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Physical Asset Management Maturity in Mining: A Case Study

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A research report submitted to the Faculty of Engineering and the Built Environment, University of the Witwatersrand, in fulfilment of the requirements for the degree of Masters in Engineering.

May 2016

THESIS CERTIFICATION

I hereby declare that the work contained herein is my own. It contains no section copied in whole or in part from any other source except where due acknowledgement is made in this thesis.

Signed…….

Date……

THESIS DEDICATION

To my loving and supporting parents

For your wisdom is astonishing

And

To my children

I hope this will inspire you to spread your wings and fly up high

ACKNOWLEDGEMENTS

I would like to thank you Lord, for continuously fuelling and providing me the strength to produce this piece of work.

To my supervisor Bernadette Sunjka, for believing in me. Thank you, for your provoking insight, encouragement and your guidance.

To my daughter, Bong'ukuthula and my two boys, Cel'ukubonga and Phumlani, for allowing me to take a significant portion of our family time. I believe you will be encouraged.

To friends and family members who supported me technically and emotionally.

Abstract

Asset management has exposed vital changes and innovations in the maintenance management methods used mostly by asset-intensive organisations. In the past, asset management was not a common language in mining organisations, but that has changed over the last 30 years. The successful implementation and execution of asset management strategy are found to be critical elements in driving value, which depends on physical assets' performance. Asset management frameworks which place their focus on planning, operating, maintaining and controlling assets have been developed. These frameworks measure how well organisations are capable of executing asset-related activities which align with the organisational objectives throughout the asset lifecycle. This research shows that strategic asset management targets measured as AM Maturity are often not attained. This study, thus, seeks to identify the key challenges that hinder mining organisations in attaining their desired level of Asset Management Maturity, which will, in turn, better address business risk.

The literature review conducted was used to determine what challenges are faced during the Asset Management execution phase, while also highlighting some challenges experienced during implementation. A qualitative case study methodology was chosen as the appropriate method to identify the challenges experienced. Three sources were used to collect data which included, documentation, semi-structured interviews, and participant observation.

This study maintains that the key issues identified preventing mining organisations from attaining the desired level of Asset Management Maturity are: lack of a strong Asset Management leadership; lack of a favourable organisational structure which will provide Asset Managers with credibility and the authority to make decisions in support of organisational objectives; no leadership support; and a lack of training obviate the benefits that can be realised from improvement initiatives which motivated, committed and enthusiastic employees can deliver.

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List of Acronyms

ACCF	Asset Care Centre Foundation
AIV	Asset Identification and Verification
AM	Asset Management
AMIP	Asset Management Improvement Planning
AMS	Asset Management System
BP	Best Practices
CMMS	Computerised Maintenance Management System
EAMS	Enterprise Asset Management System
GFMAM	Global Forum on Maintenance and Asset Management
ISO 55000	International Standard Organisation for Asset Management
KPA	Key Performance Area
KPI	Key Performance Indicator
MOC	Management Of Change
OSP	Organisational Strategic Plan
PAS 55	Publicly Available Specification
RCM	Reliability Centered Maintenance
ROA	Return On Assets
ROFA	Return On Fixed Assets
ROI	Return On Investment
SCM	Steering Committee Meeting
TCM	Technical Committee Meeting

CHAPTER 1

1 Introduction

Asset Management is defined as the systematic and coordinated activities and practices through which an organisation optimally and sustainably manages its assets and asset systems, their associated performance, risks and expenditures over their life cycles for the purpose of achieving its organisational strategic plan (PAS55, 2008). AM can also be defined as the coordinated activity of an organisation to realise value from assets, where an asset is defined as an item, thing or entity that has potential or actual value to an organisation (ISO55000, 2014)

The management of physical asset is not optional nowadays. Societies are faced with massive challenges of managing assets in endeavour to identify the lowest cost or high return on investments; understanding the lifecycle costs, as well as extending the life of these assets. If these assets are not managed effectively it will be wasteful exercise. AM is important especially for asset intensive organisation because it can help mining organisations to improve financial performance; informed asset investment decisions; improved services and outputs; some benefits can be directly quantified such as reducing capital and maintenance costs. (ISO55000, 2014)

Davis (2016) adds to these benefits that can realized by managing assets, which can help reduce the health impacts of operating the assets; reducing the safety risks and minimising the environmental impact of operating assets. He states that managing assets also help mining organisations to reduce legal risks; improving the regulatory performance; and to maintain and improve the reputation of the organisation.

Asset Management Maturity is a measure of how well an organisation is capable of optimising and sustaining the performance, risk, investment and costs related to their assets (IAM, 2012). The global forum on maintenance and asset management GFMAM (2015) defines AM maturity as an extent to which the capabilities, performance and ongoing assurance of an organisation are fit for purpose to meet the current and future needs of its

stakeholders, including the ability of an organisation to foresee and respond to its operating context.

1.1 Purpose Statement

The purpose of this research, is to identify the key challenges experienced in a mining organisation in South Africa, at A-Coal, inhibiting it from achieving the desired level of Asset Management capability.

1.2 Case Company Background

The Coal Washing Plant (A-Coal) is situated in Mpumalanga outside eMalahleni ('place of coal'). The plant is designed to beneficiate millions of tons of coal per annum. The coal is beneficiated and the product is transported to Richards Bay Coal Terminal (RBCT), where it is loaded on to ships destined for international customers. The plant was commissioned in 2009, without a proper Asset Management system. The two shareholders have outsourced the 'Operate and Maintain' function of the operation to Company A (asset service provider). It was approximately two years after A-Coal was commissioned, when Company A outsourced the Asset Management Function to Company B (asset managers). The initial assessment was conducted and AM Maturity targets were set (Company B, 2011).

1.3 Problem Statement

Company A, was contracted to Operate and Maintain A-Coal. Company B is a Company that specialises in management of physical assets and was contracted by Company A in the year 2011, to ensure Clients' expectations were achieved by implementing and executing physical Asset Management Processes. Upon Company B's arrival at the A-Coal site, an assessment to measure AM Maturity was conducted, through their developed business process termed Asset Management Improvement Planning (AMIP) process.

The AMIP was conducted in order to measure and identify AM Maturity gaps at A-Coal. The outcome was used as a base-line for the site's AM Maturity. This led to formulating a strategy, accompanied by policies, defined objectives and a clear master plan to close the gaps identified in the subsequent twelve months. The effectiveness of the actions implemented is measured by conducting an AMIP assessment annually. In 2011, Company B conducted an AMIP assessment which covered 17 Key Performance Areas (KPA). The AM

Maturity Framework that encompasses the 17 KPAs was developed such that it initially aligned with the publicly available specification (PAS55). A revised version of the AMIP tool is aligned with the newly approved international standard of organisation of asset management (ISO 55000) as well as the GFMAM 39 Subjects of AM.

The AMIP results obtained were a concern especially for an almost newly built plant, which had been in operation for only two years at the time the initial assessment was conducted. The average Best Practice (BP) obtained was at 2.28 out of a possible score of 5; but of greater concern was that the key Asset Management maintenance areas (such as Strategy Management and Asset Care Plans) were scoring the lowest. The desired average AM Maturity BP level was set at 3.18, with only three KPA targets set at level 4 and the rest at level 3. These levels are defined as, (1) – Firefighting, (2) – Stabilising, (3) – Preventing, (4) – Optimising and (5) – Excellence. Shareholders (Client A and Client B) were concerned with the results obtained, because they realised their investment was exposed, especially without a proper Asset Management system being implemented. A decision was taken that Company B must be employed to assist with implementing and executing a proper AM programme after the AMIP assessment was conducted.

During the time when the assessment was conducted, A-Coal had just been through a challenging period, where key management staff were in a forced firefighting mode to keep the plant running. This was compounded by a lack of staff. Despite these challenges they still managed to implement a number of plant related and management process improvements which ensured the worst of these problems were being addressed. (Company B, 2011).

Most mining organisations do not invest time and money to understand their Asset Management Maturity and practices. First, when an organisation does not have a framework that will be used to assess Asset Management practises, the Maturity level will not improve (‘you can’t manage, what you can’t measure’). Second, an AM framework used in an organisation must cover a number of elements including but not limited to Risk Management, which addresses business risk and the assets utilised. Third, a clear distinction between Business Risk and Asset Related Risk must be taken into account by all stakeholders involved when risk in Asset Management is being addressed.

1.4 Critical Research Question

What are the key challenges experienced by mining organisations that prevent the achievement of the desired Asset Management Maturity level, which, will in turn, better address business risk?

1.5 Objectives

The primary objective of this study is:

- To identify key challenges experienced by mining organisations preventing the achievement of the desired Asset Management Maturity level, which, will in turn, better address business risk.

In order to accomplish the primary objective a list of secondary objectives are as follows:

- To establish the **importance** of stakeholder's involvement when it comes to executing asset management activities and the improvement of AM Maturity.
- To assess employees' **attitudes, culture, perceptions and understanding** of AM and its associated benefits for properly executing Asset Management Processes.
- To analyse A-Coal employees' **understanding** of, Asset Management and Business Risk Management.

1.6 Research Design

The type of research design chosen for this study is a qualitative case study method. Information was obtained using three sources of evidence, which strongly complement each other. Each tool was used to collect different types of data, these included; documentation, semi-structured interviews and participant observation. Data was analysed using content analysis.

1.7 Limitations

A single case study has a number of limitations, the one that stands out is that findings can not be generalized. The samples taken for interviews is adequate to deduct and conclude on the case findings at A-Coal. With this study being a one man conducted, the researcher had to take caution not to be biased from designing questionnaires, until drawing up his findings of the case study.

1.8 Ethical Considerations

Ethics clearance was obtained from the School of Mechanical, Industrial and Aeronautical Engineering with Clearance number: MIAEC 002/16.

1.9 Research Report Outline

The format and structure of the Research Report is outlined as follows:

Chapter 1

This is the introduction to the coordination and rationalising as to why the researcher decided on this study. It presents the purpose of the study, a brief background of the case site, problem statement, the critical research question, the methodology that was chosen for the study, the data collection instruments and ethical factors considered. In addition, the researcher also included a high-level summary of the report structure.

Chapter 2

This chapter provides definitions of asset management and Asset Management Maturity. It also goes into detailing what an asset is, and it provides high-level AM framework content. Herein other fundamental concepts in relation to Asset Management and issues associated with implementation and execution are detailed.

Chapter 3

In this chapter, the research methodology followed is discussed along with the reasons why it was chosen. It describes the research design, the approach, protocol followed, data selection and collection methods, the evaluation of data credibility method as well as the data analysis method which highlight how the data will be analysed within this chapter.

Chapter 4

After having collected data from the various sources, a qualitative data analysis was conducted. This case study aims to identify key challenges experienced in mining organisation which prevent attaining the desired level of Maturity.

Chapter 5

This chapter contains the output of the analysis. The findings of the study based on a content analysis. The researcher used all three sources (documentation, semi-structured interviews and participant observation) of data to ensure reliability and validation of data.

Chapter 6

The researcher concludes on his findings and he also highlights limitations and implications of the research with the possibility for expanding the study prior to generalization of findings.

CHAPTER 2

2 Literature Review

The purpose of this chapter is to, outline the fundamental concepts in asset management including issues associated with implementation and execution; and to, uncover the key challenges experienced in mining in relation to physical asset management maturity. A typical AM framework to measure Asset Management Maturity will be presented and compared with other AM Maturity frameworks. This chapter is correspondingly used as a foundation for the development of the questionnaire in the next chapter.

2.1 Assets

An asset is an item, thing or entity that has potential or actual value to an organization. The value will vary between different organizations and their stakeholders, and can be tangible or intangible, financial or non-financial (ISO55000, 2014). In the mining industry assets are particularly significant as they directly add or have potential to adding value. Assets can also be defined and viewed in terms of systems. Examples of asset systems include networks, production lines, or facilities systems (Ruby, 2015). Any item of economic value owned by an individual or corporation is defined as an asset (Davis, 2016). PAS55 defines an asset as a plant, machinery, property, buildings, vehicles, and other items that have a distinct value to the organisation. Figure 1 below indicates levels of assets and their management as defined by the PAS55.

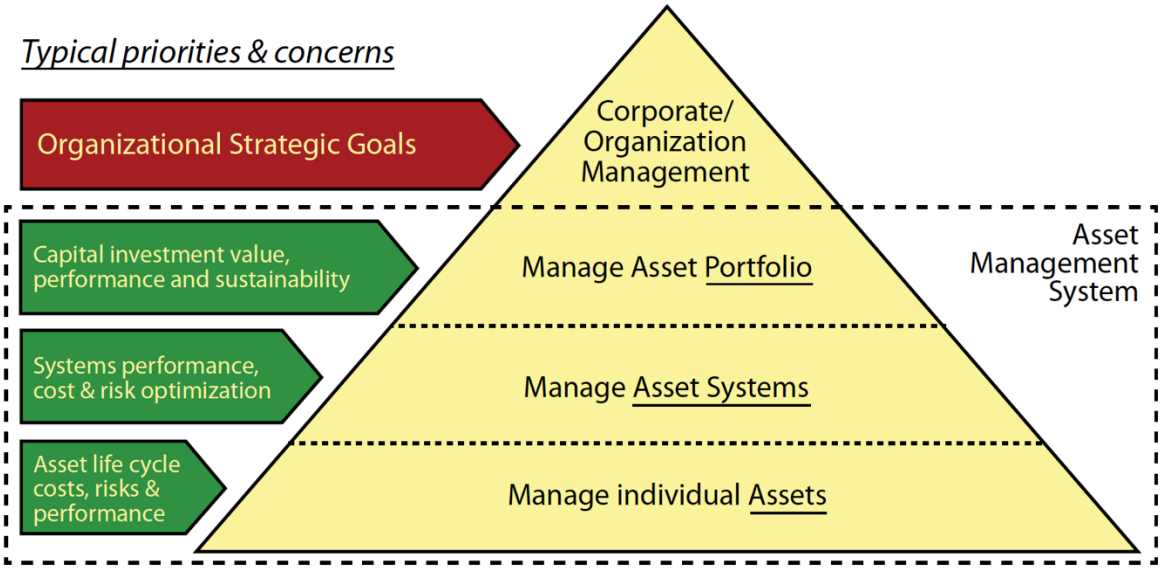


Figure 1: Levels of Assets and their management (PAS55, 2008)

Organisations may choose to manage assets as a group rather than individually, according to its needs and to achieve additional benefits. Such groupings may be by asset types, asset systems or asset portfolios (ISO55000, 2014). Mining organisations have a wide range of assets which includes but not limited to: fixed assets, such as tools, machines, computers, vehicles, roads, bridges, plant equipment and buildings which is also how A-Coal defines their assets.

2.2 Asset Management

Asset Management is not a new profession or discipline, it is thus developed enough to meet the expectations and demands of operators, shareholders and clients. Owners are demanding greater value, for lower overall costs from their assets (CSA, 2012). A study conducted by the Cambridge Service Alliance highlight that there are four key areas to be utilised to improve AM practise. These included but are not limited to (CSA, 2012):

- Effective decision making - Improving decision making across the organisation, through better use of longer term financial, and non-financial, metrics to deliver value for all involved in managing assets.
- Organisational changes - Organisation must evolve to enable better decision making and share knowledge and skills, breaking down silos and boundaries resulting from functional specialism and multiple cost centres.
- Data capture, sharing and standards - Improving the quality and availability of the information available for decision making.
- Predictive Analytics - New information technologies are available to improve AM, but several barriers prevent their effective use.

AM provides any organisation that is interested in implementing it the knowledge and tools to utilise the significant assets to achieve the organisation's objectives. An organisation can use the techniques which are provided by AM to display how well the assets are being looked after. Value extracted from utilising these assets optimally will be of great interest to stakeholders, owners, customers, regulators, communities or the general public (IAM, 2012). AM is best seen as an integration framework that uses any combination of tools and techniques to achieve these aims, provided that they are appropriately applied and deliver added value (IAM, 2012).

It is very important to understand how an organisation manages its existing assets in conformance to all stakeholder's requirements (IBM, 2007) . Asset managers must identify the need, and make decisions, to initiate any improvement project in order to enhance the organisation's operation, maintenance, logistics support, innovation, upgrading, development, expansion, technology supplement or knowledge support and their refurbishment, replacement. An organisation must also manage asset disposal consequent to the end of life of that particular asset.

The activities of asset management start when there is an existing tangible asset and it is being operated (IBM, 2007). AM will aid in making informed decisions about the asset life if data is gathered from the commencement. Generally, AM is not involved during the acquisition phase (i.e. acquiring the asset); however, the acquisition phase provides information for AM to use, so that AM practises are established. During the acquisition phase AM provides guidance on performance standards of the asset being acquired. The utilisation phase involves a number of stages, operations, need identification and justification, as well as change implementation.

2.3 Asset Management and Maintenance Management

For many years, most companies have interwoven asset management with asset maintenance. There are many companies in the marketplace who have started developing strategies to include, plant equipment, facilities, automation, instrumentation, data information technology, and employees (Shah & Lattlefield, 2008). Many organisations are starting to appreciate AM as a field or discipline that has bearing and meaningful potential for improving performance.

There still remains a lack of understanding of the exact nature of asset management's role in ensuring the competitive advantage of organisations (Dwight & El-Akruti, 2009). Asset Management achieves the realisation of AM which has evolved from maintenance management to provide a holistic approach to managing the life of physical assets (Mollentze, 2005). Asset management's ultimate goal is to produce at lower costs than that of the organisation's competitors while delivering a higher return on fixed assets (ROFA) to their shareholders (van Heerden & Vlok, 2015). The purpose of the Physical Asset Management function is to provide resources and expertise to support the acquisition, in-service support and disposal of the physical assets required by the organisation. More

precisely, the asset management function, when present at Company level, should provide inputs to asset planning, take a role in major acquisitions and developments and provide the systems and facilities needed to support assets throughout their life (Hastings, 2010). Asset Management as defined in PAS55, reveals the following characteristics:

Holistic: it integrates management of all of the aspects of the assets in contrast with specialised and compartmentalised approaches;
Systematic: it implies that PAM promotes consistent, repeatable and methodical actions, providing a clear support for decision making;
Systemic: it considers the assets as a system and tries to optimise the whole system, rather than optimising individual asset in isolation;
Optimal: it tries to establish the optimal compromise between competing factors such as performance, cost and risk, associated with the assets over their life cycles;
Risk-based: the assessment of risks leads all the decisions;
Sustainable: PAM considers the potential adverse impact to the organisation in the long term of short term decisions.

This definition defines various assets types such as financial, human, physical, information, etc.) which all add to the organisational strategic plan (OSP). A strategic plan is defined as the overall long-term plan for the organisation that is derived from, and embodies, its vision, mission values, business policies, stakeholder requirements, objectives and the management of risks (PAS55, 2008). AM embodies the important principle of proportionality or fitness-for-purpose, so any objective definitions of capability and Maturity must recognise context and are appropriate, possible and worthwhile in such an environment (Woodhouse, 2015).

AM is a mind-set which sees physical assets not as inanimate and unchanging lumps of metal/plastic/concrete, but as objects and systems which respond to their environment, change and normally deteriorate with use and progressively grow old then fail or stop working. It is also an approach that seeks to get the best out of the assets for the benefit of the organisation and its stakeholders, it is also about understanding and managing the risk associated with owning the assets (Davis, 2016).

Davis (2016) stated that AM is not just for engineers. Everyone working in a Company that owns or operates assets should be interested. This includes those working in procurement, finance, personnel, service, planning, design, operations, administration, leadership,

marketing and sales. AM is regarded as an essential technical as well as a business process in many organisations (Dwight & El-Akruti, 2009).

The terms "maintenance management" and "asset management" are frequently used interchangeably in the industry when, in fact, they are separate. While the primary purpose of maintenance management is to manage maintenance activities (which activities are performed on which asset, cost of maintenance), the primary purpose of an asset management system is to provide a whole-life view of all assets, to allow monitoring, tracking, and analysis of how funding strategies affect asset condition, and to allow the organisation to make policy and strategic decisions regarding funding (cross-asset decision making, investment decisions) (Rose et al, 2012).

Maintenance management is focused more on the short-term activities, while asset management is intended as a proactive approach to managing organisational investments over the longer term. Maintenance management should be imagined as a subset of asset management. The term "enterprise asset management" refers to asset management conducted at an organisational level instead of just one section or department of the organisation. The maintenance management system, when integrated with business intelligence, condition tracking and forecasting, and other enterprise tools, forms a true enterprise asset management system/tool (Rose et al, 2012)

According to the International standard of asset management (ISO 55000); AM is defined as an International Standard that covers management of various assets, it enables an organisation to realise value from the assets in achievement of an organisational objective. It can be said that in order to achieve a desired and sustainable outcome, AM must be in place. There are key aspects of best practice (Clarke, 2013):

- Clear line of sight from organisational strategy to activity on the ground
- Whole-organisation alignment with AM
- Active and visible sponsorship from senior executives
- Defining the levels of performance provided by the asset to customers
- Recognising the lifecycle and associated risks of the assets
- Turning data into useful information
- Understanding the true cost of ownership
- Understanding the implications of deferred interventions

- Evidence-based decision making.

2.4 Importance of AM

AM is important because it can help organisations to (Davis, 2016):

- Reduce the total costs of operating their assets
- Reduce the capital costs of investing in the asset base
- Improve the operating performance of their assets (reduce failures rates, increase availability, etc.)
- Reduce the potential health impact of operating the assets
- Reduce the safety risks of operating the assets
- Minimise the environmental impact of operating the assets
- Improve the regulatory performance of the organisation
- Maintain and improve the reputation of the organisation
- Reduce legal risks associated with operating the assets

Asset management system provides a structured approach for the development, coordination and control of activities undertaken on assets by the organisation over the different life cycle stages, and for aligning these activities with its organisational objectives (ISO55000, 2014). Asset management system has multitude of benefits associated to it. These include but not limited to (ISO55000, 2014): risk reduction, opportunity identification or process improvement; it can provide a focal point for addressing the issues of functional integration of the organisation and life cycle planning; it can create or improve organisational knowledge and decision making. Delivering the best value for money in the management of physical assets is complex and it involves careful consideration of the trade-offs between performance, cost and the risk over all the stages of the asset life cycles. (PAS55, 2008).

There are crucial elements of asset management system as described in (ISO55000, 2014) and they include: context of the organisation (it covers organisational culture, mission, vision, values, as well as stakeholder's input); leadership (involvement of top management in planning, implementing and operation of the asset management system); planning; support (from many parts of the organisation); operation; performance evaluation and improvement.

The design and implementation of asset management systems is an essential part of creating value in organisations with high intensive assets (CSA, 2012). Effective asset management systems afford companies extra depth to manage their assets and fully realise value to both shareholders and those operating and maintaining these assets. Creating AM systems comes with its own challenges, such as the alignment of AM plans or actions with organisational objectives. Most firms do not view AM as a strategic exercise, but instead deal with it in an ad hoc, reactive way, responding to market conditions and the current trading and operational environment (Urmetzer et al, 2014)

2.5 Asset Management Maturity

AM maturity can also be defined as an extent to which the capabilities, performance and ongoing assurance of an organisation are fit for purpose to meet the current and future needs of its stakeholders, including the ability of an organisation to foresee and respond to its operating context (GFMAM, 2015). AM Maturity model can be viewed as a set of structured levels that describe how well different processes of an organisation are able to produce the required outcomes in a reliable and sustainable way. This is particularly the case when the primary business of an organisation is to provide uninterrupted service to its customers by managing its assets effectively. Asset Management Maturity refers to the organisation level of Asset Management practice (Rose et al, 2012). Asset Management Maturity is a measure of how well an organisation is capable of optimising and sustaining the performance, risk, investment and costs related to their assets (IAM, 2012).

. Asset Management Maturity refers to the organisation level of Asset Management practice (Rose et al, 2012). Asset Management Maturity is a measure of how well an organisation is capable of optimising and sustaining the performance, risk, investment and costs related to their assets (IAM, 2012).

Asset managers need to answer “how good they are?” And “how good do they need to be?” This often requires a painful and honest look inward at operations and practices that have been utilised for years (IBM, 2007). It is extremely important to establish a basic understanding of the current level of AM maturity within an organisation. The importance of measuring, knowing and understanding Asset Management Maturity practices aids organisations to optimise their business performance, through reduction of risks, higher returns on assets (ROA) invested in and reduced costs.

Asset Management Maturity knowledge helps asset owners to understand if they are really getting value from the asset management systems put in place in ensuring assets perform as expected, reliably and safely (IBM, 2007). Increasing asset management maturity may deliver the following benefits (GFMAM, 2015): Aligning the individual activities and behaviours that achieve the organisation's objective; improve both financial and non-financial results; provide clarity about the goals and direction of the organisation; optimise lifecycle cost; aligning risk with stakeholders' risk appetite; and enables benchmarking, even between organisations managing different assets in different operating environments.

Benchmarking is extremely important because it allows an organisation to compare itself to others within the industry. Most organisations do some level of benchmarking to a certain extent even though some don't realise, because they have metrics, which measure KPIs. World Class means being the best, but does this mean being the best in everything, it simply means being in the top quartile of your division. Benchmarking allows organisations to compare themselves to others and constantly strive for continuous improvement (O'Hanlon, 2014).

There are three important questions that a mining Company should be asking with regards to AM Maturity (O'Hanlon, 2014):

1. Where are they? – Mining organisations should establish a baseline level that indicates their current assets, how well they are being taken care of and how these assets contribute to supporting service delivery.
2. Where do they want to be? – What are the mine's plans for the future and what assets are required in order to support current and future service needs? Having this in mind the organisation will set targets for improving the condition and performance of assets so that they match future requirements or needs.
3. How do they get there? – How will the mining Company move from the current to desired levels of AM? The prioritisation of future investments in assets will be important to match their future service needs.

Having answered these questions, the organisation should be in a position to appreciate its strategy of physical assets management. At A-Coal measuring AM maturity was imperative as Client A wanted to know how well Company A is capable of managing their asset. Client A's policy is to have their AM systems audited twice yearly. Client A deems it important that AM audits are executed to ensure compliance. (Company B, 2011).

