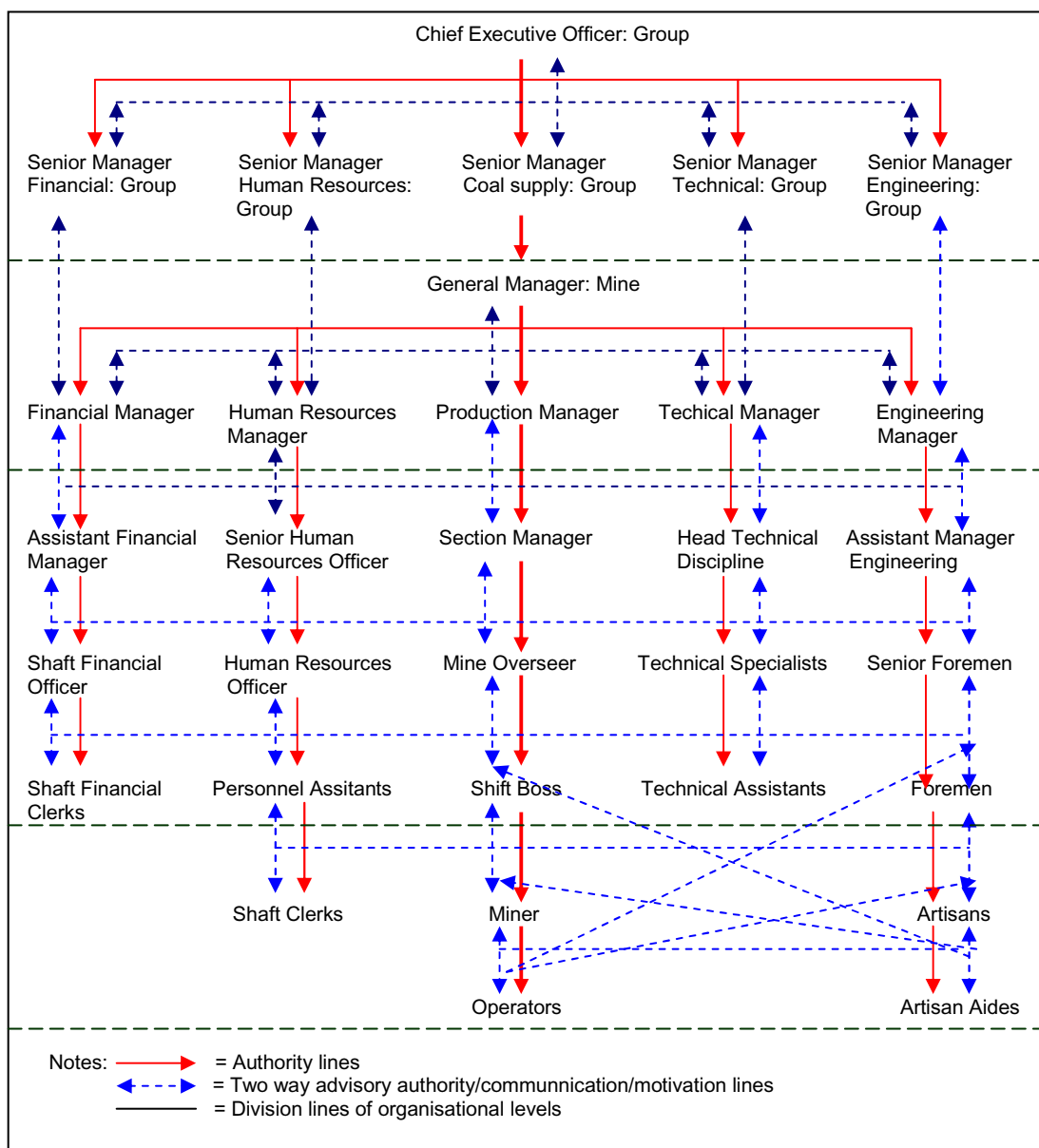


Figure 6.6: Typical mine organisational structure showing authority, advisory and communication lines

Each employee must strictly apply the procedure developed in this chapter (refer section 6.2.1). For the implementation of this management method the following procedure should be followed:

6.4.1 Management should ensure that all employees in the organisation, from the top down to the bottom levels, are thoroughly developed in the theory of the comprehensive, practical and integrated management method and trained to apply the proposed procedure. It would require that:

6.4.1.1 management should be the first to be trained and developed,

6.4.1.2 the development and training are cascaded down from the top to the bottom levels,
and

6.4.1.3 supervisors must preferably present the development and training programs themselves to their immediate subordinates.

6.4.2 In the first phase the supervisory levels must only:

6.4.2.1 compile the work flow up to the controlling tasks,

6.4.2.2 complete the task and resources analysis for those tasks that they have to perform themselves to the end,

6.4.2.3 apply the procedure up to the compilation of the task and resources analysis, and

6.4.2.4 then delegate for the results required from their immediate subordinates.