2.6 AM Maturity Models

The first Institute of Asset Management (IAM) maturity scale to be published was the PAS55 Assessment Methodology (PAM) maturity scale which has five maturity states (0-4) as shown below in Figure 2. This scale was produced specifically to support the assessment of organisations against the requirements of PAS 55, and this is reflected in the wording of the scale. Level 3 corresponds to conformance with the requirements of the standard, representing 'Competence'. Any further refinement was simply classified as 'Beyond PAS 55'. This was recognised at the time as an interim solution insofar as organisations with an adequate management system in place would wish to identify where, and to what extent, further improvements would be available or desirable. The concept of 'excellence' in asset management needed to be explored – organisations would be seeking guidance about what is possible, in what circumstances, and what would be realistic, achievable and worthwhile? (IAM, 2015)

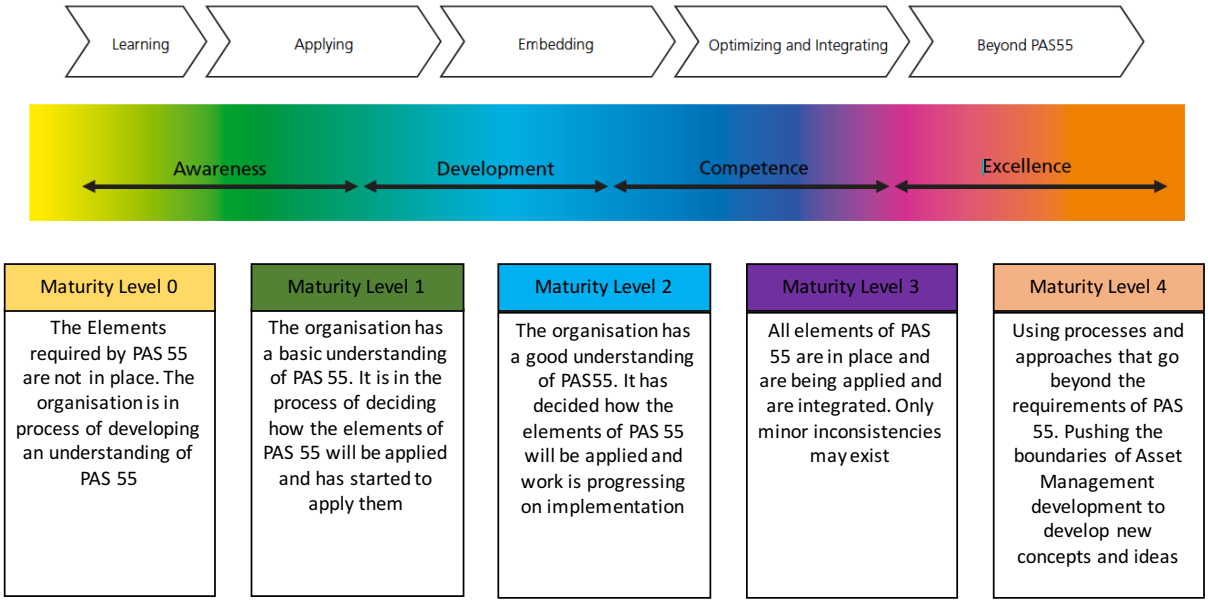


Figure 2: PAM maturity scale (IAM, 2015)

Asset management bodies, and companies have developed numerous Maturity models and are used for different phases of organisational activity. Many times these models provide an absolute scale of adequacy for specific Maturity or capabilities, processes or methods. It is not an easy thing to organise AM maturities into discrete boxes, such as "Fire Fighting", "Stabilising", "Preventing", "Optimising" and "Excellence". The maturities and capabilities in AM rely, at least as much on the coordination, integrations, optimisations and alignments of multiple activities and in the combined effects and cultural dimensions (Woodhouse J. , 2015). ISO55000 contains the core elements of using AM, using a framework of developed

knowledge. Figure 3 below, depicts a simplified approach to characterising an organisation's Asset Management Maturity with five levels (Rose et al, 2012).

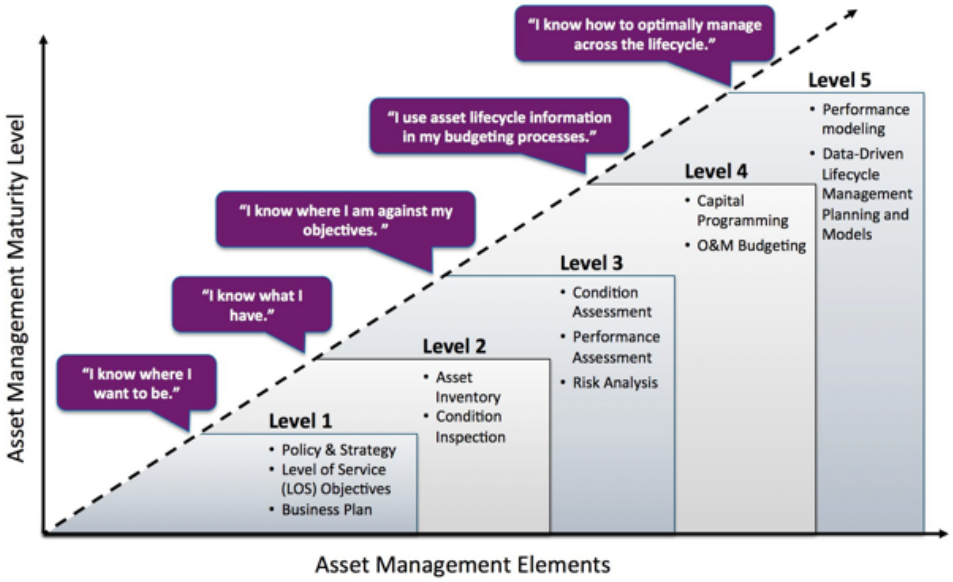


Figure 3: Simplified Asset Management Maturity (Rose et al, 2012)

There are some similarities between the AM maturity models. An overview of a maturity model used at the case site is presented and is also shown in Figure 4 below indicating the 5 levels of Maturity being measured. Many of the models available were developed based on the PAS 55 hence the homogeneous elements.

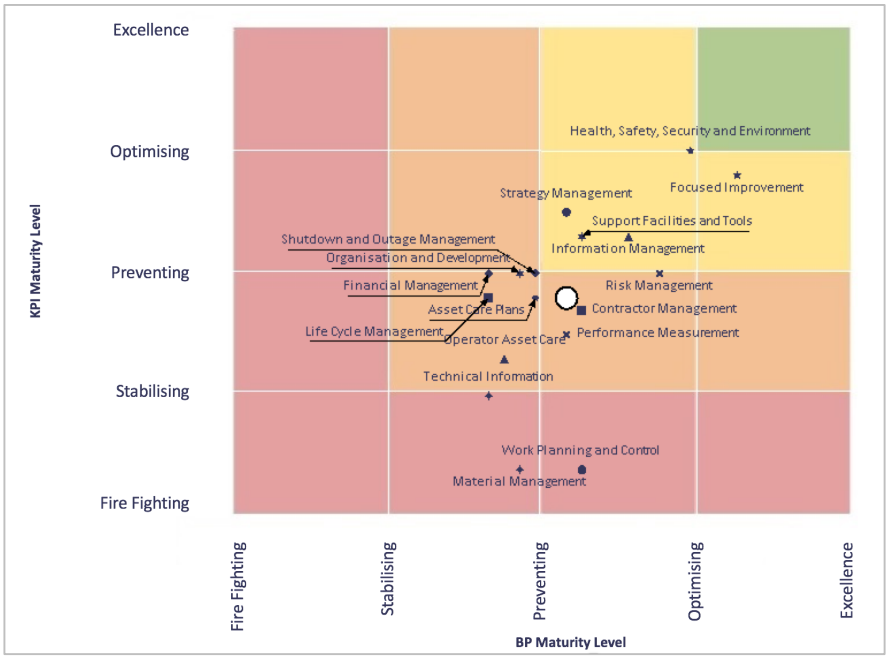


Figure 4: AM Maturity model used at A-Coal (Company B, 2011)

Overview of AM Maturity levels

Level 1 - an organisation has a clear Asset Management vision. This includes a policy statement that provides top-down direction regarding Asset Management expectations, a strategy that summarises the methodology for completing the policy, and a plan that details the people, activities, and resources needed for addressing the policy and strategy.

Level 2 – an organisation has one or more asset inventories with condition data that support multiple business processes. There is a well-defined owner and processes for all this data to maintain its reliability.

Level 3 – The organisation can conduct a risk analysis or a performance assessment to evaluate the assets' current performance and to assess how well the organisation is doing against the policy and strategy objectives.

Level 4 – At this level, an organisation can set priorities amongst and throughout all asset classes based on risk and performance data available. This is important in the development of the capital program, operations and maintenance budget.

Level 5 – Herein an organisation can apply performance modelling and other analytical tools to optimise how funding is allocated to all the organisation's asset classes.

AM Maturity Baseline

The current state of the AM Maturity assessment provides a baseline that pronounces the current state of practice. The initial assessment is used to identify gaps between current practices and best practice. Next steps will therefore be generated from the gaps analysis, which will be used to build an implementation path or a master plan with AM activities for improving Maturity. Organisation should conduct AM Maturity self-assessment to determine the current state or baseline of AM Maturity. The self-assessment is intended to be taken by the AM improvement team to ensure it reflects input from all departments throughout the organisation. There are three dimensions that this assessment should evaluate, namely (Rose et al, 2012):

1. Level of AM understanding
2. Awareness
3. Deployment of the processes and practices of the AM framework

2.7 AM Policy, Strategy and Plan

AM Policy

An AM policy provides top-down direction for the organisation. It is the leaderships' role to communicate the direction of the organisation. Success factors of an AM Policy are that it must be highly visible and used by leadership to provide direction and guidance for all AM strategy and activities, it must be addressed in the goal setting process, it must be adopted and integrated into an organisational strategic plan (OSP), it must be adopted into capital, operations, maintenance standard operating procedures, it must be integrated into talent management and training efforts (Rose et al, 2012).

There are a number of benefits that are associated with having an AM policy, namely; it communicates commitment to the AM process, facilitates the founding of a culture that values AM and makes it a priority, entrenches AM responsibilities and accountabilities into strategic planning activities, provides leadership and direction and builds a culture encouraging to entrenching AM into ongoing capital, operations, and maintenance activities (Rose et al, 2012).

AM Strategy

The AM Strategy addresses how the policy will be implemented. It considers establishing an AM strategy to be an important driver of change that sets direction. It is implemented through annual business planning and performance management practices. Strategy must include realistic, achievable AM objectives with the Specific, Measurable, Achievable, Realistic and Time Constrained (S.M.A.R.T) attributes. Having a strategy in place will bring about the following (Rose et al, 2012):

1. Sets vision and direction that enables management across functions and different services
2. Provides guidance and justification for investment decisions
3. Establishes accountability and performance management and expectations

The asset management strategy is then closely linked to the business strategy. Some issues deriving from the business situation which impact on the asset management strategy include the following (Hastings, 2010):

- Changes in demand for product or service;
- Changes in revenue and costs;

- Technological developments;
- New business developments;
- Acquisitions;
- Divestment, sale or phasing out;
- Redeployment;
- Changed operating practices;
- Equipment replacement/Leasing;
- Outsourcing or In-sourcing of services.

Other factors are related to how the organisation wants to resolve the trade-offs in decision making, such as for example (D'Alesio, 2012):

- planning for long term growth versus just doing enough to meet short term requirements;
- having a degree of commitment to in-house repair and logistic support versus outsourced support facilities;
- using the redundancy to achieve system reliability rather than seeking high reliability of individual items;
- keeping to a defined maintenance and replacement strategy in regards to run-to-failure, age-based, condition-based, spend-limit based replacement decisions.

AM Planning

Asset management planning is a process that institutes the activities necessary to address the policy and the strategy at the organisational level and asset level. At the organisational level, the plan provides direction for cross-asset business processes. And at the asset class level, it provides direction to line managers regarding oversight and accountabilities associated with their respective asset classes. The AM plan is incorporated into annual planning and budgeting (Rose et al, 2012). An asset management plan defines the activities that will be implemented and resources that will be applied to meet the asset management objectives and consequently, the organisational objectives (Ruby, 2015).

Properly developed asset management plans provide a roadmap for realising value from the assets invested in, by optimising cost, risk and performance. They form the basis of effective Asset Management. An asset Management plan includes the implementation plans for change initiatives that will improve Asset Management Practice and Maturity. The AM plan details

the activities that will be implemented and resources required to address the Asset Management Policy and Strategy.

2.8 Lifecycle Management

The process of doing maintenance has changed remarkably over the last 30 years, due to influences including but not limited to equipment design, computerisation, electronics and communication, cost pressures and societal acceptance of risk and failures (Hodkiewicz & Pascual, 2006). Life cycle asset management gives a number of advantages such as enhanced customer satisfaction, improved performance and control of product or service delivery, it improves health, safety and environmental performance, optimises return on investment and/or growth, enhances long-term planning confidence and performance sustainability, improves risk management and corporate governance (D'Alesio, 2012). Figure 5, below illustrates a life cycle management process.

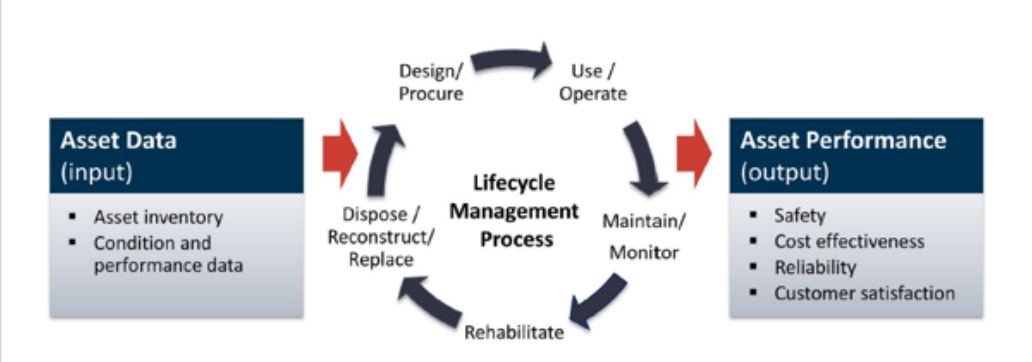


Figure 5: Lifecycle Management Process (Rose et al, 2012)

Organisations are mostly driven by costs associated with the life of assets, the profit that can be generated and how the cost structure is composed, to setting up the strategy. Organisations always face the challenge of how to sustain and improve the life cycle profits of the original investment made during the Operation and Maintenance phase of these assets. A lifecycle management plan documents the costs, performance, and risks associated with an asset throughout its life. Good data regarding costs, performance and risks throughout an asset life cycle can improve asset performance, because this facilitates informed decision making. There are major benefits associated with the use of lifecycle management plans, these include the (Rose et al, 2012):

- Improves assets performance throughout their lifecycle, while ensuring the most cost-effective investment strategies;
- Minimises failure risk throughout the system;

- Helps in decision-making processes, which are well informed and data-driven;
- Improves internal communications and cohesion by requiring cross-department coordination throughout the lifecycle of an asset.

Lifecycle management plans will differ depending on the level of AM Maturity associated with the asset class. Lifecycle management plans are managed by the asset owner; however, the effectiveness, success or failure reflects input from throughout the management of the asset (Rose et al, 2012). One of the main challenges faced when managing an asset throughout its life cycle is the fact that costs are separated and addressed in a disjointed approach to the various stages of asset life.

2.9 Asset Management and Risk Management

Risk management is the identification, assessment, and prioritisation of risks followed by coordinated and economical application of resources to minimise, monitor, and control the probability and/or impact of unfortunate events or to maximise the realisation of opportunities (ISO31000, 2009). AM is considered as an integrated approach to balance performance, costs and risks over the life of an asset. PAS55 (2008), states the different categories of risks as follows:

- Physical failure risks, such as functional failure, incidental damage, malicious damage or terrorist action;
- Operational risks, including the control of the asset, human factors and all other activities which affect its performance, condition or safety;
- Natural environmental events such as storms, floods, etc.
- Factors outside the organisation's control, such as failures in externally supplied materials and services;
- Stakeholders' risks such as failure to meet regulatory performance requirements or reputation damage;
- Asset related design, specification, procurement, construction, installation, commissioning, inspection, monitoring, maintenance, refurbishment, de-commissioning and disposal risks as appropriate.

The purpose of Risk Asset Management functions is to understand the cause, effect and the likelihood of adverse events which may occur while an asset is managed. Indeed, the risk assessment component is important in different areas of the organisation and became fundamental in Asset Management Projects (PAS55, 2008).

2.10 Key AM Implementation Steps

The fundamentals of AM are very simple and basic, however, implementing the changes suggested to become a mature asset management organisation requires a well thought out planning and execution strategy. The current organisational AM practices observed are the result of decisions made in the past, which includes many institutional factors that limits the ability to integrate decision-making across asset types and their lifecycle.

Becoming a highly performing AM organisation takes an enormous amount of time and considerable change, but en route, significant near-and long-term performance improvements can be realised (Rose et al, 2012). Highly productive organisations typically place more emphasis on executing strategy than formulating it (Kaplan & Norton, 2001). These are the principles for implementing AM (Rose et al, 2012):

- **Understand the organisations asset management drivers** – Organisations undertake an asset management improvement program for various reasons (for example, a response to a mandate, a need for improved transparency, and a drive to improve performance and more business-like management, among others). The organisation should develop an implementation approach that maintains that focus; however, the approach should be flexible enough that it can shift focus as priorities change.
- **Build upon existing strengths and practices** – The organisation should leverage its departments' existing asset management activities, identifying best practices and lessons learned with one asset class and applying these practices and lessons to others.
- **Provide value immediately** – Through incremental implementation activities, an organisation can quickly achieve results that demonstrate the value of implementing improvements to asset management practice and provide momentum for future activities.
- **Recognise that asset management is a process** – Identify the core processes that provide a starting point for developing an asset management process that will pay

dividends in improved service delivery and asset sustainability; however, the organisation should recognise the importance of continually using your organisation's experiences and those of its peers to improve Asset Management Processes.

- **Prioritise people, tools, and information** – Asset management is, at its core, about data-driven management, so your managers should identify the people who can understand and lead this change initiative and establish the data and develop tools that best support the organisation's decision-making processes.
- **Invest smartly** – Managers should identify the investments that will provide the best "bang for the buck" and only if these investments support the organisational strategy.
- **Develop your human resources** – Managers should identify the appropriate skillsets needed to implement the asset management strategy and invest in those people with recognition, incentives, and training.
- **Provide top-down leadership and assign clear ownership for asset management activities** – Strong leadership will set expectations and accountability for implementation, while your asset owners should "own" and drive implementation by developing and implementing lifecycle management plans.

Figure 6 below represents the Top-Down, Bottom-Up approach

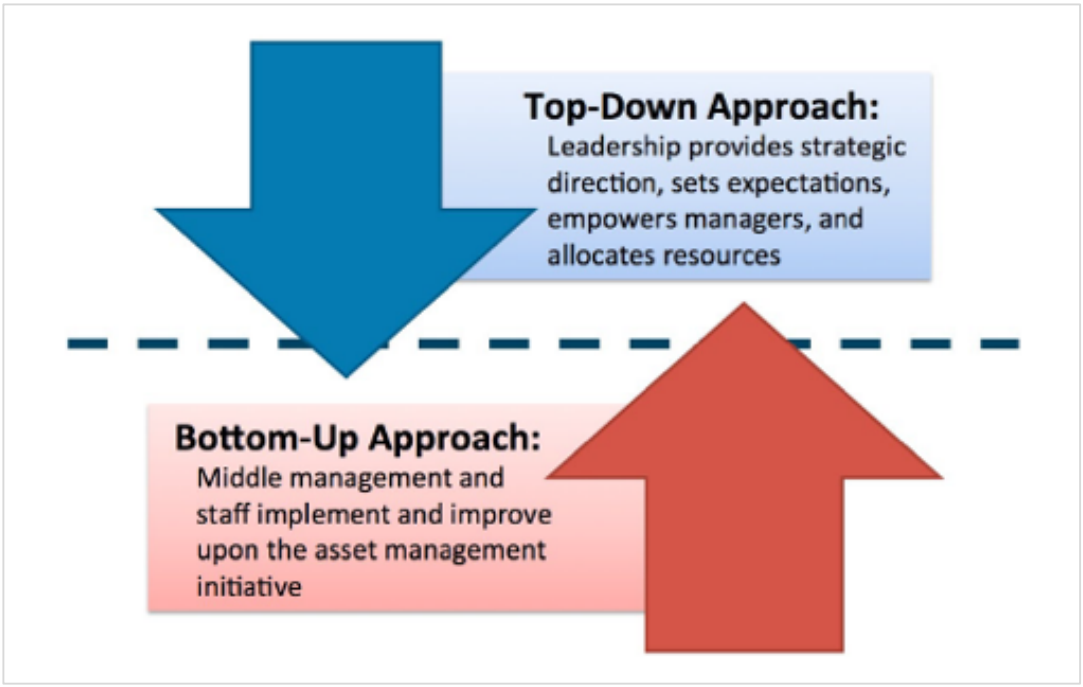


Figure 6: Top-Down, Bottom-Up Approach (Rose et al, 2012)

A relation of the Top-Down and Bottom-Up approach is illustrated in Figure 7 below, between the Operational and Tactical Level as well as the Tactical and Strategic levels. There is a huge link that is missing between strategic objectives and asset life cycle measures. There has not been much done to address the properties of executing a strategy, and therefore it looks like researchers are ignoring the salient reason for failure.

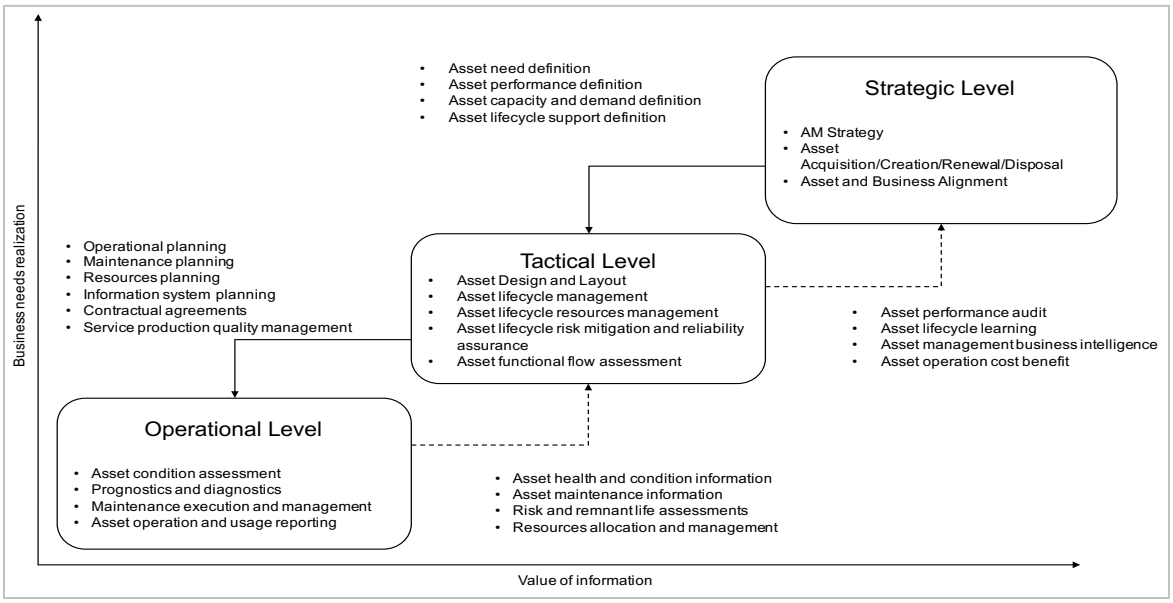


Figure 7: Strategic, Tactical and Operational relationship (Haider, 2008)

Establishing a common understanding of what AM is and having a common language within the organisation are prerequisites for success and should be addressed as foundational building blocks in implementation planning.

Asset Management Enablers

Enablers are the supportive processes and activities that form the foundation of a successful AM improvement programme. Enablers ensure that the AM business processes can be successful, and many of the enablers require dedicated resources (staff and or funding); however, in many cases, these resources can be integrated into the organisation's existing enabling processes. The enablers can be grouped into six as identified by (Rose et al, 2012).

1. Leadership and accountability;
2. Training;
3. Communications;
4. Values and Culture;
5. Project Management;
6. Continuous Improvement.

Establish Leadership and Accountability

Leadership and accountability are important enablers. As part of preparing for implementation, the governance structure must be established for the asset management improvement programme (Rose et al, 2012). The nature of the organisational structure will differ between organisations, but it should specify clear direction concerning responsibilities, accountability, change management, issue resolution, and roles for communications strategy. An organisation must have the leadership and governance structure in place to manage the success of asset management programme.

Asset management implementation is most likely to be successful with some personnel on executive level and Champion. An Individual or department leading the efforts to establish and implement an asset management improvement programme should evaluate the following questions (Rose et al, 2012):

- Is the asset management initiative going to be an organisation-wide change initiative or is it likely to "start small" and grow more pervasive over time?
- Does the asset management improvement programme have board support?
- Does the asset management improvement program have Executive Level support and/or a Champion?
- What resources are required to support the asset management improvement programme, are they available, and how can they be budgeted?

Answers to these questions will determine the required resources for an AM improvement programme.

- Strong leadership, change management, collaborative, and project management abilities with broad respect throughout the organization;
- Comprehensive knowledge of operations, maintenance, capital planning, and engineering;
- Knowledge about assets' lifecycle needs, including costs, performance implications, and risks;
- Excellent in communication, presentation and facilitation skills, and experienced in persuasion and influencing others;
- Political acumen and ability to relate well to stakeholders and staff at all levels within the organisation.

Assess Organisation's Maturity

This important step is completing an assessment of the Maturity of the organisation's AM processes. This means appraising which elements of the Asset Management process outlined in the framework used by the organisation has in place and what role they play in your organisation. This can provide a baseline describing the current process and should be used to set improvement targets (Rose et al, 2012).

2.11 AM Challenges and Associated Risk

Most maintenance improvement initiatives today are functional in nature, organisations that aspire to functional excellence have this kind of mind-set (Peterson, 2002):

- Operations owns production;
- Maintenance owns assets;
- Mean Time to Repair efficiency or MTTR (Repair Efficiency) is the best measure of maintenance performance;
- Buying excellence means procuring the lowest costing items available;
- Goals are set by functional managers, resulting in contradictory and self- defeating reward or recognition practices;
- Most measures are lagging and maybe few leading KPIs and are considered to make outlook on the future operation.

In an increasingly open global competitive environment caused by the higher pressure on costs, by the pressures to increase profit margins, or, in the worst case scenarios, by the pressures to retain profit margins despite lowering retail prices, a new mentality is being developed (Mather, 2003). To improve will require fundamental changes in discipline and culture, beginning with the management team. Relationships and personal prejudices will be realigned (Peterson, 2002).

The wide field of competence required of AM results is the difficulty to represent it clearly in the business structure, as it happens with other business functions, such as Sales, Operations, Finance and Human Resource Management. So, AM is often a "grey area", positioned between the business (senior) management and operational level (of maintenance) (Hastings, 2010). A system is a composite of people, products, and processes that provides a capability to satisfy stated needs. A system includes the facilities, equipment (hardware and software),

material, services, data, skilled personnel and techniques required to achieve, provide, and sustain system effectiveness (Dwight & El-Akruti, 2009). A system is also defined as an orderly set of interdependent, interactive elective elements functioning together to achieve a central objective or set objectives (e.g. a factory, department, university, hospital).

Asset management in an engineering perspective is differentiated from other operations management perspectives by asset life considerations. AM includes optimisation of costs, performance, budget and investments justification as ratios to Return on Investment (ROI), impact due to alternative business strategies as effects on improvement, innovation of asset and their management systems and risks as to quantifying and preventing failures (Dwight & El-Akruti, 2009).

The number of tools and techniques available to improve performance is increasing at an exponential rate. The advancement of technology has made it easier for us to learn about these new tools and to learn who else is using them. Organisations have achieved very little improvement in incorporating new systems into their daily activities. The ability to identify and learn about new improvement methods no longer presents a hurdle to most managers. Instead successfully implementing these innovations presents the biggest challenge (Repenning & Sterman, 2001). As an example, one can't buy an existing fully implemented AM system or Computerised Maintenance Management System (CMMS). It must be developed and implemented from within the organisation.

Some of the institutional and technical challenges faced within organisations is to secure senior management support and leadership throughout the period of asset management implementation, which may extend over several years and also improving the life cycle analysis methods and incorporating them fully into planning and programme development (Markow & Rackosy, 2001). Repenning & Sterman (2001) suggests that the inability of most organisations to gain the full benefits of the implementation of an innovation is less connected with the particular technique that is being selected. The roots of the problem lie at the manner in which this improvement programme has been introduced to the Company and how the process reflects the whole system. The real problem in implementation is the way the tool interacts with the physical, economic, social and psychological structures of the organisation. It is a systemic problem created by the interaction between the improvement programme, the employees, equipment, and management.

One of the main practical challenges to the improvement of AM practices in organisations is the disconnect between tactical and implementation groups. Tactical groups, mostly comprises reliability engineers and managers, assess and recommend new programmes and then involve a group of maintenance and operations staff for implementation. These programmes are difficult to sustain when the broader team of maintenance and operations staff are not engaged with the process and have little knowledge of the aims of the programme and potential benefits that changes the way they do or think about a process will have on the business (Hodkiewicz et al, 2005). The implementation of AM like any other productivity improvement challenges is believed to harbour enormous difficulties (Achanga et al, 2006). Managing assets effectively for mining is not optional these days. Across the globe, every society is faced with significant asset management challenge such as, developing countries trying to identify the lowest cost or highest ROI to reap maximum benefit.

Management involvement and commitment

Management Involvement and commitment are the most essential fundamentals in adding any of the desired productivity improvement initiatives (Antony & Banuels, 2001), (Coronado & Antony, 2002) and (Henderson & Evans, 2000). Since strong leadership permeates a vision and strategy for generating, while permitting a flexible organisational structure. Good leadership ultimately encourages effective skills and knowledge enhancement amongst its workforce (Achanga et al, 2006). organisation's strategic process. Maintenance is technically considered as a "necessary evil" and not pertinent at the strategic level as a business issue (Dwight & El-Akruti, 2009).

There are seven key activities that asset managers get involved in. It is crucial to note that these activities overlap, namely; Developing Policy, Developing Strategy, Asset Management Planning, Delivering the plans, developing People, Managing Risk, and Managing Asset Information (Davis, 2016). Institutionalising asset management requires a true shift of the organisational management and culture toward outcomes that focus on reliability, total cost of ownership, and performance or level of service (Rose et al, 2012). Without the full support and involvement of top management, this sort of programme can be viewed as the new "flavour of the month" by the plant population, and most likely will fail (Allen, 2011).

An organisation's management system can be viewed from two disciplines: the operations discipline, which includes, purchase material-operate-deliver goods or services; and the asset management discipline, which includes, identify need-acquire assets-maintain-keep, develop or replace. While these two disciplines are interdependent in action, the former is directly related to the business and easily governed by the finance budgeting for short-term cost and profitability. The second is more directly associated with strategic value. The value is hard to quantify due to the uncertainty or risk involved that influences the investment decision and also the unclear intangible relationship with business or stakeholders needs in general (Dwight & El-Akruti, 2009).

It is crucial to create awareness and motivation amongst employees by creating understanding of AM implementation and the benefits of participation. It is also important that managers act as promoters when a new initiative is implemented within an organisation. These factors play a crucial role in the success of AM Strategy implementation and execution.

Organisational Culture

The establishment of a supportive organisational culture is an essential platform for the implementation of asset management. High performing organisations are those with a culture of sustainable and proactive improvement (Achanga et al, 2006). It is appropriate to have a certain level of communication skills, long-term focus and a strategic team if intending to implement asset management.

A central theme for any AM implementation section is that attention to change management and building an AM culture in the organisation are critical (Rose et al, 2012). The Asset Management Council of Australia (AMC) defines Asset Management Culture as: "*the extent to which all levels of the organization have the knowledge, skills and commitment to achieve the documented asset management goals of the organization*" The following criteria is used to evaluate the component mentioned.

- How are AM goals deployed at all levels?
- Are these evident to all people involved?
- Are the knowledge and skills necessary for achieving AM performance goals known by the organisation?

- Is there a plan for the provision of AM knowledge and skills?
- Are the roles and responsibilities for those involved in AM clearly defined?
- How is the performance of individuals and groups recognised and supported?

It is important to develop a shared organisational culture, because the success of an organisation also depends upon the employees thanks to their knowledge and skills, and the human capital (D'Alesio, 2012). It is also important to understand how the organisational culture is understood by the employee. However, if it is difficult to define the organisational culture, it is even more difficult to examine it, due to the lack of an instrument, or test it. This difficulty of defining and testing the organisational culture could be clearly attributed to its social nature and complexities; for example, the unspoken rules about acceptable attire, how to speak and act in certain situations, and how to react during particular social exchanges (Xerri et al, 2015).

Organisational capabilities are critical for addressing the cultural challenges within the organisation. Best-in-Class organisations are strategically organised to get buy-in from different stakeholders in the organisation by raising awareness about the importance of asset performance management to overall corporate growth plans (Shah & Lattlefield, 2008). From the largest and most inclusive asset management study ever conducted with approximately 1000 participants from a wide range of industries around the world, it was found that organisational culture is cited as the top challenge faced by over 40 per cent of the asset managers who participated in the study (O'Hanlon, 2014).

Most people think that organisational culture is the biggest single obstacle to improving the asset performance as shown from the survey carried out by (O'Hanlon, 2014), this is illustrated in Figure 8 below.



Figure 8: Obstacles for Improving asset performance (O'Hanlon, 2014)

Jung *et al* (2009) extended the argument by suggesting a process for managing organisational culture and organisational culture change, because typical AM cultures must change if they are going to meet best practice standards and to maximise asset management performance. It has been suggested that organisational culture may impact on organisational factors such as: morale, job satisfaction and organisational commitment (Armenakis & Harris, 2002).

Culture is a relevant issue in Physical Asset Management, and it is then important to understand how much it is developed in an organisation, and if there is a need to further improve it. This is not easy, because many factors have to be considered (according either to the general theory of intellectual capital or to the specific studies on culture in Physical Asset Management) and, further on, not all of these factors can be measured quantitatively (D'Alesio, 2012). AM execution will fail, if the organisational culture is not supportive, and if employees feel doubtful or susceptible when data is collected about the asset they look after.

A problematic organisational culture may cause data not to be brought into the planning office for capturing, leading to insufficient data, which if it had been collected will in turn help in taking the necessary actions to improve organisational performance and capabilities by making informed decisions. The PAS-55 approach creates the awareness that everyone in the organisation has a contributory role to play in an effective asset management system which instils a sense of purpose and direction. It encourages a 'one team' perspective and dispels the silo mentality which prevails in most organisations if not checked (Michie & Mundy, 2011).

Development, Training and Skills

It is no secret that organisations undertaking engineering asset management need to be constantly poised for organisational change. Effective asset management is able to positively affect public well-being by reducing accidents and breakdowns in public infrastructure, including power, water, and of course any other asset intensive organisation. Part of being effective is having asset managers, engineers and technicians who are open to change and to adopting best practice as it continuously develops in the industry (Xerri et al, 2015)

Cost plays a huge role in the determination of any successful project. Finance covers possibilities through which provisions for consultancy and training during the implementation can be made. Organisations fear that the application of AM would require

financial resources simply because consultants are required to aid with the implementation of AM. The training of people to utilise the programme requires financial resources that organisations are at times not willing to part with (Achanga et al, 2006).

Most organisations employ people with low skill levels and they do not foster the ideology of skills enhancement (Achanga et al, 2006). This however, negatively affects the basic core of improvement strategies such as asset management, since some technicalities in the application process requires employee skills and expertise. The inclusion of participants in the EAM process from outside the range of traditional "maintenance" practitioners presents challenges (Hodkiewicz & Pascual, 2006). Moreover, low level employee skills would not harness the desire for technology or initiatives development (Achanga et al, 2006).

Management team has the tendency to pick up the latest 'best practice' (often from conferences or peer recommendations), tries them successfully in pilot form, commits to significant investment and adoption, and is disappointed by the longer term failure to deliver sustained results. Where this is the case, part of the problem usually lies in the implementation process itself (inadequate provision for training, communications, feedback measures etc.), but management turnover also bears some of the blame. Managers often rotate or move on every 2-3 years and as Woodhouse says: "*I have seen cases where this has been as short as 6 months"* (Woodhouse J. , 2014). This leads to the workforce getting changing messages from the changing leaders, in turn plummeting their enthusiasm for a new direction, in anticipation of subsequent changes. It is therefore difficult, to create purpose that is consistent.

Between 60 per cent and 80 per cent of all companies fall short of the strategic targets that they have set (Kaplan & Norton, 2008). It is also found that 90 per cent of all companies fail to realise their strategic ambitions (Zook & Allen, 2001). About 63 per cent of strategies' financial performance is realised (Mankins & Steele, 2005), (Zook & Allen, 2001).

Poor AM Implementation

One of the contributing issues when it comes to executing AM successfully is caused by having a poor implementation programme or not having to understand the elements that leads to successfully implement asset management. *Figure 9Figure 9*, below illustrates three

elements that need to be addressed to successfully implement AM. The author likens these elements to those that can be used in successfully implementing lean principles.

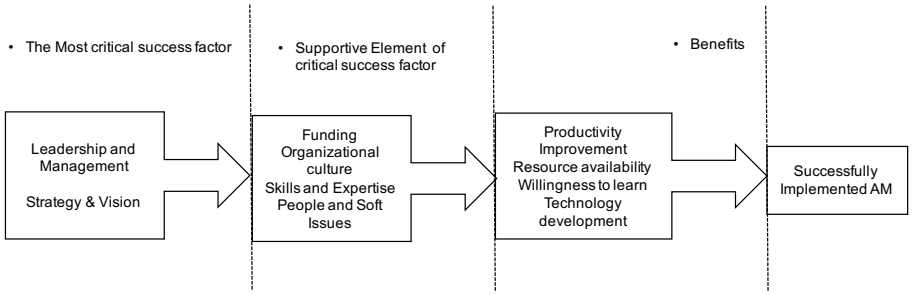


Figure 9: Elements of a successful AM implementation (Author*)*

The implementation of AM can safely be compared to the implementation of Total Productive Maintenance (TPM). TPM is an integrated process, it requires that all levels of the organisation participate during implementation (van Heerden & Vlok, 2015). TPM is described by the relationship between maintenance and production to continuously improve product quality, operational efficiency, safety and assurance, and capacity (Tsarouhas, 2007).

The implementation of a holistic asset management strategy using the ISO 55000 series of international Standards and TQM as foundation, by obtaining the Best-in-Class status will reap significantly larger benefits from improved maintenance practices than those organisations that are still classified as Average or Laggards (van Heerden & Vlok, 2015). Organisations care about managing and maximising assets effectively so that they can achieve production targets, controlling costs and meeting corporate and organisational goals (Repenning & Sterman, 2001).

2.12 AM Maturity Risks

There are other risks involved which if not addressed properly will inhibit AM growth, these risks contribute to an organisation's failure to manage its assets optimally. These risks are overly exposed for example (March, 2010):

1. If asset owners don't know what assets they have;
2. If they are under or over maintaining their assets;
3. If operators are not properly operating their assets;
4. The asset risk at hand with regards to assets is not managed properly
5. And Sub-optimised asset management systems are in place.

Know your assets

Commonly, in mining organisations it seems that they don't appreciate the need to know what assets they have confidently. It is of paramount important to know what assets you have employed for an effective asset management programme. Organisations that are truly serious about AM and improving their AM Maturity level will take this as the foundation to build on to enable a working AM. As an indication, here are a few pointers that would help asset managers to ensure their AM foundation is built properly, the following would need to be in place:

1. Develop a list of all the organisation's assets or asset register. Asset Identification and Verification business process (AIV) must be implemented, reviewed and updated as such on a regular basis.
2. Physical Asset Tree or hierarchy must be established and configured. Computerised Maintenance Management System (CMMS) will be of great assistance herein.
3. Criticality ranking of these assets is crucial. Each individual asset is ranked and linked to how it affects the organisational strategic plan.
4. Develop and Implement configuration management also known as Management of Change (MOC).

Under or Over Maintenance

During the operational phase where the asset is being operated, problems may arise not only related to operations, but maintenance problems through under or over maintaining the assets. There main issue regarding under or over maintaining may bring about other sub-issues leading to an ineffective asset management system, this include:

1. High costs are often associated with the execution of non-value added maintenance, therefore one can use cost as a KPI that will be monitored and benchmarked as to how much other organisations of a similar type and or size spend on maintenance.

2. Secondly, performing upsetting maintenance tasks more frequently has high probability of inducing 'infant mortality failures', which in turn increases maintenance costs.

Under-maintaining

This is usually the result of the thinking whereby maintenance is seen purely as a business expense, which could be open for reduction to maximise profits. Maintenance departments

are constantly struggling to balance costs with the performance requirements for the assets such as reliability and availability. Cost cutting always triumphs in this case, and this results in delayed proactive maintenance. This act surely compromises the effectiveness of AM Maturity. The use of methodologies such as Reliability Centred Maintenance (RCM), related to the most critical assets would be of great assistance in employing the appropriate maintenance strategy and frequency of maintenance (March, 2010).

Supervisors who defer preventative maintenance often experience a "grace period" in which they reap the benefits of increased output (Repenning & Sterman, 2001). They will will not go on for long while avoid spending on maintenance costs, sooner or later their assets start to wear and then they will begin to experience lower output and availability as failures start occurring.

Improper Operation

Most mining organisations suffer from lack of understanding of the inherent design capabilities of their assets and on how to operate these assets within their proper ranges to optimise the asset life cycle (March, 2010). Operating below or above the design range will negatively affect the life of the asset.

Improper Risk Management

The basic principle of best practices asset management is not only to manage the risk associated with Operation and Maintenance of the assets, but also the risk associated with the ownership and use of these assets. Risk is defined as a function of probability or likelihood and consequences (ISO31000, 2009).

Sub-optimised EAMS

CMMS or EAMS have become more popular in recent years and are used within organisations to manage assets. Most of these systems have inherent deficiencies that prevent a holistic management of all required areas of the AM plan (March, 2010). This often leads to secondary systems being employed. On the other hand, there are many organisations that are guilty of not utilising these systems to their full potential. There are many contributing factors to this, to name a few, shortcuts taken during implementation, inadequate training received, etc. (Repenning & Sterman, 2001) (March, 2010).

2.13 Where Does It Begin?

Much focus has been put on strategy development and as a result there are numerous brilliant strategies put forward thus far, however, this is meaningless if the intentions are not delivered. It all boils down to having an asset management strategy and understanding the need for having that strategy. It is rather unnecessary to have an AM strategy that is not in-line with organisational objectives. Figure 10, below is designed to bring together asset strategic planning and effective implementation.

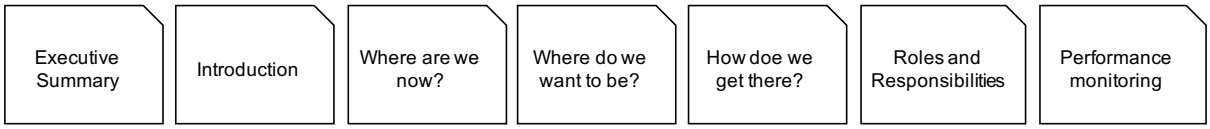


Figure 10: AM Strategic planning

The Executive Summary is the most read part of an AM Strategy (AMS). Often, it is the executive summary that is read the most from the entire document. It is thus most important to have the executive summary well written to convey the message from the main strategy document. Conciseness is the important point to put together a well-written summary. These are the key pointers or questions to answer, when developing a strategy (Health Facilities Scotland, 2010).

Executive Summary:

- What is the purpose of the executive summary?
- What information should be included in it?
- How should it be structured?
- Is it likely that some people who read only the executive summary will not have the technical background?

The Introduction:

- Why has the organisation developed the AMS?
- What are the aims and objectives of the AMS?
- What assets does it cover?
- What period of time does the AMS cover?
- What are the benefits of the AMS?
- What process was used to develop the AMS?
- How is the rest of the AMS document structured?

Where is the organisation now?

- What assets does the mining organisation have and use?
- Where are these assets located?
- What is the current condition and performance of these assets?
- Is there a backlog in maintenance expenditure requirement?
- How much does the organisation spend supporting its asset base?
- What is the background to the organisations current asset base?
- Are there any major constraints on changing or developing the assets?

Where does the organisation want to be?

- What impact will national and local policies and strategies have on the organisation's need for assets?
- Are there planned changes in the way in which the mining plant will be provided by the organisation in the medium-long term?
- What are the main issues arising from the analysis of the current asset and performance that will need to be addressed by the AMS?
- How does the AMS relate to other organisation's strategies within the mining industry?
- How have the various parts of the organisation been involved in the development of the AMS?

How does the organisation get there?

- What options does the organisation have for ensuring that its assets closely match its future service and organisational needs?
- How did the organisation make decisions in relation to the AMS?
- What key changes will take place as a result of implementing AMS?
- How much will the AMS cost to implement?
- Can the organisation afford the AMS?
- What are the risks associated with implementing the AMS?

The Implementation Plan

- Who is ultimately responsible for developing and delivering the AMS?
- What organisational structure is in place to deliver the AMS?

- How are the various parts of the organisation involved in the implementation of the AMS?
- How are stakeholders involved in implementation of the AMS?
- What processes are in place to ensure good governance for the implementation of the AMS?
- Is there a next step action plan?

Performance Monitoring

- What key performance indicators (KPIs) does the mining organisation use to performance manage its asset base?
- How is the organisation currently performing in terms of these indicators, what is the current trend in performance and what difference is the AMS expected to make to this?
- What systems and processes will the mining organisation put in place to hold managers accountable (within and outside of the organisation) for achieving the actions required to implement the AMS and the performance changes expected from it?
- How will the organisation collect and use stakeholder opinions about progress and achievements in relations to the AMS?

2.14 Conclusion

Chapter two has offered a wide overview of asset management. This was done to better formulate a solid background for the establishment and understanding of Asset Management Maturity. This chapter presented some of the issues in relation to Asset Management. Similarities of the AM maturity framework used at A-Coal as compared to other AM Maturity frameworks currently used in the industry was also presented herein. A guide is presented illustrating the key steps for the successful implementation of an Asset Management system. As a result of the chapter, it can be stated that, when any person refers to Asset Management, the relevance of these topics may arise related to how can AM be implemented in an organisation. And for a successful AM system, the organisation must not only focus on leadership but also the culture, people's development and understanding of AM, the importance of Risk Management, and where to begin if you are interested in implementing AM.

CHAPTER 3

3 Research Methodology

In this chapter a detailed methodology for the case study is presented. A sequential order was followed which describes the research design, the approach, protocol followed, data selection and multiple data collection methods, data analysis and the evaluation of data credibility methods.

Chapter 2, highlighted the critical elements required for implementing a successful AM system. Research has concentrated extensively on implementing an AM strategy and also why it also, not much has been done to understand why the AM strategy fails in the execution phase. Given that Maturity or the AM set targets are not reached as planned, strategy execution seems to be a common predicament, and the lack of success in executing strategy is formidable as it is observed that the strategy execution process appears to be prone to failure. (Baum & Vlok, 2013).

3.1 The Research Strategy: Case Study

The primary approach utilises a Case Study design. This is because the researcher is investigating a particular phenomenon which is Asset Management Maturity in A-Coal, a particular context. Each method has distinct advantages and disadvantages, depending upon three conditions: the type of research question, the control an investigator has over actual behavioral events, and the focus on contemporary as opposed to historical phenomena. In general, case studies are the preferred methodology when (a) "how" or "why" questions are being posed, (b) the investigator has little control over events, and (c) the focus is on a contemporary phenomenon within a real-life context. This situation distinguishes case study research from other types of social science research (Yin, 2009).

In order to understand a real-life phenomenon in depth, a qualitative single case study method was selected. The essence of a case study, the tendency among all types of case study is that it tries to illuminate a decision or set of decisions: why they were taken, how they were implemented and with what result (Yin, 2009). A case study is more useful when an opportunity to learn is of major importance. It also provides a mode of inquiry for an in-depth examination of a phenomenon (Yin, 2009) .This research work, may lead other researchers to

expand on this study to find a holistic view of Asset Management Maturity in mining within South Africa.

Yin (2009), characterises case study research as empirical inquiry that investigates a contemporary phenomenon within its real-life context, when:

- The boundaries between phenomenon and context are not clearly evident;
- And when multiple sources of evidence are used such as interview, documents.

A case study research arises out of a desire to understand complex social phenomena. A case study was warranted because this study encompasses activities, processes, and their interrelationships. This study seeks to establish the key challenges inhibiting the achievement of the desires levels of AM maturity in a specific mining organisation by:

- establishing the importance of stakeholder's involvement when it comes to executing asset management activities and the improvement of AM Maturity.
- assessing employees' attitudes, culture, perceptions and understanding of AM and its associated benefits for properly executing Asset Management Processes.
- analysing A-Coal employees' understanding of Change Management, Asset Management and Business Risk Management.

There are three types of case studies (Yin, 2009):

- Intrinsic: One explores a particular case to gain a better understanding of it
- Instrumental: A certain case is examined to provide information or insight on issues or refinement of theory
- Collective: A number of cases are studied jointly in order to inquire into the phenomena, population or general condition.

One of the research's goals was to establish or identify key challenges inhibiting organisations from attaining the desired level of AM Maturity, and developing an understanding of the implementation process of AM. Given the history of AM implementation, sourcing relevant documentation and understanding its development was truly valuable information to ensure the study is intrinsic. On the other hand, the study may shed light on problems and issues that may be common to other mining or other organisations in the development and execution of AM strategy.

3.2 Study Design

The study design represents a structured and logical flow from the preliminary activities that triggered the study through data collection and analysis. The protocol in *Figure 11*, as illustrated below is from (Yin, 2009). The case study protocol that is followed when conducting this study research is as follows: Designing the case study, preparing to collect case study evidence, collecting case study evidence, analysing case study evidence and reporting case study (Yin, 2009).

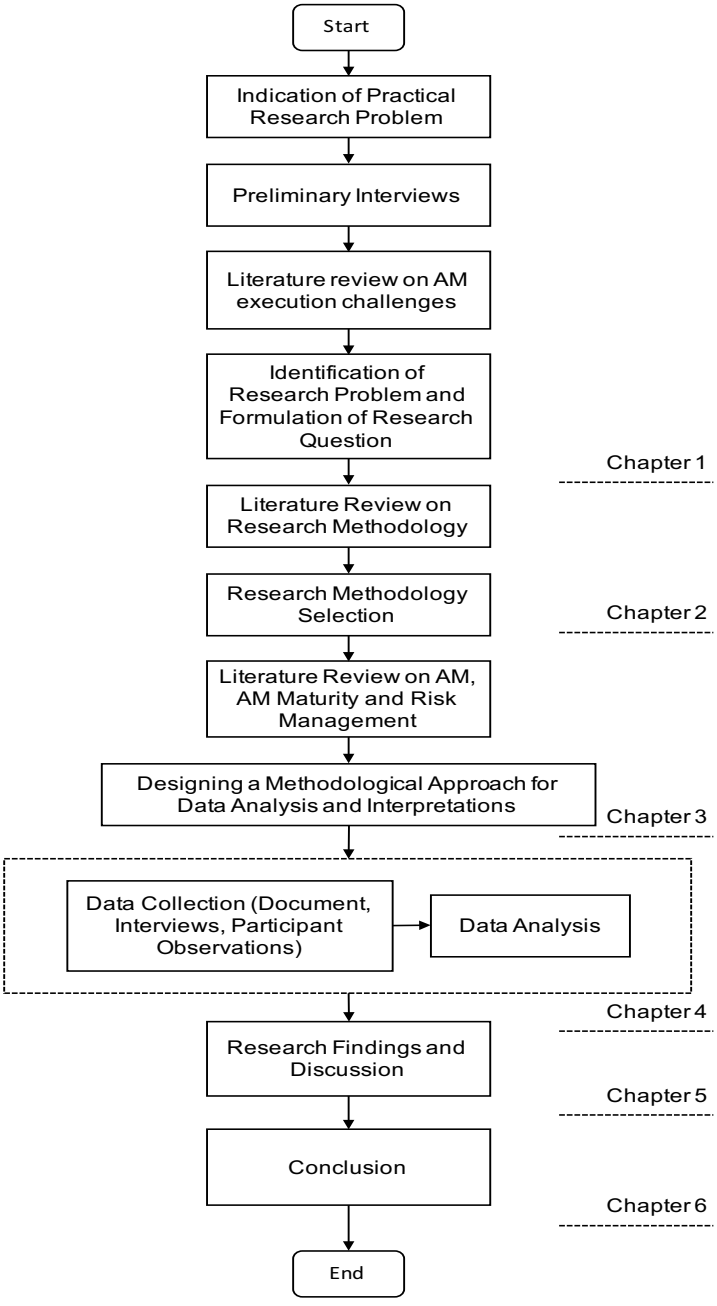


Figure 11: Research Protocol (Yin, 2009)

3.3 Case Study Design

When designing a research the following five components are significant (Yin, 2009): A study's questions; its propositions; its units of analysis; the logic linking the data to the propositions and the criteria for interpreting the findings. The first component has already been described in chapter 1, which was in a form of a "what". The second component is the study's proposition, there are no hypotheses defined in this study, the researcher aims to identify the key challenges inhibiting AM maturity growth in mining organisation. The unit of analysis is the third key component The researcher chose a mining site "coal washing plant" as the primary unit of analysis because the researcher had access to this case site to obtain all the necessary information or data and was given consent. Information about this case site will be collected and interviews will be conducted with several individuals working at A-Coal.

The main concern during the design phase is to be aware of the main choices and how they might suit your case study (Yin, 2009). The actual analysis will require that the researcher combines case study data from documentation, interviews and observations and reflect these to what was found in the literature review. Initial set of questionnaires were developed; however, upon analysis of the pre-interviews the research question was not answered and it was also difficult for the researcher to find any meaningful data. The instrument used for interpreting the study's findings was content analysis.

3.4 Method and Sources of Data Collection Activities

All case studies rely on multiple sources of evidence. A qualitative approach to data collection was deemed appropriate because the researcher had direct and personal contact with the employees at the A-Coal site and in the natural setting of the phenomenon (AM implementation and execution). This allowed the researcher a number of options and multiple data sources for data collection. A brief procedure for managing data for the study will be discussed herein. Having mentioned that this is a qualitative study, the researcher expected to use various methods and sources of data which aimed to result in a wealth of documented data. A summary of data used from all the sources of data is detailed herein:

- *Documentary evidence:* information from A-Coal when the initial assessment was conducted, implementation took place, and all the other annual assessments were captured, with findings. The initial strategy, policy, and master plan were also

captured. These documents are available in electronic formats.

- *Semi-structured interviews:* There was a total of thirteen interviews conducted at the case site (excluding the pre-test interviews). The interview sessions duration ranged from 15 to 45 minutes and resulted in transcripts averaging between 6 – 9 pages per interview (approximately totalling 35 500 words).
- *Participant Observations:* The researcher worked for over three years at current site as an Asset Care Centre Manager offering asset management consultation services, and has been involved in meetings, when certain initiatives were implemented, but only observed and documented some of the things that he was exposed to and of interest to the study. The data collected through this method also contributed as a trigger to this study. The researcher had taken note of not being biased towards this study in order to draw the most relevant conclusions and findings during analysis.

3.5 Documentation Evidence

Documented information is likely to be relevant to every case study topic (Yin, 2011). Documents consisted of those that were produced when AM was implemented at the case site and subsequent documents which are related to the context of asset management. The criteria used for selection of the documentation data was its credibility, which included meeting reports, original master plan, steering committee meeting minutes, technical committee minutes and AMIP results reports obtained over the years. It was important to capture information from and about those relevant documents. The researcher's criteria of relevance expanded as his understanding evolved, and this is also expected for an exploratory study. even an exploratory case study should be preceded by statements about (a) what is to be explored, (b) the purpose of the exploration, and (c) the criteria by which the exploration will be Judged successful (Yin, 2009).

The case site information was saved in a common network drive where Company B documents are saved or stored. Some documents were obtained from the Engineering manager, as well as the Asset Care Engineer who are the main drivers of AM at the case site. These sources offered trustworthy data related to the AM programme. The official (signed) and semi-official (unsigned) documents were important sources for activities, events and their dates related to the AM programme. The A-Coal's electronic folder included records of meetings, activities of implementation and execution of AM at the case site. The researcher's efforts to collect these data resulted in a large amount of electronic files, including meeting

agendas, minutes, correspondence between key participants involved in AM implementation, technical reports, and also financial documents relating to the costing of the implementation of AM.

3.6 Semi-structured Interviews

Semi-structured interview is a method of research used in the social sciences, they are open and allow new ideas to be brought during an interview as a result of what the interviewee says, whereas structured interview has a rigorous set of questions which does not allow one divert (Yin, 2011). Interviews are an important data collection tool for any case study. The advantages of interviews are that they afford the researcher a exclusive focus on the study topic and also provide casual interpretations by those participants who are closely involved in the context of the research problem.