6.4.3 At the operator level:

6.4.3.1 the procedure must be applied from the beginning to the end,

6.4.3.2 the work flow must be completed down to the smallest tasks,

6.4.3.3 the task and resources analysis must be completed in the necessary detail, and

6.4.3.4 at the completion of the task and resources analysis the operators must submit their plans to their immediate supervisors.

6.4.4 The immediate supervisors must then:

6.4.4.1 incorporate the plans of their subordinates, where applicable into their own plans,

6.4.4.2 liaise with the relevant stakeholders, and

6.4.4.3 adjust their plans where required.

6.4.5 Each successive supervisor must:

6.4.5.1 incorporate the plans of their subordinates, where applicable into their plans,

6.4.5.2 liaise with the relevant stakeholders, and

6.4.5.3 adjust their plans where required.

6.4.6 This process must continue up to the mine/general manager of the mine who must:

6.4.6.1 discuss the results with the senior manager in head office,

6.4.6.2 the senior manager would discuss the results with the board , and

6.4.6.3 feed any changes, adjustments or approval back to the mine/general manager.

6.4.7 The mine/general manager should:

- 6.4.7.1 discuss any changes from head office with his immediate subordinates,
- 6.4.7.2 ensure that changes, if any, be made and fed down to the next level, and
- 6.4.7.3 ensure that this process continues down to the lowest levels.

6.4.8 The plan should be:

- 6.4.8.1 finalised from the bottom up, and
- 6.4.8.2 summarised at the top into the plan for the mine as a whole.

6.4.9 At each level:

- 6.4.9.1 the best method to achieve the most optimum results with a specific task must be determined and used to further develop the work flow,
- 6.4.9.2 the tasks must be coordinated and integrated and scheduled,
- 6.4.9.3 critical paths must be compiled and optimised, and
- 6.4.9.4 communication, coordination and integration must commence with the top level down to the last levels and again upwards to the top level.

6.4.10 The planning structure should:

- 6.4.10.1 contain all the necessary term plans for each level,
- 6.4.10.2 enable each employee at each level of the organisation to compile and to have his own plan, and
- 6.4.10.3 completely facilitate the adjustment, modification or discarding of plans whenever changes do occur.

6.5 CONCLUSION

The comprehensive, practical and integrated management method consists of the theory and the procedure to implement it. The theory was developed in chapter 5 and in this chapter the procedure to implement the theory was developed (refer sections 1.5.2.8, 1.5.2.9, 5.4 and 6.2).

The implementation of the theory would require that all employees on all the levels of the organisation should at all times conscientiously and meticulously follow the steps proposed in this procedure. With adequate training and development in the theory and procedure to apply it each employee in the organisation would be empowered to fully manage for the efficient achievement of the results required from each of them.

The implementation of this management method would ensure that:

- 6.5.1 management is completely integrated on all levels by all employees under all circumstances,
- 6.5.2 no necessary or the minimum work is omitted,

- 6.5.3. each and every employee would find a place in the organisation for him that would make him feel wanted, important and useful to the realisation of the company's objectives and thereby the insurance of a sustainable future for him and his family,
- 6.5.4 every employee would be sufficiently competent to efficiently manage for the the results required from him,
- 6.5.5 the results of every employee and the organisation would be that as planned,
- 6.5.6 the formulated objectives would support the main or general objective of the organisation,
- 6.5.7 work could be logically developed into the finest detail,
- 6.5.8 the standards for control would be developed as part of the development of the work flow,
- 6.5.9 complete integration and coordination would be achieved,
- 6.5.10 all necessary risks, policies, procedures and reporting systems are developed simultaneously with the planning of the work,
- 6.5.11 the industry would be able to optimise the given mineral resources,
- 6.5.12 all management work could be computerized,
- 6.5.13 all employees would be fully empowered at all times,
- 6.5.14 the costs of management development practices in the mining industry would be optimised,
- 6.5.15 all operations could be continuously optimised,
- 6.5.16 the mining industry would be able to regain its global leading position,
- 656.17 the industry would be able to maintain its desired competitive edge,
- 6.5.18 the industry would be able to expand, and
- 6.5.19 the following management work is enhanced:
- efficient decision making,
 - efficient communication,
 - motivation of employees,
 - empowerment of employees,
 - development of recruiting specifications,
 - recruitment and appointment of the most potential workers,
 - development of training and development procedures,
 - training and development of employees,
 - exercising of effective control for each task and employee on all the levels,, and
 - improving of the overall performance.
- 6.5.20 the management deficiencies identified in the previous chapters could be completely rectified (refer section 2.8, 4.2 and 4.4).