Purpose of the interviews:

Interviews with the participants provided a good understanding of the implementation of the AM programme at the case site. They also provided background on the context, origin, and early development of asset management. And to some extent also information about the most recent developments associated with AM. The data obtained from the interview sessions were audio taped and later transcribed. For the systematic research design purpose, elements below were identified as the primary objectives in the interviews:

- Interviews to gather stakeholder's involvement from leadership;
- Interviews to collect data about AM implementation process;
- Interviews to gather information from the business processes employed and activities in the AM programme.

Participant Selection:

Interviews were conducted with participants who were present during the commissioning part of the case site, and with those that are directly impacting the AM programme and its capability. participants were Available to conduct as many interviews as required. Purposeful Sampling selection technique was used to select interviewees insuring a wide range of the relevant personnel involved in asset management. These participants included: artisans, planners, engineers, managers, from middle management to senior management. Initially, a list of potential candidates to be interviewed was developed. not all who were identified

participated in the study for various reasons; due to their irrelevance, and some not willing to participate in the study. The documentation was used as input to draft the list of the potential interview candidates.

Some interviewees were nominated by some of the participants, and it was suggested that some be opted out of the study. Some of the criteria used in the selection of interview candidates included:

- Individual's role;
- Organisational affiliation – individual's organisational relationship to ensure a range of viewpoints across the organization;
- Assessment of individual's knowledge in discussing the asset management implementation and execution;
- Individual's years of service within the organisation and in the mining industry.

The interviews were semi-structured and about 13 interviews were conducted these exclude the six interviews which were used in the pilot phase to test the relevance of the questionnaires. The questions are mostly open-ended such that the respondent can narrate or detail a sequence of events from the past, present and future expectations and may also add any information they deem to be applicable and important. The list of these interviewees is attached in Appendix (B)

3.7 Ethical Consideration

For confidentiality purposes, pseudonyms were used, such as: The plant name or site name is referred to as A-Coal. Interview respondents were labelled as (e.g. Participant 1). The unit of analysis is a Case site (single Case Study), the researcher opted not to use positions, but position ranking, such as senior, middle or lower management, because some of the positions are single occupied by only one individual and that could compromise confidentiality, e.g. MD or Financial Director.

On the 31st July 2015 a formal communication via email was sent requesting consent to conduct research at the A-Coal site. Ethics clearance was also granted from the University school of Mechanical, Industrial and Aeronautical Engineering ethics committee. Consent was granted by the General Manager authorising employees to take part in the study. Participants who were willing to be interviewed received participant information sheets

explaining the intent of the study and what contribution was expected from them. Voluntary interviews were scheduled to take place during the course of the research study. Participants also signed their consent letters before the interviews took place. Permission was granted by all participants to have their interviews audio taped. It was stated clearly before- hand that responses would be kept confidential and anonymous. The researcher used pseudonyms where ethical conduct possibly could have been breached. The recorded sessions were later transcribed by a professional transcriber for analysis purposes.

There were thirteen formal interviews that were conducted and transcribed after having successfully revised the first set of questionnaires. The interviews were held across the staff compliment, from one of the highest ranking positions to the worker operations and maintenance personnel of A-Coal. The selection for interviews was based on the individual's involvement in AM activities and favoured those with most experience in AM and the mining industry. And more so, those that were involved during the commissioning stage of the plant or when asset management was introduced at A-Coal. The sections included: maintenance, operations, engineering, and management.

A number of ethical factors have been taken into consideration, in this case study. For all scientific communications, honesty will be applied to the data, results, procedures, and publication status. The researcher attempted to be objective in all possible expectations and where required. Other ethical factors that were considered, included but were not limited to, integrity, carefulness, openness, confidentiality, and respect for intellectual property. Lastly, interpretation and analysis of data collected will be taken very seriously such that the researcher does not manipulate the findings

Development of Interview Questions

Case study interviews require operation on two levels at the same time: satisfying the needs of your line of enquiry while simultaneously putting forth "friendly" and "nonthreatening" questions in the open-ended interviews (Yin R. , 2009). A set of interview guides that summarised a list of questions following Wengraf's (2001) Pyramid Model as shown in Figure 12 were developed The interview questions were crafted in such a way that they are mostly the same for all interviewees, however, some were restructured differently as follow-up questions emerged during the sessions.

The guides allowed the interviewer to be flexible and responsive to unforeseen responses and the manner depended on how the sessions evolved. Information obtained from the interviews will be validated by comparing it to other sources of data and between participants so as to maintain a good chain of evidence. There are certain measures that must be considered when conducting interviews, they include (Yin, 2009):

1. Participant should be drawn from those with experience in asset management or are employed with executing activities in AM;
2. Interviewees should be allowed to express their views and opinions and be able to make recommendations for other relevant sources of evidence;
3. Researcher must ensure interviewees' perceptions are extracted;
4. Ensure that other sources are available for confirming and validating evidence.

This allowed the interviewer to remain free to develop a specific subject that was being discussed in order to get more information from the participant. And this also allowed for a conversational style of interview with the focus still on the subject at hand. Some of the transcribed interviews were used as templates and for rephrasing some of the questions for the subsequent participants. The CRQ – TQ – IQ/(II) algorithm is used in this case study to design interview questions and for analysing interview material as illustrated in *Figure 12* this model is referred to as the Wengraf Pyramid Model. This model is based upon the primacy of the research question and upon the distinction between the theory-language used in research questions and interview-language used in interviews (Wengraf, 2001).

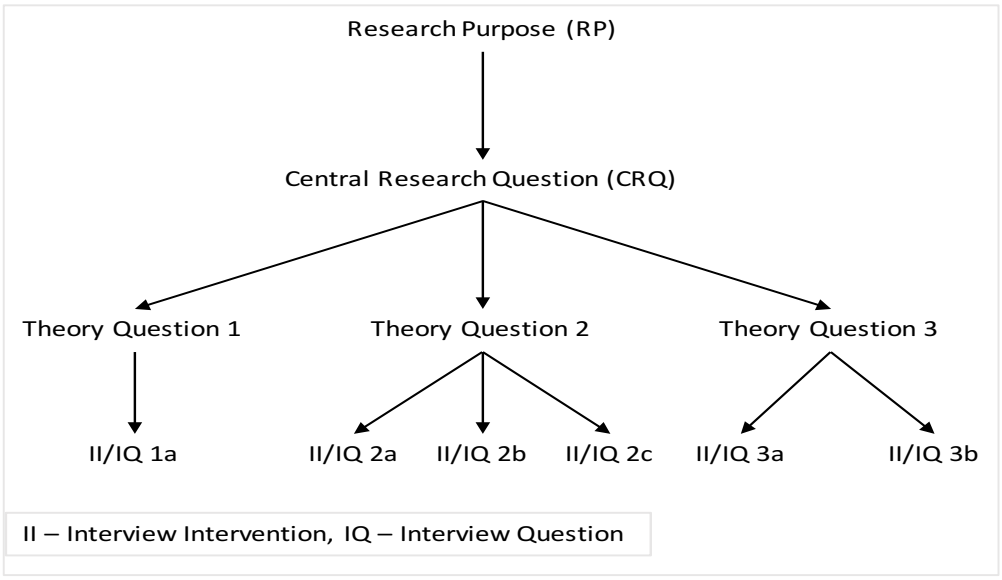


Figure 12: CRQ>TQ>IQ/II - Pyramid Model (Wengraf, 2001)

In answering the critical research question theory questions were initially developed. An example of how the researcher developed from theory question is shown below in endeavour to answer the CRQ. An example of the Pyramid Model following the Wengraf model is as follows:

CRQ: What are the key challenges experienced by mining organisation that prevent the achievement of the desired asset management maturity level, which, will in turn, better address business risk?

TQ 1: How can stakeholder's involvement implicitly affect the asset management maturity?

IQ (1): What is your understanding of asset management?

IQ (2): To what extent does senior management support asset management?

The collected data is classified into these categories:

1. Strategy event identification data: this includes, AM implementation dates, initial strategy development, policy development, initial AM Maturity data, external and internal strategy triggers, and organisational strategy and objectives and AM targets.
2. Data related to AM activities, including: Master plan activities and reviews, asset acquisition and other utilisation phase activities and AM Maturity assessments
3. A-Coal performance data, includes: business performance and asset types and asset performance data.
4. Data relates to employees' behaviours, management's behaviour, decisions, and other data related to AM activities as well as relationships and the execution manner of AM.

3.8 Participant Observation

The third technique used as a means of collecting data was participant observation. Hammersley and Atkinson (1983) argue that in a sense all social research is a form of participant observation, because we can not study the social world without being part of it.. For anthropologists and social scientists' participant observation is a method in which a researcher takes part in the daily activities, rituals, interactions, and events of a group of people as one of the means of learning the explicit and tacit aspects of their life routines and their culture. Participant observation allows the researcher to (Musante & Dewalt, 2010):

- Build on tacit knowledge, both his own and group members;

- It provides the researcher with access to the emotional reactions of the group introspectively;
- The researcher's ability to grasp motives, concerns, interests, unconscious behaviours, and so forth are maximised;
- Allows the researcher to live in their time frames and to record the experience in and on its own terms.

The researcher was able to engage actively with certain individuals in their natural settings. For this study, the researcher had direct experience with the execution of asset management within the case site. The researcher was able to attend numerous meetings and certain assessments conducted at the site in measuring A-Coal AM Maturity and AM compliance. The researcher was a participant observer in the following meetings:

1. Technical Meetings;
2. Production meetings;
3. 90-Day plan meeting;
4. Defect eliminations meetings;
5. Steercom meetings.

The role of the researcher during these meetings was to observe individuals, activities, events, communications, and processes. Some of the observations were recorded in the researcher's hand note-book. One concern about participant observation is the potential for researcher to be biased (Yin, 2009). To minimise possible bias during the study the researcher had informal interview sessions with some of the participants so as to collect less biased data. The researcher sampled whomever was willing to engage in discussion about certain information at hand, which arose in the meetings held.

3.9 Summary of Data Collection

This study presented three methods or tools used to collected data, which e strongly complemented each other. Each tool was used to collect different types of data, through which they all contributed positively to the study. The challenge was developing a common place where all data obtained could be streamed on-line to answer the critical research question. A multi-method approach was used to maximise usage of the data available in improving the credibility and trustworthiness of the data, and so as to provide a basis for triangulation between data sources. By using three sources and techniques, the researcher

intended to complement some of the disadvantages of the other sources with some of the advantages of the other, and thus tried to minimise any inadequacies. Blending the three sources of data provided an instrument to gain different perspectives on the implementation and execution of AM within the case site.

Table 1, summarizing the three different data source, the use of data, and the purpose.

Data Source	**Data Type**	**Data Utility**	**Purpose of Data**
Documentary evidence Primary source material	- Official records - Historical data -Administrative Procedure	- Provided official information from AM implementation - Verified data collected from other sources	-Assisted in determining activities, processes, situation that influenced, enabled, or limited the improvement of AM Maturity.
Semi-Structured Interviews	- Participant constructions - Historical and Contextual information	-Participants own words, their interpretations, and understanding of the problem and issues with regards to AM - Verification of data collected from other sources	- Assisted in determining activities, processes, situation that influenced, enabled, or limited the improvement of AM Maturity.
Participant Observation	- Field Notes - Observations, experience, events, activities and process executions	- Provided the researcher with the experience of AM execution in the natural situation of people responsible to drive AM and activities involved	- Assisted in collecting descriptive details about current execution of AM - Helped interpret data gathered from interviews, and meetings - Context of AM

Table 1: Summary of Data Source

3.10 Data Analysis

Qualitative content analysis is a research method for the subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes or patterns" (Hsieh & Shannon, 2005). Mayring (2000) states that it is an approach of empirical, methodological controlled analysis of texts within their context of communication,

following content analytic rules and step by step models, without rash quantification and Patton (2002) argues that qualitative content analysis is any qualitative data reduction and sense-making effort that takes a volume of qualitative material and attempts to identify core consistencies and meanings. Qualitative content analysis involves a process designed to reduce collected data into categories or themes based on valid inference and interpretation. The researcher allowed themes and categories to emerge from the data and as he carefully examined and constantly compared the emerging themes.

The central problem of content analysis originates mainly in the data-reduction process by which the words or texts are classified into much fewer content categories (Webber, 1990). The researcher tried to use qualitative content analysis method to analyze the data. Data collected was interpreted and reduced to make sense in attempt to identify key themes. A data analysis tool NVivo was used to aid in categorising themes. The researcher collected evidence from the interviews, documents and also through his observation to validate and conclude on the findings. It was advantageous to use all three methods in most cases during the analysis period to minimise inaccuracy and assumptions and henceforth being biased.

A theme is an outcome of coding, categorisation and analytical reflection, not something that is, in itself, coded. But several qualitative methodologists recommend labelling and thus analysing portions of data with extended thematic statements rather than shortened code (Saldana, 2009). A theme is an abstract entity that brings meaning and identity to a recurrent (patterned) experience and its variant manifestation. As such a theme captures and unifies the nature or basis of the experience into a meaningful whole (Saldana, 2009). A theme acts as a way to categorise a set of data into an embedded topic that organises a group of repeating ideas.

Themes can contain ideas such as description of behaviour within a culture, they could also explain why something happens, it can contain iconic statements and also reflect the morals of participants. Unlike content analysis which begins with predefined categories, thematic analysis allows categories to emerge from data. The researcher tried a set of predefined codes for his study and most of the codes were not applicable, as the codes were emerging from the interviews' data. On the other hand, Themeing the data was not an advantageous method of qualitative analysis, because, it is as demanding as coding and necessitates a comparable consideration on participant meanings and conclusions.

Analysis Procedure

The objective of analysis in this case study is identifying the predominant key themes. Below are the steps which comprise the analysis and interpretation:

1. Establishing the phenomenon: this includes, the identification and establishing of when AM was implemented as compared to the commissioning of the plant;
2. Defining the key Themes: This involves identification of the major themes which are highlighted during the interview transcripts;
3. Provision of recommendations;
4. Establishing the Outcome;
    a. This involves the resulting outcome of the key challenges;
    b. Establishing the challenges associated with the selected solution. This involves whether the resulted outcome is of any similar to what the literature review divulged;
    c. Establish how the resulted challenges with AM Maturity relate to business risk;
    d. Establish whether the resulted outcome has a positive or negative value contribution to the organisation's competitive strategy;

Interpretations requires a detailed search for actual root causes and subsequent effects. The management behaviour of the asset-related-organisational activities and the resulting Asset Management Maturity can be assessed. The interpreter is in search of both positive and negative phenomena while referencing the existence of AM activities or lack thereof, relationships and mechanisms. The identification of these challenges maybe associated with the existence or absence of AM activities. The fundamental conclusion or findings is to demonstrate how these identified challenges inhibit the AM organisation's objectives to be achieved. It is to be born in mind that the results obtained may not be influenced only by AM activities during execution but the approach on how AM was implemented in this Case site. These non-AM activities will need to be highlighted.

A case study is defined as "an empirical inquiry that investigates a contemporary phenomenon (the 'case') in depth and within its real-world context". Yin (2009) argues that case study research is a challenging endeavour that hinges upon the researcher's skills and expertise. Yin (2009) states that clear and detailed approaches to case studies have not normally been made explicit. The case study evidence is one of the least developed and

disliked methods of statistical analysis, there are few methods developed to guide the novice who is conducting case studies. Therefore, much still depends on the researcher's own style of thinking, along with satisfactory presentation of verification and careful presentation of alternative interpretations. The case study protocol is a key tool for increasing the reliability of a case study. Below is Table 2 that shows the protocol followed.

1. Preliminary	
Field of Study	Physical Asset Intensive Operation (mining).
Observations Unit	Individuals involved in the execution of AM strategy.
2. Study Design	
Qualitative	qualitative research focuses on describing and understanding a phenomenon.
Case Study	Illuminate a decision or set of decisions: why they were taken, how they were implemented and with what result.
3. Data Collection	
Participants identification	Created a list of potential participants who are involved in the execution of physical asset management strategy, obtaining organisation's archive data, consultation with top management for consent.
Data Gathering Tools	Documentations archived, semi-structured interviews and participant observations.
Questionnaires Design	Open-ended question, such as: what do you understand about AM?
Ethical Consideration	Confidentiality and anonymity of individuals is protected (Pseudonyms are used).
4. Data Analysis	
Content Analysis and Thematic Analysis	Inductive development of categories and deductive application of categories, sub-categories, nodes.
5. Results Validation	
Case site revisit	Conduct interviews about the results obtained with stakeholders.

Table 2: The Protocol Table

3.11 Stability, Reliability and Validity

Zikmund (2003) says there are generally three major criteria for evaluating measurements, i.e. Sensitivity, Validity and Reliability. Another important aspect considered carefully when it comes to and during the analysis is validity. Validity problems also grow out of the ambiguity of word meanings and category or variable definitions (Webber, 1990). There are

three types of reliability found that are pertinent to content analysis: stability, reproducibility, and accuracy.

Stability refers to the extent to which the results of content classification are invariant overtime. Inconsistencies in coding constitute unreliability; this can be caused by various factors, including ambiguities in the coding rules and text, cognitive change within the coder, or simple error. Stability issues are experienced simply because only one person is coding (Webber, 1990). Reproducibility, refers to the extent to which content classification produces the same results when the same text is coded by more than one coder, this form of reliability will not be experienced in this study because only one coder will be working with the data (Webber, 1990).

Reliability is a term applied to a measure that yields similar results over time and situation, which underpins the concepts of repeatability and internal consistency (Zikmund, 2003). Reliability relates to the truthful replicable consistency of measures, whereas validity is concerned about the definition of concepts through the measures. Reliability, relates to the characterisation of the results of a specific sample for the entire staff employed at A-Coal. This can be redefined as the indication of how probable it is that similar responses (information) between sources used would be found. Systematic error is a bias that exaggerates or underestimates the actual score being measured. If any analysis can be made free from random and systematic errors that indicates the reliability of the measure. The researcher used mostly senior management especially those who were involved during the commissioning of A-Coal and those who were involved during the implementation phase of asset management. This was done during the informal interviews as part of participant observation.

Cooper and Schindler (2003) state that validity forms can be both internal and external. The most applicable form will be the one which is external which refers to the data's ability in generalise across persons (participants' response), settings, and times. Face validity will be the most applicable type of validity in this case, which consist of the correspondence between the investigator's (researcher's) definitions of concepts and their definitions of the categories that measured them. It is considered the weakest form of validity compared to hypothesis and predictive validity. The researcher used material obtained from the three data collection sources to ensure its validity.

3.12 Conclusion

The researcher has demonstrated how he executed the study in this chapter. In order to understand the real-life phenomenon of A-Coal, using a qualitative case study method was a great advantage to exploring the environment. The protocol followed, included the preliminary phase, study design, data collection methods, validation and reporting the case. Due to the complexities of this study, a multi-method approach was used. The multiple sources used to collect data was a technique requiring great skill which the researcher chose to use to gather more data, which were archived documents, semi-structured interviews and participant observation. Content analysis was chosen to be used in the study, as the researcher did not have any pre-set themes but documented themes as they emerged from the transcribed interviews. Analysing data from three exclusive sources ensured data quality, integrity, reliability and validity was not compromised.

CHAPTER 4

4 Data Analysis and Results

This chapter presents the processed data from the documents, interviews and participant observations. The current state of AM and AM maturity is first outlined leading to the initiation of this study. This largely relies on documentary data sources. Subsequently, the data from the interviews and participant observations is analysed with the objective of answering the research question for this study. The strategy data received is qualitative by its very nature, and was examined by the researcher and any change in the organisational strategy, mission and goals, which can be triggered by internal or external influences mainly from the shareholders (Client A and B as referred to in the interviews transcribed works). Data extracted from the transcribed works contained both but mostly qualitative than quantitative data. As for Asset Management Maturity, this is represented as a figure or can be expressed by describing the level of Maturity (such "fire-fighting, or excellence").

The KPI are mostly measured in figures, they can be represented as performance of asset types, systems or individual asset performance which can be relative to the performance of any activity. With regard to management or other employees' behaviour, the action data can only be qualitative and this data will be determined by investigating what transpired in relation to the implementation and execution of the AM strategy and other events related to performance, management behaviour, structure and mechanism.

4.1 Case Study Organisation: Current State

The following narrative describes the state of AM in A-Coal prior to the start of this study.
In this phase of analysis, the focus was on analysing data received from archived documentation of the implemented AM systems at A-Coal site. This data provided a holistic understanding of the implemented system detailing the financials, methodology, framework used, assessment results conducted, developed AM Strategies, AM Policy, setting up AM Objectives and the AM Master-plan, with AM activities that were set to be actioned during the initial year of implementation, based on the AM gaps identified. The establishment of technical and steering committees to drive AM activities occurred during this period.

The documented source material for implemented AM had high credibility because they included official records of the work that was carried out at the initial phase of the AM project, such as meeting minutes, feedback reports from AMIP, correspondence, and other reports. The documents were examined information in a chronological order was recorded. The objective of this analysis was to provide a brief background of A-Coal site's context, AM capabilities and describing description of the AM implementation leading to this research study.

A-Coal is a newly built plant which was commissioned in 2009. Shareholders decided to outsource the Operation and Maintenance of the plant and contracted Company A to perform those functions. Understanding that asset management is a new field but surely in the past thirty years it has been taking solid hold where asset owners realised the value in having asset management systems in place. It is to be borne in mind that this operation is one of the biggest operations in the coal mining industry relative to the other operations currently in existence in South Africa. It was almost two years before the first coal was produced and the proper asset management system was still not implemented at A-Coal.

Figure 13 illustrates a high-level overview of the organisational structure. It illustrates that Asset Owners (Client A and Client B) are in a joint venture owning an equal share percentage of A-Coal assets. Company A completed an agreement with the joint venture of Client A and B to have A-Coals assets operated and maintained. Company B was sub-contracted two years later after A-Coal was commissioned to implement an Asset Management system. by Company B. Company A is the main contract holder and sub-contracts any other work that is outside of their core business to other companies which A-Coal requires services from such as asset management, and condition monitoring, because Company A specialises only in operating and maintaining assets.

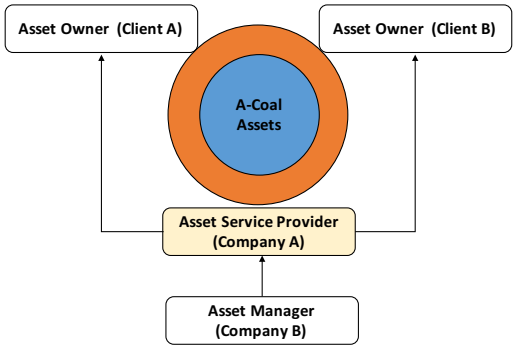


Figure 13: A-Coal High level Organisation Structure (Author)

There are three main executives representing both Asset Owners, being the General Manager, Financial Manager and Engineering Manager. A detailed organisational structure of A-Coal is shown in *Figure 14* below.

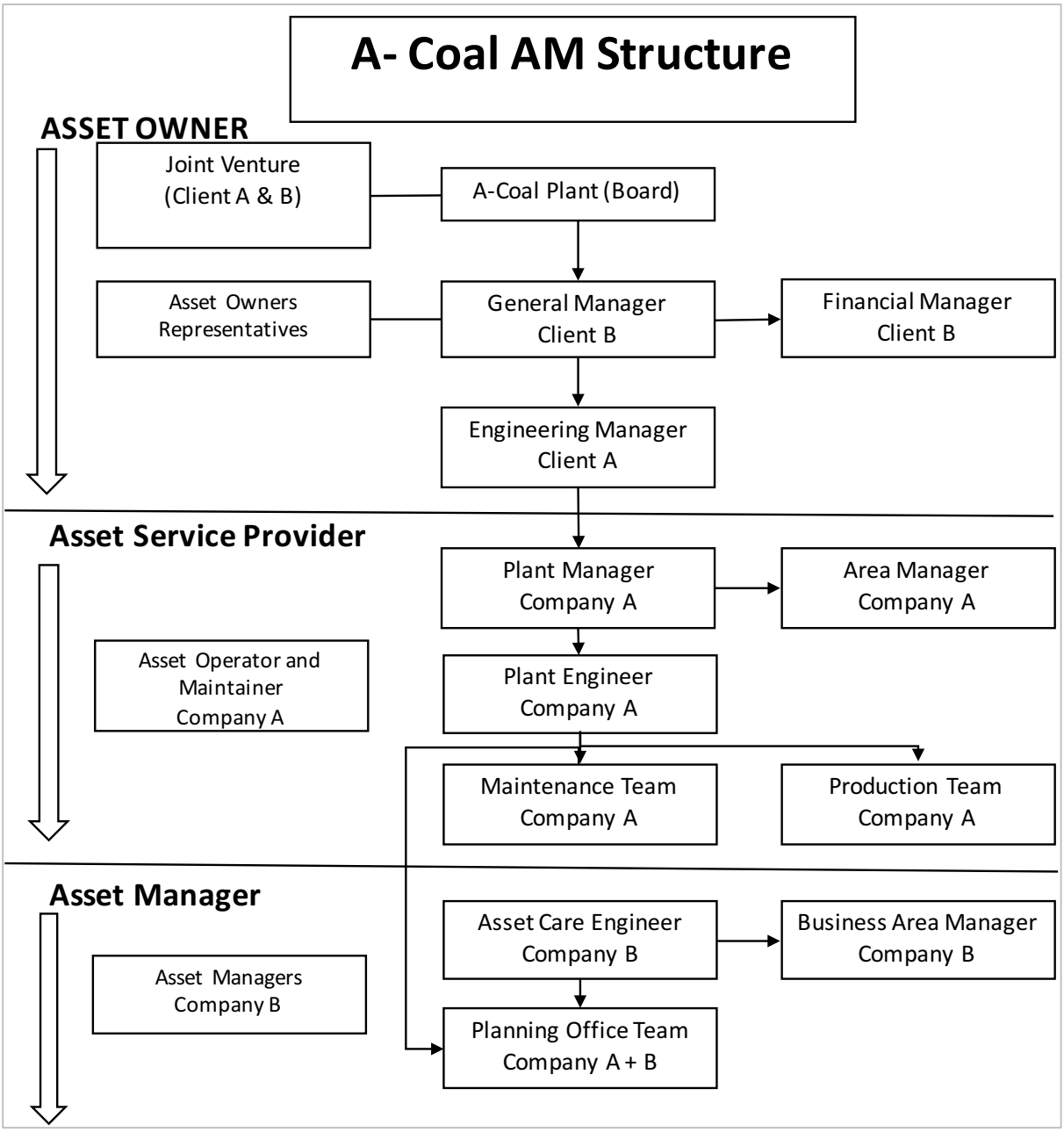


Figure 14: A-Coal Organogram (Author)

Company A is employed to Operate and Maintain A-Coal assets, and has employed Company B to run the AM programme to ensuring asset owners realise value for money from the assets invested in A-Coal. Company B was contracted to first asses the AM Maturity at A-Coal to identify the gaps which Company A will have to focus on and thus enable a definition of a set of AM activities in support of improving asset performance towards the

desired level of AM Maturity. Company B has a developed AM Maturity framework which they have been using for decades and is currently aligned with the newly adopted ISO55000 and with the 39 Subjects of AM. The model being used is called Asset Management Improvement Planning (AMIP) and has grouped the Key Performance Areas into 17KPAs. On a two-dimensional field the Company assesses the organisation relative to best practice and the associated Key Performance Indicators (KPIs).

Table 3 below illustrates the initial AMIP assessment results that were obtained against the target set for the organization to achieve within a 12 months period.

	BP Scores		KPI Scores	
	BP Target	BP Maturity	KPI Target	KPI Maturity
Strategy Management	4	1,6	4	4
Information Management	4	2,5	4	2,8
Technical Information	3	2	3	2
Organisation and Development	3	2	3	3,8
Contractor Management	3	2,4	3	2
Financial Management	3	3,1	3	3
Risk Management	3	2,3	3	3
Environment, Health and Safety	3	3,3	3	2,5
Asset Care Plans	3	1,5	3	2,7
Work Planning and Control	3	1,9	3	2
Operator Asset Care	3	2,4	3	2,5
Materials Management	3	2,2	3	2,4
Support Facilities and Tools	3	2,9	3	3,3
Life Cycle Management	4	2,7	4	4
Project and Shutdown Management	3	2	3	3
Performance Measurement	3	2	3	1
Focused Improvement	3	1,9	3	3
Average	3,18	2,28	3,18	2,76
	BP Target Average	BP Maturity Average	KPI Target Average	KPI Maturity Average

Table 3: A-Coal, initial AMIP results and the associated targets (Company B, 2011)

During the period when the Assessment was conducted A-Coal had just been through a teething period, where key management staff were in a forced firefighting mode to keep the plant running. This was compounded by a lack of staff. Despite these challenges they still managed to implement a number of plant related and management process improvements which saw the worst of the teething problems being addressed. (Company B, 2011).

The average Best Practice (BP) obtained was at 2.28 but the worrying thing was that the key maintenance areas of asset management were scoring the lowest (such as Strategy Management, Asset Care Plans). The desired average AM Maturity BP level was set at 3.18, with only three KPA targets set at level 4 and the rest of the BP KPAs targeted for level 3 for the next 12 months.

Some of the supporting maintenance processes (finance, safety,) were well established and working well. However, a lot of asset history was lost in the initial phase, and a basic EAMS system was in place with standards and business processes documented. There were basic asset care plans "asset maintenance strategies" which also needed to be improved. There was also a basic material manager function under control (Company B, 2011).
On the other hand, Company A did not have a consolidated AM Policy or Strategy and a platform to discuss AM issues and goals as part of the shareholders' operations review. The EAMS systems implemented was not configured as per documented standards resulting in under performance or sub-utilising the system. With the shortage of staff complement it was going to be extremely difficult for the operation to escape the fire-fighting mode of operation. And the planning department needed to be enhanced from a one-man operation in capacity and capability. (Company B, 2011).

There were limited asset management KPIs but production related KPIs were the ones that were available. And these KPIs were not broadly communicated amongst all the employees on site. Some optimisation that needed to occur, was at the stores department where stock levels and critical spares needed to be identified. The stocks levels were weighted towards optimising service levels rather than working capital. Only a very limited structured improvements process was in place. This included the use of routine failure analysis on all breakdowns experienced. There was very little control in the process of updating asset manuals and drawings (Company B, 2011).

Company B was awarded the contract to implement asset management programme and drive the execution of the AM activities. Amongst other business processes they implemented, was one to provide a foundation and a framework for the overall service offering called asset care centre foundation (ACCF). It aimed at aligning and integrating other business processes, according to the service level agreement between Company A and the Asset Owners (Client A & Client B). Three functions were aimed to be fulfilled (Company B, 2011):

1. Ensuring that the generic elements of the AC service are established, such as Steering Committee, ACC office infrastructure, the AM Policy, AM Strategy, definition of daily, weekly, monthly meetings between Company A and Company B.
2. To align and integrate implementation of other business processes using the integrated

ACC implementation plan, standard manuals, and signing of the key master data with the required reports for Company A meetings.

3. And to facilitate the change management process to ensure success implementation and sustainability in the execution phase of the service.

At the start of the implementation phase the AM Steering Committee and AM Technical Committee were established to drive and coordinate all asset management activities. The stakeholders of the meetings also take responsibility for change management during the implementation of the ACC (Company B, 2011). The members of both the technical and steering committees were trained in the overview of asset management to create a knowledgeable forum where all major decisions regarding asset management can be made. Company A employees were trained in generic ACC principles and practices in preparation for the execution phase. All employees involved in the AM programme will have to be retrained to ensure a thorough understanding of AM and the new or enhanced ways of executing certain activities for a successful AM programme (Company B, 2011).

This training must be done correctly across all levels in the organisation with those affected, from top management to mine workers' positions in the organisation. Finally, the AM Strategy, AM Master Plan and the Service Level Agreement are updated on an annual basis as a result of the reviewed AM Maturity assessment (Company B, 2011). Figure 15 below is picture representing a comparison of AM Maturity measured in the year 2011 and 2015 .

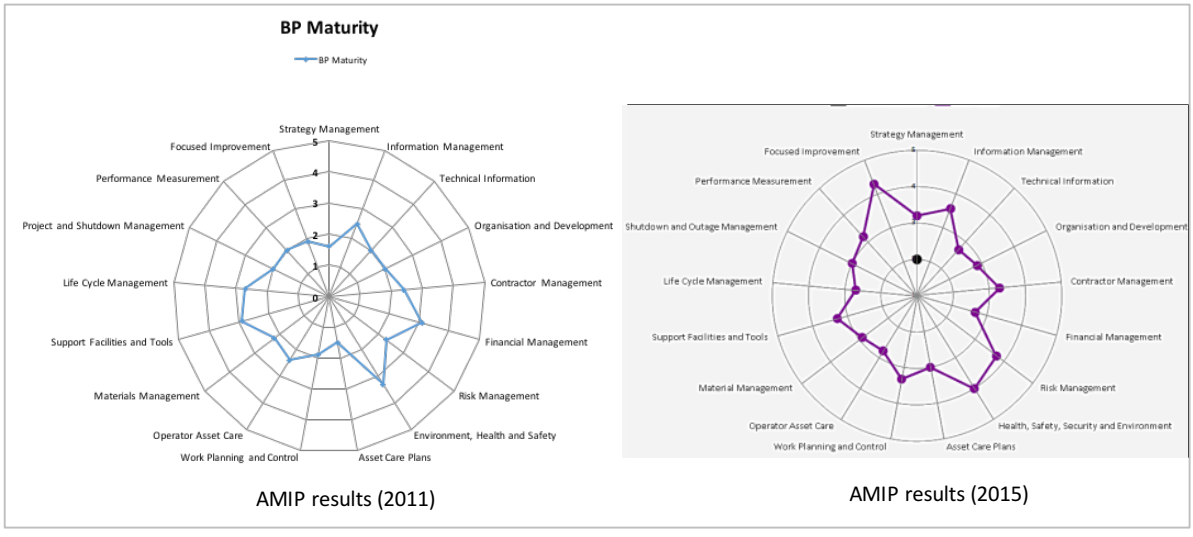


Figure 15: A-Coal AMIP results for 2011 and 2015 (Company B)

Four years later, the picture looks as shown in *Figure 15* it is evident that there were areas of significant improvements, such as Focused Improvement. However, there was little progress

made in terms of the overall results. Table 4, below indicates a detailed picture of which KPAs and KPIs plummeted and those that showed signs of improvement.

The variance columns indicate the positive and negatives being improvement and plunging score respectively and the zero figure shows with no move at all. It can be seen from this table below that more focus was placed in focused improvement with 1.3 improvement in Maturity score followed by risk management. (Company B, 2011)

This study, thus, aims to find the key impediments that hindered the improvement of AM Maturity in the four years' period that asset management was implemented.

Key Performance Areas	BPs in 2011	BPs in 2015	KPIs 2015	BP and KPI Targets	BPs Varience	KPIs Varience
1. Strategy Management	1,6	3,2	3,5	4	-0,8	-0,5
2. Information Management	2,5	3,6	3,2	4	-0,4	-0,8
3. Technical Information	2	2,7	2	3	-0,3	-1
4. Organisation and Development	2	2,9	3	3	-0,1	0
5. Contractor Management	2,4	3,3	2,7	3	0,3	-0,3
6. Financial Management	3,1	2,7	3	3	-0,3	0
7. Risk Management	2,3	3,8	3	3	0,8	0
8. Health, Safety, Security and Environment	3,3	4	4	3	1	1
9. Asset Care Plans	1,5	3	2,8	3	0	-0,2
10. Work Planning and Control	1,9	3,3	1,3	3	0,3	-1,7
11. Operator Asset Care	2,4	2,8	2,2	3	-0,2	-0,8
12. Materials Management	2,2	2,9	1,4	3	-0,1	-1,6
13. Support Facilities and Tools	2,9	3,3	3,3	3	0,3	0,3
14.Life Cycle Management	2,7	2,7	2,8	4	-1,3	-1,2
15. Shutdown and Outage Management	2	3	3	3	0	0
16. Performance Measurement	2	3,2	2,5	3	0,2	-0,5
17. Focused Improvement	1,9	4,3	3,8	3	1,3	0,8
Overall Maturity	2,28	3,22	2,79	3,18		

Table 4: A-Coal BPs and KPIs results for 2011 and 2015 (Company B)

Qualitative Analysis

This section presents the data analysed from the semi-structured interviews, documentation as well as participant observations.

4.2 Analysis of Semi-Structured Interviews

The semi-structured interviews were used to explore any problems and successes related to the implementation and execution of asset management. They were also used to gain understanding of some of the data obtained from the documentation with regards to the current execution of AM. The semi-structured interviews were analysed using thematic content analysis as outlined in chapter 3. The coding and subsequent identification of themes was accomplished as follows: The transcribed interviews were imported to NVivo analysis tool, where the researcher went through the questions and answers transcripts in attempt to identify emerging themes from the answers. All thirteen transcribed interviews were taken through the same process and comparison were made of similar themes and nodes were created to group the themes.

The researcher reduced the data and made sense of what each interviewee meant and he made deductions based on his understanding. Predominant themes were extracted for further analysis and understanding. A screenshot of what the coded data is shown in Figure 16 below:

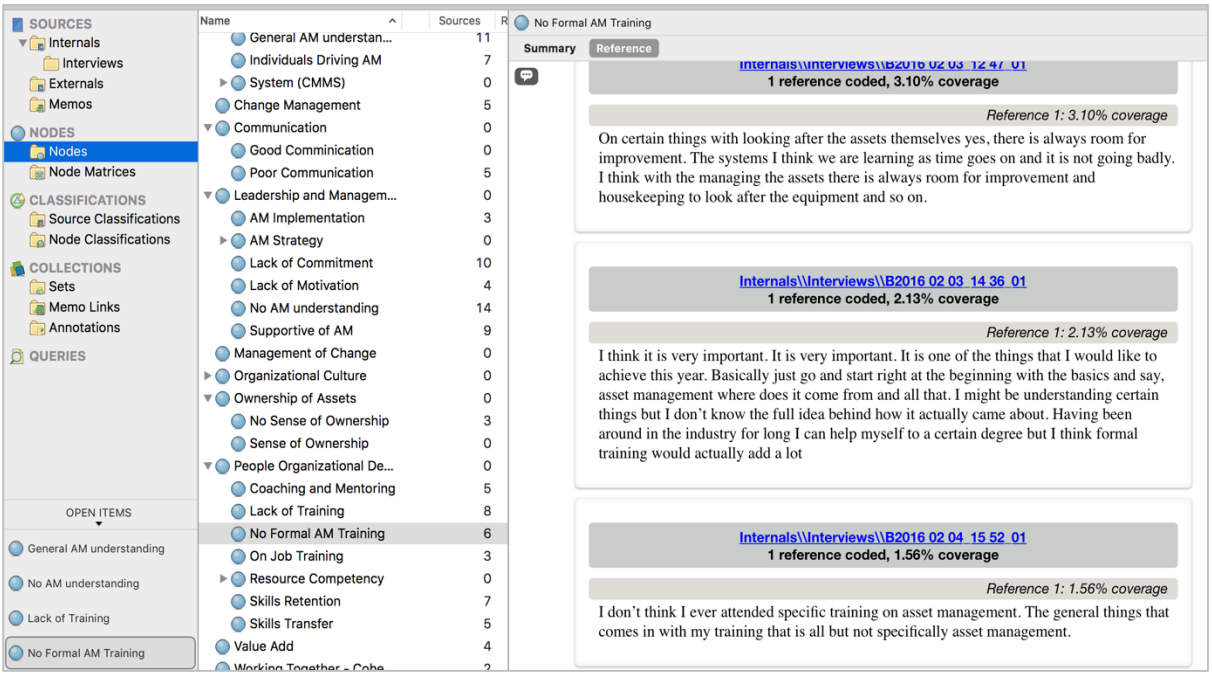


Figure 16: Data Coding using NVivo (Author)

The most predominant themes which emerged during the analysis are categorised as follows:

1. Reactive mode of operation;
2. Asset Management Understanding;
3. Stakeholders' involvement;
4. People's training and development;
5. Organisational Culture;
6. Skills Retention and Skills Transfer.

Reactive Mode of Operation

A-Coal plant is a newly built plant and shareholders appointed an 'Operate and Maintain' Company (Company A) to utilise and maintain the shareholders' assets and realise value for money they have invested. Both shareholders own a number of operations similar to A-Coal. On this Joint Venture they decided neither of them would Operate and Maintain the plant and contracted a third party to do so. The data obtained from documentation and interviews, it is evident that Asset Management programme was not implemented during the commissioning phase of the A-Coal.

It was discovered that a call for AM implementation was made because investors realised that the plant was operating in a fire-fighting mode. They commissioned A-Coal without a developed strategy, without adequate documented proper maintenance strategies. This, in turn, indicates a reactive mode of operation because such documentations should have been implemented first before the plant was operated considering that it is a new plant. One might presume that based on the Shareholders' experience in the mining industry, Asset Management would have been the first priority system implemented at the A-Coal operation.

An asset management Company (Company B) was brought in to implement asset management systems two year after the plant was commissioned (Company B, 2011) also validated during the interviews. Figure 17 below, illustrates a tri-partite relationship system with many decisions being taken in Asset Management as per Brown and Humphrey (2005). It shows Asset Owners final output is Corporate Objective which acts as an input to Asset Managers whom within their responsibilities will be coordinating all the activities from capital planning, operations, maintenance, evaluation of projects, life cycle costing, risk management, budgeting and the final output is an Asset Plan. This plan is then used by the operations and maintenance teams (Asset Service Providers), who will procure, build, operate, inspect, monitor, maintain, overhaul, and provide Data to be used in preparation for reporting to the Asset Owners of the performance of the asset (Brown & Humphrey, 2005).

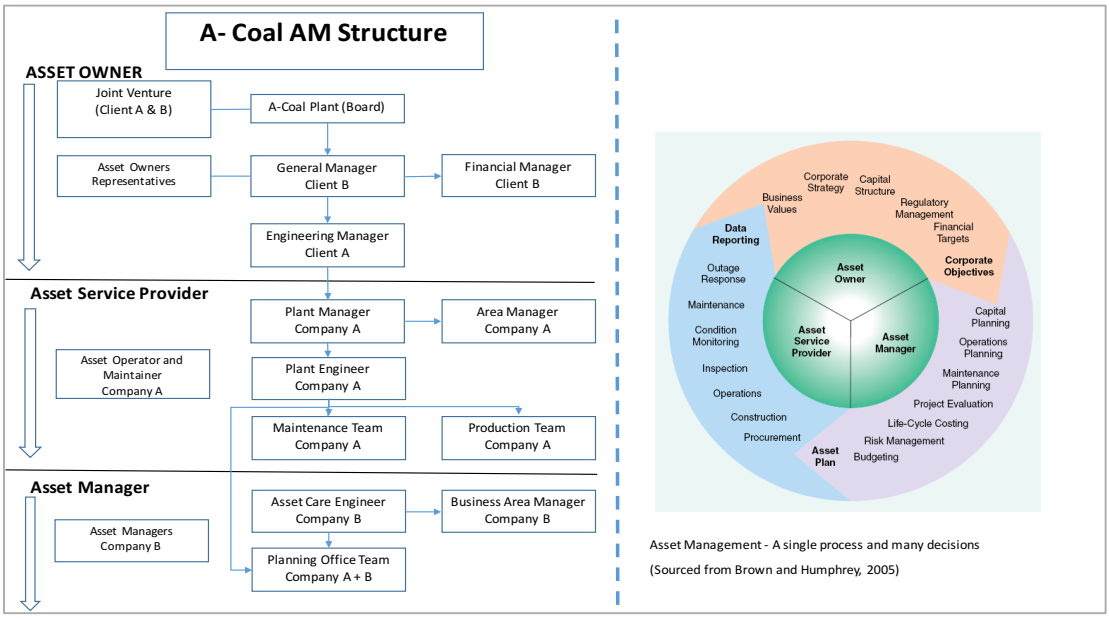


Figure 17: AM system with many decisions (Brown & Humphrey, 2005)

At A-Coal, it was found that one leg of this system was missing for almost two years as the Asset Owners and Asset Service Provider operated the A-Coal without a fully implemented asset management system (without an Asset Manager). The interviews; however, revealed that Company A (Asset Service Provider) had appointed an individual to run with the Asset Manager pillar for the intermediate two years, while the plant was still ramping up to a steady state of operation. That being said, it means that AM practices had already been compromised, since there was no asset manager to ensure that the assets are well look after. Evidence from the interviews is extracted as shown below.

Participant 10: *"I think the reason was probably immaturity within the Company A systems at that time, because when we adjudicated the project, the Operation and Maintenance to Company A… or let me go one step back. When we decided to outsource the Operation and Maintenance of the site we went out on open tender. Company A were one of the companies that tendered and they gave us a presentation where they placed a lot of emphasis with their experience with Company B, who specialised in Asset Management. They even suggested that they were sort of awarded medals as being one of the best users or implementers of Company B's AM system worldwide.*

They put that forward as a very strong motivator why we should employ Company A to do the Operation and Maintenance for this site. I think during commissioning it was very hectic and I think we were probably understaffed on the maintenance planning side and you know so over the years, especially when the Engineering Manager came, we identified it as a weakness and then we started to get the fulltime team in from Company B. Before that it was sort of done in-house within Company A, but I think they didn't really have the capacity on site to provide the service as we understood it initially. So they were lacking but then slowly it grew once we got the fulltime Company B team in".

Participant 9: "*I think that should have been in place alongside erecting this industry/this mine. That should have been part and parcel of how they erect and how they would have managed. To come afterwards and try to integrate your asset management system to what is already there that is a hell of a backlog so you don't know where they are coming from and where they are going to. You've got to establish that and you've got to get that into place. So yes I think time was lost and I don't think it was quite that seeing ahead in the future. Maybe a mistake on both the Client and the Company I am working for, for that period of time. I*

think it was a major mistake."

Similar information is captured from other participants who agree to the point that Company B was contracted to implement asset management a few years after the plant was commissioned. Participant 8 admits that as another mistake made by both Company A, Client A and Client B.

Participant 2: *"No I am not aware of any asset management programme during commissioning."*

Participant 3: *"Asset management, the start… the actual asset management strategy was initiated when they brought Company B in. It wasn't really… there wasn't really proper asset management but it was initiated when they brought Company B in which was towards the end of… towards the end of 2011 or 2012."*

Participant 6: *"In the beginning we never had Company B, we just had one person running it and then they brought in Company B. Probably I would say 2013. 2013 since that Company B started but it has been improving all the way since then."*

This can be seen as a call for disaster to start with, to have an asset management department understaffed or being run by an individual, as can be seen from participants' responses. Participants mentioned that Company A was awarded the contract and one of the contributing factors for their successful bid against its competitors was that they had received accolades for being the best implementers and users of Company B systems (EAMS). It is widely known and common practice that management will mistake asset management as a tool or system. Participant 4 shares his understanding of what asset management is and defines it as a tool,

"I think just to kick off, the most logical basic thing for me was to understand asset management as a tool, because I believe it is a tool, it will help me understand how to use it. First I will have to understand that in order for me to be able to utilise it fully. After understanding or having to understand it that will tell me what I should expect out of this asset management"

As indicated previously, A-Coal plant is a contractor based operation. There are just three representatives from both shareholders who occupy senior managerial positions at the site. The rest of the personnel on site are contractors. Company A is the main contractor and

appoints all other sub-contractors which offer required services to the A-Coal plant that are outside the scope of Company A. That being said, it means Company B is employed by Company A not the Asset Owners herein referred to as Client A and Client B.

A reactive mode of operation is noted in this situation upon the introduction or appointment of the engineering manager, who then saw the manner in which they operated had a weakness and that the asset management department which was a one-man- band show was not adequate to execute the AM activities as set by Brown and Humphrey (2005). For almost two years A-Coal did not have an engineering manager appointed on site.

Implementing asset management when a plant is already in operation has implications and challenges that need to be overcome and failure to do so, will hamper proper implementation and execution compared to if the AM systems were part and parcel of operations during the planning phase of A-coal. There were challenges posed with the implementation of AM while employees were already accustomed to their own way of operating and maintaining Client A and B's assets, especially if they have been operating in a reactive mode "wait until it breaks then fix" due to lack of proper planning. In order to improve AM practices there are key areas that must be utilised more, this includes:

1. Effective decision making – the way decisions are taken across the organisation needs to be backed by data, which needs to be captured and collected by all those involved in managing assets
2. Organisational Change – Change management is the key business process to be employed herein, especially if people are cemented to the way they have been doing things. One needs to break any existing silo mentality which might be discipline specific.
3. Data capturing – data needs to be collected from any asset related activity for the life of the asset, which will be captured and analysed to aid in decision making process.
4. Predictive analytics – data collected and captured must be used in a feed-forward approach to predict unwanted failures of systems and assets.

Leadership and management play a vital role in driving change in an organisation. The asset management company (Company B), will not succeed in this endeavour if Company A and Client A & B AM leadership is not strong. Senior management must play their role in ensuring that all affected by the implementation of AM, are sensitised and well trained for

the success of the implementation, execution and sustainability of AM. Company As employees were trained in generic ACC principles and practices in preparation for the execution phase (Company B, 2011). However, this will not bring about a total understanding of what AM is to these employees, simply because employees were going through the change process and having to deal with the pressure of being in a fire-fighting mode and the new changes brought in, plus a mental shift on the way they were used to executing their activities. **Participant 7**, was quoted as saying *"Job card systems is an excellent paper work, also sometimes it is a paper exercise, because what is really bothering me about asset management is that the guy will work on one job card and he will draw things out of the store, but he will use the same job card to draw something else on the same job."*

Such challenges are most likely to be eliminated if AM is embedded and part and parcel of when designing the plant and scope of asset management activities within a policy, strategy being the first to be developed. Asset Owners must be able to distinguish the different roles that asset managers and asset service providers play in an organisation. The current set-up compromises the credibility of asset managers from Company B on site as they directly report to the asset service providers Company A. There is truth to what **Participant 8** said,
"Well… look, it would have been nice for asset management to have been introduced from the word go but I think it would be very careless of me to say this site lost an opportunity because I was not around during that time."

He goes on to adding that if he could correct one mistake he thinks was made during the appointment of the asset care engineer, who is currently employed by Company B, as they are reporting to Company A structure as indicated in the A-Coal Company structure. He would change the structure such that the asset care engineer reports to the asset owners (Client A & B). The suggested structure would have given the engineer full authority to give instruction to Company A when it comes to executing asset plans.

"The mistake that we made… and if I can correct that, that is one thing I would correct. Asset care engineer should have been a person employed directly by both Clients A & B. That will basically give him the full rights that he deserves and the full powers that he deserves. Your asset care engineer is the person that is able to see things looking at the trends, looking at the history, looking at everything. He will be able to do some analysis and tell you that you know that there and there and there we have problems so let's zoom into those problems and

look at the things we can do. Right now the arrangement is Company A who is a contractor to Client A&B contracted the asset care engineer through Company B to come and do this and so you basically have the people that are not really enthusiastic about asset management to manage the most critical person as far as asset management is concerned. You can understand it is very difficult to yield any good results from that."

To summarize on the reactive mode of operation theme at A-Coal, a few noteworthy points can be highlighted. Client A and Client B made a call to have AM implemented two years later after commissioning and this could have been done right at the start of the project. The operations and maintenance staff started to attend more equipment breakdown than focusing on preventative maintenance. The responsible engineering manager was appointed in 2011 which should have been right at the beginning or commissioning phase of A-Coal. A feasibility study should have been conducted at the beginning of the project to understand the skills requirement and capacity for driving asset management for an organisation of A-Coal size than to appoint only one resource to drive AM.

Asset Management Understanding

The million-dollar question which was aimed at measuring participants understanding and their knowledge of asset management was answered as follows by all 13 participants. The researcher has extracted key points from each of the participant's definition of what they think asset management is. It can be noted from the definitions which comes in lengths and details ranging from a two-liner to as long as eleven lines. This clearly denotes the differences of the participants' understanding of asset management.

Table *5* summarises the key themes of the definitions is presented.

Participants	**Key Themes (Phrases)**
1	Manage from inception to disposal, life cycle, cost & maintenance
2	Sweating the asset, peak performance
3	Managing assets, person, machine, small thing, smooth operation
4	Maintenance, Tracking and Measuring
5	Planning, maintenance, breakdowns
6	Managing company assets
7	Managing equipment, plant and people
8	Beyond maintenance, maximum asset life
9	Knowledge of what is at hand, how it affects his tasks

10	Taking care, maximum value, availability optimisation
11	Equipment monitoring, maximum life, lowest cost
12	Improve performance, mitigate risk, cost reduction
13	Coordinating Activities, Optimise Asset Life Cycle Cost

Table 5: Participants' AM definitions summary

Participant 1: "*I would say with a specific reference to physical asset management it is the management of physical assets from inception to disposal in terms of looking at the whole asset lifecycle. So that includes the costing and the maintenance as well, the maintenance management. Not only the physical maintenance but the maintenance management, the management of the maintenance function*"

Participant 2: *"Asset management involves the values one derives from one's assets in an organisation. So when one talks management one talks about sweating the asset but also talks about maintaining that so that it always performs at peak."*

Participant 3: *"Asset management is just… it is a broad terminology that can be summarised into how each and every asset, being a person or a machine or any small thing in an operation, how it can be managed for the effectiveness of that operation and for the smooth running of that organisation at large."*

Participant 4: *"The little understanding that I have on what asset management is, is around maintaining the equipment within the industry, tracking their performance… just around that – maintenance and tracking them and measuring how they are performing and the life that you are getting out of them. So that whole context is about asset management according to my own understanding."*

Participant 5: *"Okay let me say this. Asset management you are referring to the planning? well according to my understanding it is very, very handy as we do maintenance day and night and also breakdowns too. So it is better that we have asset management so that we can do planned jobs and that way we would be able to eradicate or be good in problem solving."*

Participant 6: *"Asset management is managing the assets of the company. That is pretty*

much what our job is here. The Client owns the plant and we manage the asset that they are keeping here. The assets themselves are all of the equipment and vehicles and everything. Those are the assets. We manage their assets. That is our job."

Participant 7: *"Asset management is about the equipment, plant and the people that are working there. It is a total concern, the thing together – asset management. It is not just specifically about one thing. Am I correct or not?"*

Participant 8: *"Asset management – it is basically a process beyond maintenance. I mean back in the days we used to talk preventative maintenance but with asset management we basically look at other things outside just preventative maintenance. You look at the life of your asset. You look at the life that you should expect out of your asset. When you do your planning, your budgeting you basically do it around that asset. So you… what we are basically doing is you want to get maximum life out of the asset and you want to make sure that your asset, when you need it, it is available and it is also reliable. Asset management… I think asset management nowadays in this type of business is something very important. You need it in order to be able to survive and make sure you are going to get a return on investment from your asset."*

Participant 9: *"Asset management is basically knowledge or at least the basic concept of what is at hand, what is in use, and how it is affecting what I am doing in that process where I am working."*

Participant 10: *"Asset management is the… basically taking care of your assets. You know in our business it is important to sweat the assets so you know for us to extract maximum value out of the assets we try and stretch it as much as possible and to be able to do that we have to have a very solid asset management programme in place to do the right maintenance at the right times that you can optimise the availability of your assets. I think it goes… obviously it is a much wider field. It is also about not overspending money. You can only spend the optimal amount of time and money to extract the most availability out of the assets. So it is always a delicate balance. You know, basically you need to reach that turning point where you invest enough time and money to give you the hours you require but not going overboard and spend another R10 million and only gaining a very small percentage. So that is my take on it."*

Participant 11: *"Asset management for me is basically just monitoring equipment and proactively taking care of any findings. It is through programmes. Through predetermined timeframes and condition monitoring and so forth. Taking care to make sure that you get the maximum life out of all your assets at the lowest cost."*

Participant 12: *"So asset management is a very broad subject basically it outlines* ***thirty-nine subjects*** *that is basically put out there by global forum of maintenance and asset management according to* ***ISO55000****, it is all about improving performance, reducing or mitigating the risks and reducing costs in an organisation"*

Participant 13: *"Asset management in the basic form it is all about coordinating activities across the value chain of the operation to make sure we can optimise our life cycle cost of the asset, which is the plant. So those activities will involve all the way from procurement, HR, maintenance, operations to make sure all those are coordinated with one goal of lowering the life cycle cost of the asset."*

Having seen how the participants define or understand asset management to be, there is a huge discrepancy or misalignment amongst all the participants in terms of their understanding. The most common one is found to be that participants wants to maximise life of the assets and performance; however, the devil lies in the details. A further question that can be asked is how does one maximise value, what are the key things that are required to achieve that? Surely the answers might look pretty much like the picture as summarised when defining asset management.

Having different views on what asset management is, is not a good start where AM Maturity is concerned and where working together as a team is vital to improve asset management capability. Senior, Middle and lower management must align in working towards improving AM capabilities. This can be seen as a concern where by management needs to have a clear vision of why there are driving asset management. One of the element of Asset Management systems states that AM systems should specify the competency requirements for personnel involved in asset management. All the participants interviewed in this study are involved in AM. However, they all seem to have a different understanding of what asset management is.

Stakeholders' Involvement

The initial platform as stipulated in this chapter that the implementation phase the AM Steering Committee and AM Technical Committee were established to drive and coordinate all asset management activities. The committees are led by different stakeholders; however, some stakeholders are involved in both committees. There were individuals who were appointed to drive change management and get buy-in from the lower level employees who are the main executors for AM activities. There are stakeholders which were identified during AM implementation whose responsibility is to give direction to the AM team and to ensure alignment of organisational objectives and AM activities.

The measure of how engage the stakeholders are can be determined by their attendance of the Steering committee meetings (SCM) and Technical committee meetings (TCM). Participants were asked questions regarding their awareness and involvement in the above mentioned meetings. The table below summarises what participants had to say about their awareness and involvement in both the Steering Committee and Technical Committee Meetings.

The individuals who participated in the study are categorised as follows, there are categorised more by their ranking in the organisation than position in order not to compromise confidentiality. At least one representative from all three stakeholders responsible for driving asset management were interviewed, employed by Asset Owners (Client A & Client B), Asset Managers (Company B) and Asset Service Providers (Company A):

1. Four (4) Participants – Senior Management
2. Seven (7) Participants – Middle Management
3. Two (2) Participants – Engineering Maintenance

About 75 per cent of the respondents indicated that they are aware of the Steering Committee meetings, and only about 16 per cent of the 13 are attending the SCM. Only two are involved and are currently part of the steering committee, and their positions are ranked as senior and middle management. What can be noted from this outcome is that the middle and senior Management personnel are employed by Company B (Asset Managers) and Asset Owners (Client A) respectively. None of Company A employees including Senior management responded as to whether they are involved in the steering committee as shown in

Table *6*.

This can be seen as a concern, which will hamper the success and improvement of asset management's capabilities, when there is no leadership or a lack of leadership's involvement in steering committee meetings. It is highly desirable to have a certain degree of leadership engagement throughout the Company, long-term focus of management and the strategic team while executing AM activities. In many organisations, focusing the business practices around improved asset management can require a change in the way the Company does business. This means leadership needs to provide a clear direction regarding people's responsibilities. They must also provide suitable accountability mechanisms, develop and follow a structured communications strategy. The steering committee (SCM) and technical committee meetings (TCM) are the platforms that enable such activities to take place.

Participants	**Aware of SCM**	**Comments**
1	Yes, Not Involved	*"The Steercom will be scheduled very soon so I believe I will be involved in that…"*
2	Yes, Not Involved	
3	Yes, Not Involved	*"I think I have just seen the minutes of the Steering Committee because I have always missed them."*
4	Yes, Not Involved	*"…I am no longer taking part in the Steercomms"*
5	Yes,	*"… I would say that is where we do our ninety-day plan."*
6	No, Not Involved	*"Steercom, what is that? …I don't know what Steercom is."*
7	Yes, Not Involved	*"But the steer committee I am never involved with."*
8	No, Not Involved	*"I am not aware of asset management steering committees"*
9	No, Not Involved	*"I am not part of those either."*
10	~~Not asked~~	~~*Not asked*~~
11	Yes, Not Involved	*"Steering committee I have only attended one but I am aware of them"*
12	Yes, Involved	*"Yes, so our steering committee meetings are basically looking at costs, looking at reducing costs, our AM technical meetings are basically looking at downtimes. So we use our downtime and relate that to costs going upstream"*
13	Yes, Involved	*"…is purely around us improving our Maturity on best practices around asset management and purely again focusing on the master plan for that specific thing"*

Table 6: Participants Steering Committee Meeting involvement

On the other hand, a completely different picture is presented in

Table *7* with regards to Technical Committee meetings. It is gathered that 100 per cent of the respondents replied with a yes when they were asked if they were aware of the Technical Meetings taking place at A-Coal. And 83 per cent of the participants are involved in the Technical Meetings; however, they have an idea of what transpires in those meetings because they receive feedback and communication with regards to the outcomes of the meetings. Having said this, this goes to show how organisations are tuned to operate in reactive mode. Technical meetings clearly present communication of lagging KPIs and performance trends. Low attendance or lack of attendance at the Steering Committee meetings.

Participants	**Aware of TCM**	**Comments**
1	Yes, Involved	*"...I have only been to the technical meetings."*
2	Yes, Involved	*"...we are basically looking at performance. Not performance as such… life of assets so to speak. Where the troubles are and how to get out of them"*
3	Yes, Not Involved	*"...looks at technical things that maybe have been improved in the plant; if there are any redesigns or upgrades that they can be doing on the machines."*
4	Yes, Involved	*"... things that are affecting your operations be it improvement, be it challenges that we are having at a technical level. "*
5	Yes, Involved	*"We talk about MTTRs and MTBF...; ...how long does it take to repair things"*
6	Yes, Involved	*"All the middle management and senior management that are involved are there."*
7	Yes, Involved	*"...sometimes I am involved with that, we discuss all the technical problems and things we have and see how we can solve them."*
8	Yes, Involved	*"provides assistance and help in areas where we might be challenged and to basically share best practices"*
9	Yes, Not Involved	*"I am aware of them but I am not part of them unfortunately."*
10		
11	Yes, Involved	*"I attend those whenever I am here on a monthly basis", "...mostly discussed is the… no I can't tell you off the top of my head I have to go back to the minutes"*
12	Yes, Involved	*"....Things such as root cause analysis, failure modes and effects analysis to iron out all of those issues in order to improve our costs and the costs"*
13	Yes, Involved	*"...it is what is happening around the technical space, new equipment and challenges that the plant is facing"*

Table 7: Participants Technical Committee Meeting involvement

Many of the participants interviewed believed management is in support of AM and its initiatives. However, it is believed that senior management is playing their part in driving asset management practices. Some of the participants indicated that AM was driven by certain individuals. *"It was mostly driven by an individual rather than being systemic. So the individual left and the process went the way of the dodo."*

"They fully support the asset management system although some of them don't have a clear understanding of what it is meant to achieve. They fully support it."

"...it goes back to the senior management to understand the role that they can play in asset management. The role that they can play in asset management and their understanding and their follow up on what needs to be done. If the Senior Management Supervisor can be clued up and join hands in this Asset Management their teams will automatically follow and that would make the maturity to move from one level to another."

One of the middle managers indicated that he will training, to ensure he has full understanding of what asset management is.

"So training is important, it makes you more understandable and also makes it more clear what Asset Management is about. Because sometimes you can be in doubt – and I am honest if I say sometimes I am also in doubt about Asset Management, because you don't always understand everything."

Participant 3 goes on emphasising on a point that most of the Middle Managers are in support of AM. He suggested that management does support AM activities; however, they are not doing so optimally, and he adds on saying management is not clued up and they don't understand the principle of Asset Management.

"So immediately when they are not clued up they cannot really give you maximum support because they don't really understand this whole principle of asset management."

Participant 4:

"...hence the question of saying do people support this thing (AM)? If you do not understand it definitely you won't support it as it needs to be. So the first thing, people should understand the need for this thing and the power behind this tool for them to be able to rely on it"

Participant 5:

"To me it is not working for them as some of them do not even understand it. I will say they are doing it just because they have to do it due to the Client's requirements."

One of the great challenges is that, if lower and Middle Management believes that Senior Management is not leading them in the right direction of AM excellence, they will lose trust and commitment to where matters of Asset Management are concerned. And most importantly lose confidence of Senior Management to leading them in AM. A very strong AM leadership is required to drive AM capabilities or Maturity to excellence. An organisation with low Maturity increases the organisation's business risk, because when a Company is mature it will have a strong competitive advantage over its rivals. If Asset Management is not executed properly, the three functions; cost, risk and performance which AM aims to balance will be compromised as such exposing the business risk to be higher.

It was also indicated that A-Coal plant is under a leadership that was not initially employed under Company A when AM was implemented. Management was shuffled a couple of times during this period after AM had been implemented at A-Coal. The key positions that were affected in terms of staff turnover from the three parties involved include:

1. The Plant manager (Company A)
2. The Engineering manager (Client A)
3. The Plant Engineer (Company A)
4. Asset Care Engineer (Company B)

Clearly, looking at the above staff turnover picture of asset management the leaders within A-Coal fail to present a favourable picture for AM capability improvement. It helps to have a minimal staff turnover within an organisation in order to maintain the level of commitment and execution to AM activities. There is doubt that during the handover period, this is an opportunity lost to action AM activities, which could have aided to improve AM capabilities.

Participant 10 elaborates the context during the period when the organisation lost key role players:

"You know we lost the Company A engineer. This Engineer was replaced by another Engineer so it was a long… well there wasn't even a handover. There was a period where it was a bit loose. Then from the middle of last year the Engineering manager left the site supported and seconded by Client A, he left the Company and he was replaced by a New Engineering Manager. You know as new people come in and other people leave the new guys take time just to understand the business and get to grips with the people and the systems. So there was a period where we went through a bit of a dip"

Participant 7 added by saying:
"There was a significant change in terms of the senior management and the time when this thing was introduced we were having particular individuals who were in charge who were part of the senior management"

Top management is responsible for developing the AM policy and objectives and for aligning these AM objectives with the organisational objectives. It was found during the study that since the policy and strategy were developed they were never reviewed. The review of these documents is management's responsibility. The dire lack of not reviewing these documents for more than five years indicates the low level of commitment and involvement of AM leadership. This supports the findings that the AM strategy does not align with organisational objective. It is also noteworthy that only two of the participants interviewed are familiar with the steering committee and the rest are not involved. This clearly indicates that strategy formulated and activities that needs to be carried out to ensure AM maturity grows in the right direction will be a challenge to achieve especially when there is a disconnect or misalignment between AM strategy and overall business strategy.

People Organizational Development and Training

Asset Management training received by most of Company A employees goes as far as when they received generic training in the early stages when Company B implemented asset management at A-Coal. Employees received training as part of a change management process. Some employees also received training on how to utilise the Enterprise Asset Management System (EAMS) - On Key system. Low level employees were training on how to create job cards, how to fill in a job card, and all the basic training that is required for them to execute their jobs efficiently.

Participants who are employed by Company A, indicated that they have not received any formal training. Some stated that they have been able to update their knowledge in asset management through self development engagements such as reading articles related to AM. The Company B employees who participated in the study indicated that they undergo training through a formal training assessment and their skills are being evaluated on a regular basis. They also stated they have skill set training matrices revised annually which includes mostly AM related courses. These employees' knowledge of asset management is regularly assessed and evaluated to ensure they offer their Client (Company A) competitive skills and ensuring that Client A and B's assets are well taken care of.

None of the senior management and middle management has received formal AM training, such as an overview of asset management, ISO 55000, 39 Subjects of AM. It is rather surprising; how can the organisation even try to consider improving the level of AM by relying on a few individuals to drive asset management? As one of the participants was quoted saying:
"It was mostly driven by an individual rather than being systemic. So the individual left (the organisation) and the process went the way of the dodo."

Participants' responses were an overwhelming "**Yes**" when they asked if they think it was important for them to understand AM? Their collective reason for this answer was that, if they understand asset management it will help them execute their job effectively and efficiently and will result in high availability of the plant, and the asset owners will realise value for their money by maximising the life of their assets. Below is what some of the participants had to say for themselves:

"If the user doesn't know how an asset works or what is supposed to be done to keep it working, then we've lost the battle. Everyone, including myself, should be very conversant with the asset management system."

"Well, being at this I manage a lot of the equipment so it is my job to manage those assets correctly so it is important for me to be able to do that."

If I don't know what is going on how can I lead or how can I at least attempt my planning or the contribution that I need to make to get the level or to the level the Client expects of me?"

"Yes, myself as an individual for me to understand it, it is so important because I am going to be part of it because asset management involves everyone. It is very much important that each and every individual irrespective of their level of management or any level,"

"I'd say in my opinion and in my current employment or job it is very important to have a clear understanding of the asset management practices so as to help the organisation to manage their physical assets in an optimal way so that they get their value for money in terms of return on investment"

It can be observed from the answers provided above, employees deem the understanding of AM to effectively perform their Job. When these employees were asked if they are receiving regular or any sort of training their overall answers was a "**No**", which somehow is putting it out clearly there that the way they perform their work is not optimal, simply because of the reasons stated above with regards to their understanding of asset management. Only a few participants said "**Yes**", but not in a formal way. The only exception was employees employed by Company B (Asset Managers) who say they receive regular training and they have their training matrix which mostly applies asset management related courses. This is what some the participants had to say excluding Company B employees, when this question was posed: - *"Have you been taught any skills in relation to asset management?"*
Answers:

- *"Nope. By whom?"*
- *"...I have been getting experience in the environment"*
- *"Not in a formal way. So what I have learned was in a form of questioning…."*
- *"...I never really fully understand asset management."*
- *"I haven't attended a fully-fledged formal training where I get taken through asset management..."*
- *"Yes I have been on some courses, a couple of courses actually. Also now with my diploma I have been on courses on asset management and logistics and statistics and strategies."*
- *"I don't think I ever attended specific training on asset management."*

Answers from Company B (asset managers) employees:

- *"Yes, I went through many courses, I have also done many case studies; I have also studied asset management by myself so I think I have quite a lot of knowledge in asset management", "...Basically through the Company I work for we have a skills matrix,*

we go through that skills matrix and we get assessed on that, but there are also other things that we do on a personal level. At the moment that is not being assessed, but basically I am studying towards an international accreditation."

- *"…Like I am working for a physical asset management specialists company so whatever skill that I need to acquire in order to exercise my duties that skill is being? imparted to me in a relevant way. So there is training every now and then as per the requirements of Company B…"*

Company B, being a specialist in asset management provides, their employees an opportunity to grow in the field of asset management, in such a way that some of the employees have their own personal development plan in line with what they are currently doing. Company A, should embrace a culture that promotes personal development in the field of asset management as was indicated that it is important that management, or any level, understand their role in effective asset management to improving AM Maturity. All personnel involved in asset management have to receive formal asset management training so that can support of AM initiatives and execution of activities in full confidence.

Skills Retention and Skills Transfer

One of the challenges faced by A-Coal was losing key asset management role players. A-Coal was equipped with certain individuals who were passionate about Asset Management. To understand Asset Management one needs to have love for it, understanding the benefits that can be reaped if AM is executed properly. But having the passion only, will not bring about changes and improvement in the AM Maturity of an organisation. Passion combined with AM understanding and knowing the benefits associated if AM is executed properly are the ingredients to AM Maturity improvements and success.

A-Coal was commissioned and operated with a limited Asset Management system. There were basic and unstructured systems in place, until the first Engineering Manager was appointed to lead the engineering team from the Asset owners' side. Participant 10 shares his experience as he witnessed AM implementation unfolding.

"We only really started to go into it in a more structured fashion when the first Engineering Manager came and that was… if I remember correctly that was mid-2011. But you can check

with the Engineering Manager. You know we went through a huge improvement programme when the Engineering Manager was here. Before that the systems were very basic."

This is captured by one of the participants saying, some systems and processes were driven by individuals who left the organisation. This is unfortunately an unsustainable situation because after the individual left, the process went the way of the dodo, meaning there was a lack of steam on those processes and nobody at that time could carry on with the same level of passion, understanding and having the vision of where the individual wanted AM Maturity to be.

"It was mostly driven by an individual rather than being systemic. So the individual left (the organisation) and the process went the way of the dodo."

Participant 4, acknowledges the challenges faced, when some of the Senior Management who were in charge of AM or in the driver's seat of AM left the organisation to find greener pastures. What this participant highlights is the fact that during the transition period, the handover process is normally ineffective, as negative results are usually experienced.

"There was a significant change in terms of the senior management and the time when this thing was introduced we were having particular individuals who were in charge who were part of the senior management. Now suddenly the CEO introduced a shock into the system which is this site and you were expected to absorb that and by doing that… by absorbing it I am talking about the knowledge transfer where you have to interact, transfer the system in place, this is how it works – I think that never happened hence the negative results we are getting now.",

Participant 4: *"Some they moved to greener pastures. Some just transferred from one plant to another. It was just a combination."*

Participant 10

"You know we lost the Company A engineer. This Engineer was replaced by another Engineer so it was a long… well there wasn't even a handover. There was a period where it was a bit loose. Then from the middle of last year the Engineering manager left the site"

An organisations' AM capability stands a high chance of plummeting when champions of certain processes under development or matured already are given or handed over to a new leader to run with. There is an opportunity lost during any transition of staff (hand-over period) to improve on AM activities. By examining the staff turnover of key role players in asset management within A-Coal it is observed that within the six years that the plant has been running it has experienced a high staff turnover rate.

The key role positions that were affected include, the Plant Manager, Engineering Manager, Plant Engineer, and Asset Care Engineer as shown previously, to such an extent that some of these positions had to be filled more than once. It can not be concluded that these were positive or negative changes because it is too soon to make such deductions. However, during the transition phase where any of these positions were filled there was an opportunity lost for improvement. And change can be good at times, and also bad, as employees might start to lose confidence in their leadership and in the manner which the operation is being run especially where key role players' positions are affected.

Tacit knowledge (as opposed to formal, codified or explicit knowledge) is the kind of knowledge that is not easy to transfer to another person by means of writing or verbalising it. Effective transfer of tacit knowledge requires personal contact, consistent interaction and trust. This kind of knowledge can only be exposed through rehearsal in a particular context and conveyed through social networks. An opportunity lost can also be in the form of tacit knowledge on how well certain individuals were familiar with the plant, their relations with other employees, and their general knowledge and intelligence. This is another challenge that can be experienced by an organisation when tacit knowledge can not be transferred from one leader to the next. The other key challenge is that systems and processes will be driven by individuals simply because people are not receiving training with regards to AM practices.

Organisational Culture

When establishing an organisation's asset management system, consideration should be taken on internal and external context. As ISO55000 states that the internal context includes the organisational cultures and the environment as well as the mission, vision and values of the organisation. Stakeholders' inputs, concerns and expectations are also part of the context of the organisation (ISO55000, 2014). Stakeholders' influence is key to setting rules for

consistent decision making and also to contribute in the formulation of organisational objectives.

Organisational structure plays an important role in the execution of AM activities and success thereof. Structures shape the way in which assets are managed across the business and for the whole life cycle of the assets. A silo mentality obstructs the efficiency and effectiveness of AM as compared to team work. Key to asset management success is gaining the commitment from top management to drive change in organisational culture.

Leadership or management needs to improve their understanding of how good asset management contributes to achieving organisational objectives. Once management understand this, they need to encourage it throughout the life of the plant and across the organisation by encouraging system thinking and working towards eliminating organisational limitations to improve AM practices. Contrary to what participant 1 stated, management must understand AM first before they can support it, in this case it can be said based on what most of the participants mentioned that management doesn't understand AM.

"They fully support the asset management system although some of them don't have a clear understanding of what it is meant to achieve."

It was almost two years after the plant was commissioned, when AM was implemented properly. This can be seen as management taking short cuts by not fully implementing AM in the beginning with complementing resources to drive AM, after having implemented a basic system which placed the operation in fire- fighting mode from the word go.

"it would have been nice for asset management to have been introduced from the word go"

"I think we are compliant if you understand what I am saying. We do things to comply. We are not really proactive. We are basically falling a bit behind with what needs to be done as far as asset management is concerned"

An improvement in AM Maturity requires an organisational culture shift from reactive to a proactive mode with a culture of proactive improvements efforts. Employees must also have pride in what they do, especially if they understand the benefits of AM. Participant 2 shares his views and opinions about the culture experience at A-Coal.

"…it is not part of our culture. If it was our culture to look at stuff operating and ask ourselves whether we are at an optimum level or not, then we would be in a better position to appreciate the benefits of Asset Management."

Participant 10 adds his view to say lack of pride is a concerning factor, if employees don't have a culture where they have pride in what they do, there will be difficulties experienced to improve AM Maturity.

"You know if we go into the workplace there is often sloppy work and lack of pride which is a bit concerning. I think that is an area where we need to focus on the skills and the motivation of each individual to take us to the next level."

As discussed in the previous sub-section on how well does senior, middle and Lower Management understands AM. It may be suggested that management will not be able to encourage or be supportive to the entire organisation if their knowledge of Asset Management is limited. Generally, the push for change emanates from Senior Management, which is driven by the organisation's objectives. The hearts of the people who will be implementing AM activities to deliver the organisation's objectives need to be won to be able to successfully implement and sustain new AM initiatives. Therefore, a strong leadership that fully understands AM, to make it stick, with full support or buy-in from the rest of the team is vital.

4.3 Participant Observation Analysis

The theory of knowledge of participant observation (especially with regard to its methods, validity, and scope, and the distinction between justified belief and opinion) rests on the principle of interaction and the exchange of perspective between two parties. The researcher is currently employed by Company B, and was privileged to engage with ex-employees and current employees whilst engaged in this research from the workers and maintenance staff at ground floor level to as high as the General Manager. It was through this engagement that a need for this study surfaced. The researcher was able to engage the ex-leadership team (Plant Manager, Engineering Manager, Plant Engineer, Asset Care Engineer) and discuss matters affecting asset management outside the research context.

Some of the matters discussed included but are not limited to refresher training on asset management from high-level to low-level, improvement projects etc. Management were offered invitations to attend asset management conferences, which are currently hosted by the Southern African Asset Management Association (SAAMA). They were invited to attend annual Client days which are hosted by Company B in aiming to sensitise its Clients

regarding knowledge in asset management in order to keep abreast of current dealings in the AM community. None of the senior managers and middle management have attended training with regards to the new International Standards Organization specification (ISO55000), of which the standard was released in 2014.

Due to the extremely good participation of stakeholders in the Technical Committee meetings. All stakeholders involved were given feedback about their section or divisions or their discipline's performance. However, with regards to steering committee meetings, attendance was poor or at times it would be postponed in case management had burning issues to attend to on site. Steercom meetings are held between Company A and Company B on a quarterly basis and the actions arising from the meetings will be updated to the AM Master-plan.

The researcher observed senior management including the general manager 'walking the plant' a number of times per day to ensure all work performed is of good quality and plant is operating safely and at optimum. Certain individuals, some of whom left the organisation were passionate about asset management and they will be enthusiastic and eager to see plant improvement driven through new initiatives.

Generally, once a certain process gets buy-in from management, it is most likely that the rest of the team will follow suit and support the new initiatives, such as the Lean Process that was initiated by Client B. What was observed, was that processes to implement or review AM strategies, which mostly requires a technical team will not get off- the- ground as quickly as the reactive issues which require almost immediate attention.

The researcher noticed that a reactive culture is more predominant than proactive. As part of his service offerings the Asset Care Engineer focused more on proactive work, implementing systems and process that benefited the organisation. The Asset Care Engineer unfortunately lacked the credibility or authority to effectively drive asset management systems. Some of the limitations were some- what as the result of the implemented reporting structure. Employees; however, appreciated the value-add that the Asset Care Engineer was providing, even with their limited knowledge in AM, but the analyses made were of benefit to them. In the subsequent chapter, findings of the interview analyses are presented.

4.4 Conclusion

Chapter 4 has provided the analysis of all the components critical to the study. The researcher took into consideration the literature review in chapter 2 and his experiences and written findings are outlined in the next chapter. The researcher used data from the three data collection sources as an endeavour to validate the findings. Content analysis was used for the qualitative data analysis and findings were drawn as more data was received from either the participants or the other data collection methods used. Chapter 5 will continue with endeavour to synthesise the findings and what was found from the literature review.

The results obtained from the study indicate that there is some alignment of what was found in the literature as Markow & Rackosy stated that some of the technical and institutional challenges faced within organisation is securing senior management support and leadership throughout AM implementation. Participants were quoted repeatedly saying there is lack of support from management or lack of AM understanding. The establishment of steering committee is of paramount important as this will aid top management to take full responsibility in driving AM. Top management support can be realised by seeing them taking part and attending AM steering committee meetings so that they can ensure that all AM objectives are aligned with the A-Coal's objectives. Antony & Banuels (2001) add by saying management involvement and commitment are the most essential fundamentals in adding the desired productivity in improvement initiatives.

Establishing a supportive organisational culture is an essential platform for implementation and execution of AM (Achanga et al, 2006). Management needs to supports change and execution of AM to realise improvement in AM maturity. A culture where all the levels in the organisation have the knowledge, skills and commitment will help achieve asset management goals. If the organisational culture is not supportive and personnel don't have pride in taking care of the asset they are looking after AM execution will fail.

Generic Asset Management training was offered to all employees involved in AM at A-Coal during the implementation phase. It was not established why employees were not given further training in asset management. Achanga et al (2006), argues that the training of people requires financial resources that organisations are at times not willing to part with. This can not be concluded to be the case at A-Coal; however, it is also not ruled out. In addition to this

the researcher can deduct his conclusion based findings above with regards to senior management support and commitment, which can be added by saying if management does not fully understand, nor involved and not committed to AM there are less chances that they will even budgeting for AM training courses for any of the employees.

Woodhouse (2014), mentioned that managers often rotate or move every 2-3 years and it can be as worse as 6 months. This leads to employees getting changing messages as AM leaders are changing. It was found that at A-Coal most of the senior managers who were initially responsible to drive asset management and were involved during the implementation of AM were no longer working for A-Coal for various reasons during the period when this research was conducted. It is without doubt that such experience will result in plummeting the enthusiasm of driving AM activities which will hinder AM maturity growth.

It is important that all employees understand the importance of AM and their relation with business risk. There is no distinct link between AM maturity growth and business risk. However, an improvement of how well organisation is able to carry out AM activities indirectly influences the risk that the business is exposed. For an example an organisation that has attained “preventing” level of AM maturity has less exposed business risk than the one on fire-fighting state of AM maturity.

Findings of these study were discussed with selected personnel and are in agreement with those findings analysed from the data. There was a lot common themes from the interviews. And the researcher used the predominant themes to make his conclusion of the findings. To a certain extent these findings related to what was found during literature review and what best practises place emphasis on for a successful AM programme according to the international organisations of standardisation ISO55000.

CHAPTER 5

5 Findings and Discussions

5.1 Introduction

The appropriate design for identifying the key AM challenges that are experienced in mining organisations has been investigated. Using the content analysis method, the researcher was able to find emerging themes. A Summary of findings per emergent theme were observed to be the key challenges, which the study aimed to achieve. The objective was to use the source stipulated in this study to identify those challenges impeding A-Coal from attaining its desired level of Asset Management Maturity.

5.2 Summary of Findings

It was concluded from the literature review that AM is the coordination of a set of activities and practices through which an organisation will optimally manage its assets, and ensure a balance between risk, cost and performance throughout the life of its assets with the aim of achieving a predesigned organisational strategic plan. AM incorporates cross-inter-disciplinary activities within an organisation. Whereas, Asset Management Maturity is a measure of how well an organisation is capable of optimising and sustaining the performance, risk, investment and costs related to their assets.

It is rather a complex link that can be made between an organisations competitive strategy and its AM related strategy, with activities associated with it. It can not be demonstrated or represented in a top down structural approach. This is simply, because AM coordinates and integrates with many organisational assets related activities, such as human resources, financial, information, engineering, production and so forth. An Asset Management Maturity framework as such must ensure that all the disciplinary activities are covered or assessed.

An AMIP tool developed by Company B was consistently used to measure the AM Maturity in the organisation under study. It covers 17 KPAs which align with 39 subjects of Asset Management and ISO 55000, the newly developed and approved international standard of AM. The research methodology applicable to this study was to explore and understand a real-life phenomenon in depth.

The use of a case study methodology resulted in noting those challenges experienced within the mining organisation. The critical research question was formulated, which theoretical questions emanated from answering the research question and from these questions interview questions were developed. The researcher deemed the case study method suitable to answer the critical research question (CRQ). There were three data collection methods that were used, namely: documentation, semi-structured interviews and participant observation. To acquire more data on this case to aid in answering the CRQ, 13 interviews were conducted with participants ranking from senior management to lower management level.

5.3 Case Study Findings

Utilising this case study, this research aimed to identify challenges faced by mining organisations for not attaining their desired level of Maturity, herein is a list compiled after an analysis was made from the various sources used to collect data.

1. The current AM Organisational structure has limitations to the improvement of AM maturity growth. Asset managers are currently reporting to Asset service providers instead of the other way round.
2. Lack of alignment between organisational objectives and operational activities. (AM strategy has never been updated since it was developed to align with business objectives. Therefore, poor communication of the Company objectives to translate into AM activities).
3. Company A management supports Technical Committee meetings. Through lack of management backing they don't fully support Steering Committee meetings.
4. There is a general lack of knowledge and understanding of Asset Management principles from management.
5. Lack of systems which resulted in key man dependencies syndrome. (AM initiatives are driven by individual and skills retention).
6. Poor management support to drive AM capabilities of employees. Employees have training matrices which focus on technical skills development.
7. Resistance from people to do the same things in a different way, as AM was introduced.

A-Coal has an unusual Company structure compared to other organisations. Generally, asset managers will be employed by asset owners, and they will report within the organisation's structure. Unlike A-Coal's organisational structure, asset managers (Company B), are

contracted by Company A, which is contracted to 'Operate and Maintain' A-Coal's asset on behalf of the Asset Owners. Findings from this study are cognisant of the Company organisational structure. It is an interesting phenomenon whereby, the Operations and Maintenance manager will have a higher say than asset managers. A structure that supports high credibility for Asset managers is key, because asset managers are the ones who understand the use of assets and will give the appropriate asset plan, depending where the asset is in its life cycle (Brown & Humphrey, 2005). Asset management states that there's coordination for inter-discipline. In this case asset management looks like it is a sub section of Operations and Maintenance management, rather than the other way round.

Prior to AM implementation Company A had standards developed for the use of EAMS, without an AM Strategy, AM Policy or AM Objectives. During implementation these documents were developed and then became static documents rather than dynamic. These documents had never been updated from the time they were developed. The documents are supposed to be dynamic to align with organisational objectives, which supposedly get updated at least on a yearly basis (Company B, 2011). Strong AM leadership which understands how AM contributes to an organizations competitive strategy and how to translate an organization's objectives to AM activities is a must for the success of AM activities' execution and the improvement of AM Maturity thereof (GFMAM, 2015).

AM management should not be driven by a one-man- band show; an organisation should not find itself in a state whereby AM is driven by an individual. Generally, interest is created through exposure. It was found that the majority of the participants interviewed had never received formal AM training. Training must be used as a platform to create interest in the subject in question and as such employees will understand better why they have to do what they opt to do. Training also stimulates people's minds to be more proactive than reactive as it creates an inquisitive mind. Another subliminal finding is the loss of skill, including tacit knowledge. It is a fact that people change position for various reasons. And tacit knowledge is not easy to transfer. These findings can be considered to augment and agree with other challenges mentioned in the literature review (Dwight & El-Akruti, 2009), (Antony & Banuels, 2001), (Achanga et al, 2006) and (Rose et al, 2012).

The results obtained from the study indicate that there is some alignment with what was found in the literature as Markow & Rackosy (2001) stated that some of the technical and

institutional challenges faced within organisation is securing senior management support and leadership throughout AM implementation. Participants were quoted repeatedly saying there is lack of support from management or lack of AM understanding. The establishment of steering committee is of paramount important as this will aid top management to take full responsibility in driving AM. Top management support entails driving and engaging AM steering committee meetings to ensure that all AM objectives are aligned with the A-Coal's objectives. Antony & Banuels (2001) added by saying management involvement and commitment are the most essential fundamentals in adding the desired productivity in improvement initiatives.

Establishing a supportive organisational culture is an essential platform for implementation and execution of AM (Achanga et al, 2006). Management needs to supports change and execution of AM to realise improvement in AM maturity. A culture where all the levels in the organisation have the knowledge, skills and commitment will help achieve asset management goals. If the organisational culture is not supportive and personnel don't have pride in taking care of the asset they are looking after AM execution will fail.

Generic Asset Management training was offered to all employees involved in AM at A-Coal during the implementation phase. It was not established why employees were not given further training in asset management. Achanga et al (2006), argues that the training of people requires financial resources that organisations are at times not willing to part with. Researcher cannot conclusively attribute this to be the case at A-Coal. In addition to this the researcher can deduce based on abovementioned findings that, without senior management support and commitment attempts at implementing AM with fail. Without the buy-in from senior management also means that AM training will not be allocated any budgets or minimal at best.

Woodhouse (2014), mentioned that managers often rotate or move every 2-3 years and it can be as worse as 6 months. This leads to employees getting inconsistent AM information as AM leaders are changing. It was found that at A-Coal most of the senior managers who were initially responsible for driving asset management and were involved during the implementation of AM were no longer working for A-Coal. In essence, these inconsistencies and lack of AM continuity with new management will hinder AM maturity growth.

It is imperative that all employees understand and appreciate the importance of AM and its relation to business risk. There is no distinct link between AM maturity growth and business risk. However, improvement on how well an organisation is able to carry out AM activities indirectly influences the risk that the business is exposed. For example, an organisation that has attained “preventing” level of AM maturity has less exposed business risk than the one on fire-fighting state of AM maturity.

Findings of these research were discussed with expects or senior management in the AM field and are in agreement with those findings analysed from the data. There were a lot of predominant themes from the interviews that were extracted to be the most common themes. The researcher used these predominant themes to draw conclusions from the findings. The findings relate and align to a certain extent compared to what was found during literature review and what best practises place emphasis on for a successful AM programme according to the international organisations of standardisation ISO55000.

CHAPTER 6

6 Conclusions

The objective of the paper was to identify the key challenges experienced by a mining organisation, which inhibits the improvement of Asset Management Maturity in reaching the desired level of Maturity. The identified key challenges have been noted to not only have surfaced from the execution stage, but also what happens during the implementation of Asset Management plays a massive role. It has been cited in this study that there are many challenges and issues faced with the implementation of Asset Management, little has been written with regards to challenges faced during the execution phase of AM.

This study maintains that the key issues identified prevent mining organisations from attaining the desired level of Asset Management Maturity which is; lack of a strong Asset Management leadership; A favourable organisational structure which will provide Asset Managers with credibility and the authority to make decisions in support of organisational objectives; No leadership support; and a lack of training obviate the benefits that can be realised from improvement initiatives which motivated, committed and enthusiastic employees will be delivering.

In addition to these challenges are organisational culture and a certain level of employees' competitiveness in the field of asset management. It is noted that there is an indirect correlation between Asset Management Maturity and Business Risk. For a Company with a low level of Maturity this would mean they are operating in a reactive mode. Organisations that execute reactive activities are doing a minimum of planning or planned work (pro-active). Organisations that operate in a proactive mode are most likely to survive rather than those in reactive mode, hence exposing the organisation to a high risk of failure.

Asset Management is not a project or a destination, but an on-going process following the plan-do-check-act loop. Continuous improvement is the core of Asset Management. Challenges identified during the study at A-Coal are not unique to the case site, and are surely similar to challenges experienced in some other organisations. Future work with some other organisations or industries in different sectors could lead to a wider spectrum of

challenges identified at A-Coal in order to develop a more solid base of the key challenges that hinder organisations from attaining their desired level of asset management Maturity.

6.1 Implications and Limitations of Research Findings

One of the limitations of this research study is that it was based on a single case study. The other unique elements are its organisational structure or reporting structure. In some organisations these complexities may not be the case, whereby there are two main shareholders - Asset Owners, outsourced operations and maintenance to Company A – Asset service providers, and they (Company A) outsourced the Asset Management responsibility to Asset Managers (Company B). In some cases, one might find the Asset owners and Asset Managers are one organisation, in some cases one might find there is no work that has been outsourced, that the asset owners, operate, maintain, and also manage their own assets. Therefore, some challenges encountered here may not be applicable to those cases.

There is always a possibility of the researcher making errors when dealing with qualitative data due to the imprecision of the data, interpretation, presentation or analysis. Given the methods used to collect data, especially from interviews, errors such as the possibility of poor recording, can not completely be eradicated. It could happen that one single data could be interpreted twice or misinterpreted completely.

Apart from the fact that this is a single case study and the sample was not well represented, especially where only one position participated, such as Finance Manager, there can only be one Finance Manager in an organisation. With these limitations in mind, the findings can still be compared to similar researches conducted.

This study involved qualitative data, and content analysis was used to analyse the data to reach those findings. The analysis depended on a single point of view of the researcher, which could be a weak point or distort the results or misinterpret participants' opinions and expressions. The researcher; however, employed his best skills and ability to address these possibilities, by examination of validity and reliability and the use of multiple sources.

6.2 Future Research Opportunities

The findings or results of this study could be improved and validated by future studies, which could take place in larger samples or multiple case studies. The findings made don't mean that they are valid to the case site studied. The aim is to generalise whatever could be generalized in mining, as key challenges that impede the AM Maturity improvement as desired. And this study could still be expanded not only within mining, but to other sectors, such as manufacturing or public sectors.

There are some KPAs where the AM Maturity score improved, and as such A-Coal is reaping those benefits. There were many processes developed at A-Coal; however, the challenge remains to constantly sustain those processes at the higher level of maturity. There are also a number of areas where AM capability needs to improve to effectively increase the overall level of AM maturity.

The researcher strongly believes that AM can be likened to leaf surrounded by ants. And just as it will be eaten bit by bit, so it is with AM. To mature an AM process costs money and time, and AM benefits are not realised immediately, thus Senior Management might not give it priority of implementation or spend the monies required in relation to the AM initiatives. Therefore, it is extremely important to pick a few KPAs which are in line with organisational objectives, ensure you have the resources at hand and focus on those, once the desired Maturity has been attained, then you move forward to the next KPAs. It is also important to ensure that a proper balance is attained since the KPAs are not in isolation and some could be linked. Following a structured and focused approach to improving AM Maturity could move the organisation to a more competitive position in the mining industry, and will provide results in the organisation which will have the following advantages:

1. A more focused and effective approach in executing AM activities;
2. An easy to follow translation of organisational objectives to AM activities;
3. Employees at 'coal-face' level will have a clear understanding of why they do what they are doing and how it contributes to the bigger picture for the organisation and what that means to them;
4. A proactive organisational culture can be developed.

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Appendix A: Pre-Test Case Study Interview

A first set of questionnaires were developed by the researcher in endeavours to answer the critical research question. These questionnaires were used to a few individual, but were later improved in order to extract the most information from the participants. The second set of questions are attached in Appendix B.

Before I go any further will you just share your position with me and what it entails?
Thank you for having me on this occasion. My role is basically Asset Care Engineer working for Company B – some people will call it reliability engineering, but there is a slight difference in that. My position is working currently for the physical asset management structure of the mine in terms of business processes, and taking care of the Asset Care Centre – as we call it ACC in Company B language. I am ensuring that the assets do what they are supposed to do, or what they are assigned to do at the desired level of operation and performance. Basically the processes we are looking at is Asset Register Administration, focused improvement and that is the most relevant I would say, the most applicable one on this specific site in terms of trying to ensure that the physical assets do what they are supposed to do.
And there are a couple of business processes as well, which includes work planning and control.

Thank you. How long have you been in this position?
I would say in this position in this site, it is one month.

And have you been involved in the implementation of Asset Management Strategy?
That's right, from my previous employment, I have been involved with a couple of companies, I would say two companies, in their implementation of their asset management strategies.

Have you attended any training or workshops on ISO 55000 in the last twelve months?
Not in the last 12 months.

Are you aware of any Steering Committee that is taking place in this Company?
Currently we will be establishing a Steering Committee, in this course of this year, but currently there isn't one.

So I believe you don't participate since there is nothing in place
That's right.

And in your previous employment?
Ja, in my previous employment there were steering committees.

Okay, and the guys who were here before you?
They used to have, yes. Apparently it stopped somehow, and it is now going back into place.

Okay. So at your previous employer you did partake in steering committees.
That's right.

Tell me what was your role there?
My role was basically around the RCM, the maintenance, being a facilitator of the RCM processes, around the Steering Committee. Yes.

And do you take part in the compliance?
That's right, we do AMIP and we meet with the Company B managers, and we also do some audits with Client A, with the Client.
Alright. So do you have a score card that explicitly measures cost, performance and risk at this site, since you started here?
Currently not in place.

Okay. Do you feel it is important?
It is very important, yes.

And what do you think it should measure?
It should measure the cost of having the Asset Management in place as well as the cost of maintenance and the quality of the maintenance and all the risks associated with that.

Okay
So basically we would be looking at the safe, cost effective preventative maintenance, with all the systems in place.

Do you feel the implemented targets that are set in a score card should relate to Asset Management?
If I understand the question correctly, yes, because basically when building up an Asset Management Strategy you do have some targets in terms of milestones, which basically will give you your score. So those points or those milestones should be related to your scorecard. That is my thinking.

So your scorecard should be updated yearly, quarterly or monthly?
I believe yearly is more relevant.

Okay. So if you do any reviews, or if you have weekly meetings or daily meetings, you don't go back and review your scorecard? Say the target changes?
Ja, if there is something that we see that needs to be changed on the scorecard then any time it will be changed.

Okay, and do you have a place or plan for assets?
That's right. All the assets have got their asset care plans, so I can say we do have a place for everything.

Okay
And everything has its place as well

And do you have a plan in place for upgrades for placement of assets, e.g. like an existing model, which is life cycle costing. Do you have something like that this side?
We currently are in the process of implementing the ACC model on the specific site.

For all the significant assets?
For all the significant assets, yes.

And how often do you update your asset plans?
The asset care plans will be reviewed as we go along, as we see any changes that are necessary; we learn from our shutdowns and all the repairs and all the problems we encounter. We take them into our current asset care plans and see how we can improve that, the asset care plans, to take care of whatever shortages we encounter.

Do you have a strategy in place that is followed to review asset management plans, based on the maintenance strategy which is employed for those asset types? E.g. if you have a strategy that is condition based, in terms of failure, do you have something like that to say in this particular month we will be looking at all the condition based assets and then review on their strategies. Do you have something like that?
Basically I can say our strategies are continuous. So it is not like we stop and take action some time; they are continuous, whatever learnings that we get, whatever improvements are suggested, whatever learnings we get from the OEMs or the artisans on site, we will implement those changes continuously. So it is a continuous strategy.

And does your plan also consider reviewing risks after certain improvements have been suggested and implemented?
Whatever changes we make to our asset care plans we do consider risk, and we make sure as well that there is change management in place. So whatever risk is there we would look at and try and eliminate it as fast as possible.

Do you have a method you follow on how you organise your assets?
The control of the assets or the risk?

Of the assets.
Yes, we do have metrics in place that we use for all our assets, in terms of classifying them.

And do you have plans that detail resources required for certain actions that must be taken?
That's right, with every change that we make we assign people on to the actual list. Firstly, we draw up an action list and we assign people to the different tasks that we need changed or that need to be amended.

And one of the things that is also important in Asset Management, I don't know if you will agree with me, is Change Management.
That's right.

Does the Company Have Change Management?
The change agent I would say is the Engineering Manager.

And yourself?
Myself I do facilitate changes as well, in terms of documenting them, yes I would; I would take part in the Change Management process and on my side as well make sure that the implementation is in place.

So you will come up with some initiative that needs to be rolled out to the guys let's say, do you go about making those changes to be effective to the guys, or discussing whatever, or training or whatever?
That's right. Whatever training needs to be done we do give training, whatever changes to the system, we do make those changes, and ensure that everyone related to those changes is properly trained and informed in terms of the changes made.

So you get involved in change.
That's right.

Are you familiar with all changes currently taking place with regards to Asset Management on site?
On site, yes I am familiar, because I attend daily meetings with the management and daily meetings, we have weekly meetings and we have technical meetings. So whatever change management is being done I am made aware of.

You mentioned the change agent you identified is the Engineering Manager.
That's right.

Do you think there should be more change agents or people you think should be change agents?
I would say he is the custodian of change because the plant is mainly engineering wise, but we need all the departments, or maybe the critical departments – let's say all the departments – to have delegates of Change Management. Like the Risk Manager, the Corrections Manager, the Plant Manager. That's right.

Currently do you think that is happening?
They do all participate in the Change Management process but the main driver is the Engineer, as the legal appointee.

And is there a platform to communicate changes with respect to Asset Management?
That's right, everyone is made free to communicate whatever changes that he can come up with. Like whatever he picks up from the failures or breakdowns, it gets discussed in the daily meetings, and whatever changes need to be made, they get done at the same time. So ja, there is an open platform for that.

Did you get any formal training or certificates since you have been at this plant?
That's right, because I have been with Company B for a year now, so I have been through the Company B training and whatever processes are being used on site I did get training on them.

Do you think the changes implemented are sustainable?
That's right, whatever changes that are being made in terms of Asset Management are sustainable and they get measured in terms of we do have a 90-day plan which is a lean methodology, we do have that in place. So whatever change that is being done is being tracked on the 90-day plan and as well as the planning cycle, the PDCA cycle.

Okay.
So we do sustain our changes; we monitor them, we measure them and we do sustain.

And does top management agree with the effectiveness of the Asset Management system?
I can say yes, because they are involved in this 90-day plan and the PDCA meetings, so they are fully involved, they are fully aware of what is happening in terms of Asset Management changes and implementations.

So are there KPIs monitored with regards to the initiatives?
That's right, whatever we change we do measure, so we do create KPIs for that and make sure everything is measurable.
And are those linked to a scorecard?
Most probably, yes.
When you look at organisational culture, do you have a culture that promotes silo or team work?
We promote team work as far as possible, we condemn silos, on a daily basis we do encourage working in teams. So I can say I haven't seen any silos, but we do condemn the culture of working in silos at the moment.

Do you know of any daily production for safety targets, or… that are reported on a daily basis?
That's right, on a daily basis there is a report that is being sent by safety, like a safety flash, or a report with all the KPIs being measured on that. It is from safety but it is connected with all the departments and it gets put on one slide for everyone to see – the production targets and all the production costs and whatever.

And where is this displayed?
It is on all the notice boards and whoever has an email gets communication. So it is basically a safety brief with all the production stats and the safety stats.

Who is responsible to ensure that production targets are achieved?
Like I said earlier we work as a team so we all make sure that the production targets are achieved and we support production and production should also then do their part to make sure targets are achieved. But we make sure that we do that cost effectively and as safely as possible.

Do you think the quality of work or that produced by other contractors or workers on site is satisfactory?
We do sometimes question the quality of work in terms of the quality of the inspections because our maintenance is basically based on the inspection sheets, or the inspections that are done by the artisans on site. So sometimes they do fail to identify the defects as they go along with their inspections. So at the moment the quality of inspections is quite questionable. It is not up to the level we desire.

What motivates you to deliver in your work to achieve your daily target?
I mean the bottom line is the employer should get the return on his investment, and the people as well, I mean we do know why we are where we are because we need to make changes in this life and changes in our own personal lives as well. So the motivating factor is getting what we are paid to do and satisfying ourselves that we are productive in this world.

What is your take about interdepartmental relationships, that cohesion?
Currently there is a very strong cohesion between the departments, there is unity in this plant here.

And what do you think of the C&MS system used to manage assets?
The system we are using currently is MT5, which has got all of the functionalities that are applicable to this plant. So currently I can say it is the best one for the specific site. I mean they will differ per asset type or specific site, but for this site and these assets it is the perfect one.

It is being used to its full potential?
It's being used to potential.

Okay.
You can see that in the Client requirements also

Is it flexible?
Very flexible.

And since we are dealing with people and we need to understand their development and the one thing is do you attend any form of training with regard to asset management?
That's right, as Company B, they are specialists in the field of Physical Asset Management, the company does encourage all the employees to go to whatever training is being offered and Company B has a lot of training they offer to both the employees and the outsiders or Clients. So everyone is welcome to attend training, at their own convenience – on the Client side or at Company B offices.

Do you know of a formulated strategy implemented to help?
Currently not that I know of, but I believe that on the current Asset Management strategy that still needs to be reviewed, there is some form of detail on that, I just have to acquaint myself with that.

Do supervisors and managers focus on coaching and leadership or are they hands-on?
That's right, like just even today we came from the Invisible Coaching and Leadership session, so we interact, Supervisors and Managers do fully interact with all the workers on a weekly basis to show leadership skills and coach them on whatever they need to be coached on. So there is Apprentice observations that are done by Supervisors on a weekly basis. So there is a lot of coaching and a lot of observation from management side.

Do you know of a training development programme in place, which covers skills?
That's right, like my current Company Company B, does encourage a lot of personal development and professional development, as well as the Client has his own development plans in place for developing their employees. So there are plans for both Company B and the Client itself.

Do you have a personal development plan?
I do have my plan that is measured on a yearly basis; so there is a formal plan in place for my development.

And how often do you review that plan?
Quarterly.

Do you undergo any formal assessment programme to assess the level of your competency?
There is ongoing communication between myself and my managers, so wherever I lack I will be advised accordingly and anything that needs to be reviewed will be reviewed there and then. So it is an ongoing process.

Okay. Are you empowered to make decisions in order to achieve your objectives in relation to asset management?
That's right I am fully empowered to make whatever decisions that need to be made in terms of Asset Management, like whatever changes I think are applicable and should be implemented I will communicate with management and they will either approve or disapprove. So I am fully empowered.
Do you take ownership of your own work in terms of asset performance?
I take full ownership of my work areas, yes.
Okay, and when it comes to asset performance?
I engage fully with the workers on site to make sure that not only myself but all the workers as well take ownership of the assets they are meant to maintain or take care of. So on the site basically everyone is encouraged to take full ownership of whatever it is he does with specific reference as well to asset performance. Because without the performance of these assets I mean we are here for nothing.

And at this site do you think there are absenteeism issues? Certain tasks that will not be completed because a certain somebody is not at work?
Currently, no.

Okay. And does the training requirement change every year?
Ja, we are living in a dynamic world so whatever needs to be changed can be changed.

So does it change?
It changes with the level of employment but I can say currently it is static, otherwise if there are new problems that come in place it will be changed accordingly.

Alright. We're looking at skills retention. Having been on site for a month it says there is still somebody left on site and then you are new. Do you have skills transfer programmes where you will train the new person starting in the Company?
That's right. I can say the previous person who was in my place gave a proper handover to me in terms of the duties and expectations of the Clients as well as the expected performance. So it was quite an intensive one in terms of imparting the knowledge, as well as his own private knowledge or skills that he also imparted on to me. So there was a formal process in place, and yes, information sharing as well.

Okay, so you said you worked for the same Company that this guy was working for.
That's right.

And then do you have a succession plan in place for a position? For example, if you were to leave, is there a succession plan for the next person to come in?
I can say the Company encourages impartment of skills, so whatever position the person is on, the Company does encourage that the subordinates do know what that position entails so that there can be a succession plan for everyone. So I can say there is a succession plan for everyone in the Company. It all depends on the performance of the person and the Company will help them as such.

Alright. Do you think Asset Managers stay in the same position for long?
It depends from person to person. If you do choose to stay in the position for long you will, but if you choose to grow – it depends on your interest and the environment as well. Some people will be comfortable in one place and some people won't, some people like to move fast and some people like to establish their own comfort zones. But generally I believe they do stay for relatively long.

Glad to hear that. Would that be…
As compared to other Managers who move around I can say roughly four years or more – they do stay long.

So do you think Asset Managers will stay for greater than five years or 10 years in the same position in this plant? Have the Asset Managers in this plant been here for longer than five years?
Not currently, because the plant is also not that plant, it is a new plant so everyone here is relatively not older than four years – not older than five years I can say.
Alright. When was the plant commissioned?
I believe it was 2011 if I am not mistaken.

According to your observations do you think the organisation has lost key role players?
Currently there have been people who left and the Company wasn't happy with them leaving. They were key role players but they have been replaced by other people as well, so ja. I cannot say… it is a loss, but there are replacements for those people.

Do you have a training programme for skills retention?
I believe there is one, yes.

Alright, I think this brings us to the end of the session. Thank you so much for your feedback, it is really appreciated and thank you for taking the time from your busy schedule for this.

Appendix B: Case-Study Interview(s)

Interview 1:
Participant 1: 2016.02.02_09.22_01

Thanks. I will start with the first question whereby I would like you to state your position or your ranking in the organisation. Are you in senior management, middle management, lower management or maintenance or production?

I would say middle management.

Okay and then the number of years in the organisation?

In this site?

Yes.

That would be one month.

Your highest qualification obtained is it High School Certificate, Diploma or Degree?

It is a B. Tech Degree.

Okay and then Section B I would like for you to explain to me what do you understand about Asset Management?

I would say with a specific reference to physical Asset Management is the management of physical assets from inception to disposal in terms of looking at the whole asset lifecycle. So that includes the costing and the maintenance as well, the maintenance management. Not only the physical maintenance but the maintenance management, the management of the maintenance function.

Okay. Do you think it is a good idea to have Asset Management systems within the coal washing plant?

Generally, I would say all the institutions or all the environments where these physical assets are in place there should be physical Asset Management systems in place so as to manage these assets well from their infant stage up until disposal. Generally, you have to account for all the activities that take place within our Asset Management system to maintain the lifecycle of the assets.

In your opinion what is the importance of you understanding Asset Management in this organisation?

I'd say in my opinion and in my current employment or job it is very important to have a clear understanding of the Asset Management practices so as to help the organisation to manage their physical assets in an optimal way so that they get their value for money in terms of return on investment.

Okay. Are you aware of any computerised or manual Asset Management system within the coal washing plant?

That is right. Various plants have various asset management systems in place. Like this one is based on the Pragma Model and the Company B Enterprise Asset Management System as well. So there is one in place and it is running 100 per cent.

Okay. To what extent does senior management support and commit to this programme?

I would say that senior management have got a great respect and… what can I say is the word… belief in the Company B Systems. They fully support the Asset Management system although some of them don't have a clear understanding of what it is meant to achieve. They fully support it.

Okay. Does the coal washing plant have a clear strategy and vision for Asset Management activities?

There is a strategy in place although it still needs to be revised. It should be revised every after two years. The revision year is going to be this year again to revise the Asset Management strategy. So there is a strategy in place with a clear vision although we just need to polish here and there in terms of defining our milestones and attaching timelines to that.

Do you think Asset Management has any significant role towards Company competitive strategy of the coal washing plant?

Can you just repeat the question please?

Do you think Asset Management has any significant role towards Company competitive strategy?

That is right. I would say I strongly believe that there is… the [unclear 5:46] … in the Company at large in that it guides the Company, it guides the management together with all the workers from top to bottom in terms of what is expected to be done to achieve the life of the physical assets. That is if I understood that question correctly.

Okay thanks. I think you did. Can you differentiate between AM Technical and AM Steering Committee?

I would say… you are speaking Technical and Steering Committees?

Why do we have a Technical meeting and why do we have a Steercom meeting?

For now, I don't have a clear understanding of that but from my own common sense or perspective I would say a Steering Committee is used to guide the workers in terms of the higher level objectives of the Company and the technical one is on the functional basis… functional or operational basis to undertake the recommendations or whatever communications of the steering committee.

Okay. What can you say with regards to stakeholder involvement on each of these meetings?

On this side there is involvement from all the stakeholders. They are the driving force behind all these meetings. They make sure that whatever needs to be achieved by the Client in terms of the Asset Management policies and strategies is fully supported by both stakeholders.

So you said you are one month here?

That is right.

Have you attended any Steering Committees yet?

No I have only been to the technical meetings.

Okay and you say stakeholders are involved?

They are fully involved.

You are not aware of the Steercom because…

The Steercom will be scheduled very soon so I believe I will be involved in that so that is when I can be able to divulge or elaborate more on the management commitment or the shareholder commitment on that.

All right thanks. Have you been taught any skills in relation to Asset Management?

That is right. Like I am working for a physical Asset Management Specialist Company so whatever skill that I need to acquire in order to exercise my duties that skill is being imparted to me in a relevant way. So there is training every now and then as per the requirements of Company B as well as with regard to the current development of the people at large.

Are your skills in AM regularly evaluated and updated?

That is right. The Company B has got a training matrix in place for each and every employee so each and every employee gets measured on a quarterly basis regarding the objectives and the targets of the training matrix.

Okay. Do you think it is important to include AM courses in your training matrix and why?

I would say they are included on my training matrix because if the Company specialises in such a thing as Asset Management, I mean the route of this… of the training matrix will be the Asset Management courses because we are meant to be specialists on the Asset Management practice.

Is it important?

It is very important yes.

Okay. How would you describe the current state of Asset Management in the coal washing plant?

I would say the current state… I would say we have matured well from the start of this plant. We are at a point; I would say in layman's terms that we are at a very advanced stage or at a very advanced state regarding Asset Management Maturity. I would just like to put it as

simple as that. So there is no fire fighting. All the systems that are supposed to be in place are in place. Although we are striving now for excellence.

I believe you have a framework that you use to measure Maturity in the organisation?

That is right.

I think it measures from level one to level five in terms of firefighting and I think the last one is excellence like you say.

That is right.

So where do you think you are after having worked for a month… where do you think the organisation is at between one to five?

I would say on the scale of one to five we are on stage four. So we are only striving to excel in whatever we do, but all the practices that are supposed to be in place are fully in place with the commitment of everyone and the support of everyone as well. So yes, we are on stage four.

Are you aware that there are any annual AM audits taking place in this plant?

That is right.

Do you think the actions suggested from the findings are in line with the organisational strategy?

I would say so because those recommendations from the audits are being communicated to top management to drive and they are as well put up on the yearly plan or the master plan.

And how often do you review the master plan or the yearly master plan?

Like I have been here only for a month so I still need to hear about that.

Okay. According to your understanding of Asset Management?

It should be reviewed as often as possible at minimum on a quarterly basis.

Okay.

That is right. Which draws me back to this ninety-day plan which we do have on site where we measure most of our technical proposals.

All right. Do you believe employees are aware of the benefits that the coal washing plant can gain from Asset Management?

Employees at last have been sensitised on a daily basis in terms of our daily KPI meetings. So we are just enlightening them to see what is being measured and why it is being measured. They are being sensitised continuously so as to see the value that the Asset Management function is giving the enterprise as a whole.

But are they aware of the benefits?

They are aware of the benefits yes.

Are there any challenges noticed on the present Asset Management system?

Not really.

Do you have issues with backlog; do you have issues with compliance?

I would say yes, regarding backlog, but it is not about the Asset Management system itself. That was as a result of the changes that were done on the Enterprise Asset Management system so it is not directly as a result of the Asset Management system failing, but it is only a software issue. That is what caused the backlog or the work in progress. In terms of compliance we try to engage with the workers on all the levels on a daily basis to ensure that there is compliance from all the sides, although we are not 100 per cent complying. We have a few errors as well so yes.

You mentioned that it was the system problems?

Correct.

What happened in the system?

Okay the Enterprise Asset Management system was being upgraded from the one version to a newer version and that is where a couple of our issues came in where there was a lot of… I would call it, work orders created unnecessarily by the system itself. We are busy working on that currently so it shouldn't be a headache after some time. That will be cleared off and we should be standardised again.

Okay. Are there any strategic recommendations you may suggest towards asset management for the coal washing plant?

No. Currently I believe everything is being explored and everything is almost in place. So for now I wouldn't suggest anything in terms of the asset management strategy.

Okay. Are you happy with the level of Maturity where this plant is at?

I am happy because as compared to the other plants this plant is doing very well. We only strive for excellence. We have achieved whatever we wanted to achieve in terms of Asset Management Maturity and Asset Management daily and whatever yearly tasks that we needed to put in place. We just need to polish and review things and we will be on the right level.

What would it take for you to get to excellence?

It is basically more of employee motivation and more commitment from all the levels across the organisation. Other than that we are almost at excellence.

Okay. Thank you so much sir. I really appreciate your time.

Interview 2:
Participant 2: 2016.02.02_09.56_01

Would you state your position/ranking within the organisation and classify it as Senior Management, Middle Management, Lower Management, Engineering, Maintenance or Production?

Middle Management.

And number of years within this organisation?

Two and a half.

Two and a half years. What is the highest qualification you have obtained classify it under High School Certificate, Diploma, or Degree?

Degrees.

Degrees, okay. Then going into the core of the questions – what do you understand about Asset Management?

Asset Management involves the values one derives from one's assets in an organisation. So when one talks management one talks about sweating the asset but also talks about maintaining that so that it always performs at peak.

Okay. Do you think it is a good idea to have an Asset Management system within the coal washing plant?

Definitely.

Why?

Because without the care… the caring system for the assets, assets will not last nor will they deliver the value they intended to deliver.

In your opinion what is the importance of you understanding Asset Management within this organisation?

If the user doesn't know how an asset works or what is supposed to be done to keep it working, then we've lost the battle. Everyone, including myself, should be very conversant with the Asset Management system.

Okay. According to your knowledge, when was the plant commissioned?

I think it was around 2011.

2011.

Not sure.

Oh you said you are here two and a half years in this organisation.

Yes.

Maybe we can leave that one. To your knowledge do you know if… I mean, when the plant was commissioned was Asset Management also part of the commissioning phase?

No I am not aware of any Asset Management programme during commissioning.

Okay. All right. Are you aware of any computerised or manual Asset Management system implemented within this organisation?

Yes.

If so, to what extent does senior management support commit to the programme?

They are supportive. It can be improved but they are supportive. They meet the bare minimum required.

What makes you say that?

It is because we seldom discuss efficiency or the process or the utilisation of our assets. We definitely fix what is broken, we maintain, but when all is well I have yet to hear of the level of performance being measured.

Okay. Does the coal washing plant have a clear strategy and vision for Asset Management activities?

Yes.

Please elaborate?

Asset Management activities include, amongst other things, maintenance on a regular basis. It includes condition monitoring. Those programmes are there in place at this site and they are being used. My earlier comment about measuring performance, once again, as mentioned, I have yet to hear us talking about how well a pump is performing relative to design spec. For me sweating an asset should involve the design parameters… design criterion relative to performance in the field.

Okay. Do you think Asset Management has any significant role towards Company competitive strategy?

Oh yes.

Why do you say that?

Efficiency is about sweating the asset. If you can use less of a resource and get maximum possible then you are at peak. Competitiveness will be a given.

Okay, so your understanding with Asset Management is it using less resources?

Well once you have your resources you should optimise their performance. Meaning that the maximum possible outcome from those assets should be the driving force. At the moment we do what we are supposed to do as per targets, but have we stopped and said, is this the best there is? That is my question.

Okay. Can you differentiate between AM Technical and AM Steering Committee meetings?

No I can't.

Do you know of a Technical Meeting that is being held on site?

Correct.

And a Steering Committee?

No. Not involved.

You are not involved. Are you aware of it?

No.

Your understanding, what transpires in the Technical Meetings?

Technical Meetings – we are basically looking at performance. Not performance as such… life of assets so to speak. Where the troubles are and how to get out of them.

Okay. What can you say with regards to stakeholders' involvement in Technical Meetings?

Well we do have stakeholder attendance. I am not in a position to judge on whether they are the best people in the meeting or not, but at least I am fairly impressed with the Client A side of things with some of the stakeholders, but I am not in a position to judge on how well or the level of participation.

Okay. Who would you like to see involved at Technical Meetings?

The end users. That being the process people. The engineering personnel who will be maintaining those assets. The projects personnel who will be looking at what can be done differently basically in terms of optimising. So the end user reports on whatever is the trouble. The other one maintains and says I am happy with this one. The other one looks at benchmarking those assets against other mines or against design criterion, hence I am saying projects but it could be Planning Department or Asset Management Company employed, it could be anyone.

Okay.

Those are the three parties.

In the current state do you feel or do you see that you don't have the involvement of…

At the moment we have the guys on maintenance sort of driving this. They will discuss what breaks but it is basically keeping afloat.

Okay. Have you been taught any skills in relation to Asset Management?

Nope. By whom?

By the organisation?

No.

Who would you or do you think should be teaching you Asset Management skills?

The organisation I work for (Company A).

Okay. And currently that is not happening?

Nope.

Are your skills in AM regularly evaluated and updated?

Nope.

Okay. Do you think it is important to include AM courses in your training matrix?

Definitely.

Why?

Because if the end user does not understand what he is using then how does he optimise that asset utilisation?

Okay. How would you describe the current state of Asset Management in this organisation?

It meets the bare minimum required. It could be improved upon.

Okay, when you are referring to the bare minimum can you elaborate on that?

We maintain our assets, but is this the best strategy we are using? I am not sure. You know, I have… I mean I do know that it is industry norms to run stuff to failure, to proactively maintain stuff, but we hardly ever discuss this. It is sort of ingrained. We know this one must run to feed this one… this that. I have yet to hear in a meeting where we will say this is the best we are doing or not.

Okay. Are you aware of any annual AM audits taking place in this plant?

Nope.

You are not aware?

[No verbal response]

Is there a master plan for Asset Management that drives Asset Management activities?

None that I am aware of.

Okay. Do you believe employees are aware of the benefits that the coal washing plant can gain from Asset Management?

Nope. I don't think so.

Why do you say that?

Because it is not part of our culture. If it was our culture to look at stuff operating and ask ourselves whether we are at an optimum level or not, then we would be in a better position to appreciate the benefits of Asset Management. Since we don't ask those questions we just operate and I don't think we are looking at benefits. We are concerned about the target that is it. Running hours. Coal washed tonnes.

Okay. What according to your opinion would be the benefits that are there?

Look if for instance we looked at a pump, if I make an example, let's take any liner that is out there and we ask ourselves, is this failing prematurely instead of just fixing it when it is failed? Then we would be on the road to understanding asset care.

[Knock at the door, interview interrupted]

Okay we were saying, what are the benefits according to your knowledge that are there when you have Asset Management...?

Then I was making an example of liners in a chute or a pump that is sort of failing prematurely. We must ask a question, has this pump given us the life? If so… maybe it has but then we should be asking questions. Instead of changing this pump what about changing the impeller. Those questions basically will contribute a lot towards sweating the assets, but I don't think we are seeing the benefits because we do not ask those questions. We don't interrogate asset care management. We change what needs to be changed as it is due and that is it.

Okay. Are there any challenges noticed on the present Asset Management system?

Sure.

What are those?

We fix what is broken instead of proper root cause analysis of why stuff failed so that we can learn from that and then improve upon that. Prevent failures if possible.

Okay, any other?

[No verbal response]

Are there any strategic recommendations you may suggest towards Asset Management for this plant?

Yes.

I am all ears?

For instance, what I have been talking about, understanding why stuff happened. My opinion is that we should be asking ourselves what the bottlenecks are and then go back and see if there is any benefit in exploring those bottlenecks. That is one thing that I will recommend. Secondly, we've got recurring delays. In the two and a half years since I joined this mine

there are delays that I have seen maybe fifty times. Have we sat down and said can we explore this and improve upon it? We haven't. We started that process a year and a half ago but then it died. My position is that we should look for perpetual improvement until we cannot improve any more.

And that was the second one. Do you have a third one?

Employ academics like you to come and on odd occasions just walk the plant to understand what the plant is like. Learn from this new plant because then if we've got, say Coal Tech, or WITS guys here, DRA who knows what we can learn.

Okay. The second point where you said you had already a system that you started a year and a half ago, you said the process died. What would you say was the cause for that process to die?

It was mostly driven by an individual rather than being systemic. So the individual left and the process went the way of the dodo.

The individual left as in the individual resigned?

Left the organisation, yes.

And there was nobody that carried that process over?

Nope.

Okay. What do you think it would take for this organisation to move to the next level of Maturity? Let me say, maybe on a scale of 1 to 5 where would you put this organisation?

Around 2.

Okay. Do you know where it is supposed to be or the strategy or the target that is set?

Remember I asked you about the benchmark earlier on. It was because I wanted to check where we are, or where the global average is. For a plant this new I will take it to 3 or even 4.

3 or 4.

If it was performing properly or rather if we had a system that was functional. We should be 3 or 4 no less.

So you are saying the system is not functional?

No. Like I said earlier, it meets the bare minimum so we are able to carry on. Optimising is about going beyond the obvious.

Okay so what would it take for this then to move from this level?

Establish a system. Document learnings. Learn from them. Avoid repeats. Sometimes improvement is not even about doing things better it is about eliminating the wrong. What bites you yesterday should not bite you today. We are not once bitten twice shy. So for us to move to the next level we must just have a database of what broke when, which we already

have by the way, but disseminate the learnings. Let guys know in rand and cents, in efficiency what a pain it is to have certain breakdowns or delays.

What platform would you recommend to let the guys know?

Like we already have certain meetings, Maintenance Meetings etc. We should have a section, instead of discussing what broke yesterday we should be asking questions like, yesterday we had five delays were they repeats or were they new? They were repeats. Okay, database, drop down menu. This is the pump this is what happened. Why didn't we do what we did last time to turn it around? Those kinds of questions will keep the guys honest and ultimately will drive us to a more preventative culture rather than a reactive one.

Okay. I believe… this will probably be my last question. I believe you have a Defect Elimination Process that is currently taking place on this site of which in my understanding they should be suggesting what you are suggesting should happen. Has it been happening like that?

Defect Eliminations is one of the programmes which was more people driven than systematic. Check my calendar and the engineers and you will see we do not have a Defect Elimination meeting. We address defects through other avenues like ninety-day plan etc. Effectively to say we are targeting Asset Care management using Defect Elimination or breakdown Prevention strategy whatever it is, we do not have such a focused programme.

And that was also driven by an individual?

Yes.

Was it the same individual?

Yes.

All right. Thank you so much. I appreciate your contribution to this.

Interview 3:
Participant 3: 2016.02.02_10.30_01

I would like for you to state your position in this organisation in terms of or categories in Senior Management, Middle Management, Lower management, Engineering, Maintenance, or Production?

You can say it is Middle Management.

Number of years within the organisation?

This is my fifth year.

What is the highest qualification that you have obtained – High School Certificate, Diploma, or Degree?

Degree.

My first question would be what do you understand about Asset Management?

Asset Management is just… it is a broad terminology that can be summarised into how each and every asset, being a person or a machine or any small thing in an operation, how it can be managed for the effectiveness of that operation and for the smooth running of that organisation at large.

Okay. Do you think it is a good idea to have Physical Asset Management systems within the coal washing plant?

Yes, it is needed because I mean Asset Management is the core of cost savings so you need to take care of your assets. They need to operate at their optimal level. So for you to achieve that you need to take care of all those single assets because that is where your cost saving comes in. Failure to do that and you may not control your costs so that is very important.

Would you say Asset Management is about basically managing costs or saving costs or is there more to that?

It is all about cost… because Asset Management is going to make you run your operation to its optimum level, to a higher level. Immediately when you have that level of operation you are going to have a high level of production. Your organisation is going to be profitable. Then again if you minimise your breakdowns or your assets are well taken care of that is where cost saving comes in. The key here is to reach your targets, your production targets and profitability of the organisation.

Okay. In your opinion what is the importance of you understanding Asset Management in this organisation?

Yes, myself as an individual for me to understand it, it is so important because I am going to be part of it because Asset Management involves everyone. It is very much important that each and every individual irrespective of their level of management or any level, it is important that everybody understands it so that they can know their role within that Asset management.

You said you have been with this organisation for five years.

Yes.

Do you know when this plant was commissioned?

This plant was commission in 2009. Towards the end of 2009.

Do you know when Asset Management was implemented?

Asset Management, the start… the actual Asset management strategy was initiated when they brought Company B in. It wasn't really… there wasn't really proper Asset Management but it was initiated when they brought Company B in which was towards the end of… towards the end of 2011 or 2012.

Do you know the reason why did they bring in the Asset Management Company on board two years after they had commissioned it?

Yes, they realised that we need that. Actually it was one of the negotiations between Company A and the Client that we need experts in this field so that we can have proper strategies and standards so that you can know where you are going. We needed those people who specialise in that so it can be properly implemented.

Would you say that when this plant was commissioned it was commissioned blindfolded?

Yes… the thing is you know when… the thing is with Asset Management it is sometimes… most people sometimes don't see it as a priority especially on the new plant because the failure rate… looking at machines, the failure rate due to wear and maintenance/poor maintenance or maintenance related problems that kind of risk is very low at commission. You can have failures because something is still new… maybe design faults and stuff like that, but the failures due to poor maintenance or lack of maintenance all those kinds that risk is very low. When such a risk is very low people just see that plant as the most reliable plant you can ever run and then all those things like Asset Management they don't really see them as a huge priority in the beginning in most cases.

Are you aware of any computerised or Manual Asset Management system implemented within the coal wash plant?

Yes, the one that we are using. There are the other ones that are being used on the other sites.

To what extent does Senior Management support and commit to the programme?

It depends from site to site.

This site in particular.

This site in particular it… I am not sure whether to say the Senior Management doesn't give maximum support or I should say they are just not so informed about Asset Management at large. I think maybe I should just say they are not so clued up about this whole Asset Management principle. So immediately when they are not clued up they cannot really give you maximum support because they don't really understand this whole principle of Asset Management.

Does the coal washing plant have a clear strategy and vision for Asset Management activities?

Yes. At this site we do. We do have the strategies in collaboration with Company B and the Client, especially on the Client A side and the coal side. We are trying our best to end up or to land in those dream greener pastures that we want to be at.

Do you think Asset Management has any significant role towards Company competitive strategy?

Very important that Asset Management is actually the key thing that companies need to use, especially if you talk of a Company that is running maintenance and operations for the sites. Those companies they need to take Asset Management very seriously and it is a tool that they can use, it is a very important tool that they can use or that they should use to process the whole world because from Asset Management you can make your Clients comfortable that

their operation is going to be well taken care of, and everything is going to be well recorded, profitability and all the costs can be easily checked. It is very much important.

Can you differentiate between an AM Technical Committee Meeting and an AM Steering Committee Meeting? What is being discussed at either of those?

I think I have just seen the minutes of the Steering Committee because I have always missed them. From what I heard there isn't much of a difference, but the Steering Committee is too much into discussing the strategies around Asset Management and the status and where we are with Asset Management and moving forward what can be improved and stuff like that. The Technical Meeting also looks a bit at that but it is also the technical things that maybe have been improved in the plant; if there are any redesigns or upgrades that they can be doing on the machines.

What can you say with regards to stakeholders' involvement in each of these meetings?

Stakeholders… okay, in each of these meetings… I think the right people are being called in for those meetings and I think the participation is great and fruitful.

Okay. Do you think there are other people that you might think they are important to attend these meetings and they are currently not attending? Maybe not people per say but in terms of discipline?

With the current setup that we have with those meetings specifically I think the people that are being called to attend are fine. The only thing that can be done is whatever is discussed that relates to a particular department that particular HOD has to just convey the message if there is anything to be conveyed. The current setup is fine. The employees that are being invited are fine. Just ensure that if there are any issues that are raised or recommendation it must be well communicated with the team.

Have you been taught any skills in relation to Asset Management?

Skills… skills have been taught and I have been getting experience in the environment. Some… some they are from visiting part of Asset Management so yes.

Are your skills in AM regularly evaluated and updated?

In what?

Are they regularly evaluated and updated?

I wouldn't say there is evaluation as such. There isn't evaluation that is done on Asset Management skills. Evaluation can be through audits that we have. It can form part of that evaluation.

Do you think it is important to include AM courses in your training matrix?

Yes, that one is very much important that it be included and then for people working directly with the Asset Management Department like people working here, but most importantly also the Supervisors, they must also get trained so that they can know about Asset Management and how they can play their role in Asset Management.

Do you think currently they do not know?

Yes. A high percentage of them do not know and that is something that drags most organisations backwards. That there are people who are supposed to lead their teams to the planet of Asset Management that they are not very informed about the principles of asset Management.

Okay. How would you describe the current state of Asset Management at this plant?

Okay the Asset Management I would say a lot of work has been done and then… okay there is no maximum efficiency in Asset Management. There is still room for improvement. That is what I would say. There is still room for improvement and it is work in progress.

What are those things if you had to point at what needs to be improved?

If maybe, I can just say things that need to be improved like implementation of the EAMS… or maybe… okay now we implemented… I can say implementation of other things that we want to put in like LCC running properly for this operation. Also cost, maintenance cost tracking, proper tracking of all those kinds of things. I am busy with those guys from Company A finalising reports and things like that. It is work in progress.

Are you aware of annual AM audits taking place at the plant?

Yes.

Do you think the actions suggested from the findings are in line with the organisational strategy?

Yes, they are. The findings are in line with the organisational strategy because our Asset Management we do in collaboration with Company B and Client A and we are being audited on Asset Management by Client A and Company B. So basically we are being audited on the standard that we are supposed to be following which is our organisational direction. All the findings are relevant and we try by all means to implement.

Do you believe employees are aware of the benefits they can reap from Asset Management?

No. The employees are less informed. I mean it also starts from their Supervisors. They are less informed but we are also trying to take that information to them through this thing of LEAN. The LEAN principle made it better to break the bridge between the Foreman and the Artisans so somewhere somehow we are trying to reach out to them and slowly but surely we will get there.

All right thanks. Are there any challenges noticed on the present Asset Management systems?

The challenges at the end of the day… you know Asset Management needs a collective effort so the key challenges that we end up having is the mind-set issue. If you are not on the same mind-set towards Asset Management you are definitely going to have challenges. That is the key challenge. Some of the things are not easy to implement because if you've got less knowledge or a different mind-set towards Asset Management from supervisory level until the low-low level guy on the floor then you will come up with challenges.

Okay. Are there any strategic recommendations you may suggest towards Asset Management for the plant?

Strategic Asset Management… in this operation I think the most important thing maybe it may not be strategic… what was…

Recommendations.

Yes, it may not be a recommendation, strategic recommendation as such but what mining companies or operation… not only being mining, but now focused on mining is that they must resource their Reliability… their Asset Management Departments that specialise in Asset Management. Maybe give you an example like Planning Officers and stuff like that because they drive such things. So that proper Asset Management can be driven and can be tracked. So that the companies… although the other teams like Managers and Artisans they play a role in Asset Management, but there is this other department that should run with those strategies and the implementation and driving them and they need to be well resourced.

Do you have an idea or what would you rank the Asset Management Maturity on a scale of between 1 and 5, where does this plant sit at?

I can give it maybe… I can give it a 4. Like I said a lot has been done. It is just that the… the reason I am giving it a 4, it can be a 5… the reason is we need a collective effort. So now it is just some parties driving Asset Management. The strategies are fine but for the fact that you are not yet there in understanding of Asset Management that is why it is sometimes more challenging.

Would you say the Work Planning and Control Department is under control?

As in like being monitored all the time?

No, is it managing things properly? Do you have backlog that is okay? Schedule attainment?

It all goes back to… the issue of Work Planning and Control it is a challenge. It being a challenge it goes back to the note that I also made about having resources. So due to the stuff like resources and okay on our side the changeover between the systems and stuff like that there it is not yet okay. It used to be okay but now it is not yet okay. It is just work in progress, but it is not okay at this stage.

Okay. What would it take, according to you, for this plant to move from one level of Maturity to the next?

For it to move I mean it goes back to the Senior Management to understand the role that they can play in Asset Management. The role that they can play in Asset Management and their understanding and their follow up on what needs to be done. If the Senior Management Supervisor can be clued up and join hands in this Asset Management their teams will automatically follow and that would make the Maturity to move from one level to another.

All right. I think that was my last question. Thank you so much.

Interview 4:
Participant 4: 2016.02.03_10.42_01

Are you in Senior Management, Middle management, Low Management, Engineering, Maintenance or Production?

Senior Management.

Number of years within the organisation?

The current organisation I am now five years. I have been in total eight years in the mining industry.

What is your highest qualification you have obtained – High School Certificate, Diploma, or Degree?

B.Eng. Hons in Metallurgical Engineering.

What do you understand about Asset Management?

The little understanding that I have on what Asset Management is, is around maintaining the equipment within the industry, tracking their performance… just around that – maintenance and tracking them and measuring how they are performing and the life that you are getting out of them. So that whole context is about Asset Management according to my own understanding.

Okay thank you. Do you think it is a good idea to have Asset Management system within the coal washing plant?

Yes, I would say it is. Fortunately, enough I learned that when I am here at this site through Company B because that first it allows you an opportunity to track or to understand where you are losing most of your time and if you've got systems or you are managing your asset well then you can be able to pinpoint and identify where your losses are in terms of the downtimes. You can focus your energies and focus all your people to improve on that. It is very, very much important to have Asset Management in place.

Okay thank you. In your opinion why is it… what is the importance of you as a person understanding Asset Management in this organisation?

Just repeat the question.

What is the importance of you having to understand Asset Management?

I think just to kick off the most logical basic thing for me to understand is Asset Management as a tool, because I believe it is a tool, it will help me understand how to use it. First I will have to understand that in order for me to be able to utilise it fully. After understanding or having to understand it that will tell me what I should expect out of this Asset Management. So first is the utilisation of Asset Management that is why we will have to understand it. Second, how will I use this thing and the results that I have to get out of it?

Okay. Do you know when Asset Management was implemented in this plant?

If I am not mistaken I will say 2011 or early 2012 if I am not mistaken.

Okay and then when was the plant commissioned?

2009.

So what can you say or why was Asset Management not implemented when the plant was first commissioned?

From my own understanding I think from the whole Senior Management, maybe the understanding or knowing that there is a tool called Asset Management as a whole, I think that is something that we didn't know about that or the guys who were here before me didn't know about that. Secondly, the power that this tool has on its own I think that is another thing the reason why initially when we kicked off or when we commissioned the plant we didn't have that in place. So the knowledge of the Asset Management itself and the understanding of the power behind this tool, I think those were some of the contributing factors why we didn't have it. After having challenges there and there and there and then having a look at different solutions as to what we can put in place in order to sort out the issues that we are having… I mean one of the issues that came out was around Asset Management to manage things around the plant. Fortunately, the move was made to go with that and then it brought significant and tremendous welcomed results.

So this Asset Management Company was brought in because you guys experienced problems before?

Exactly.

Okay. Are you aware of any computerised or Manual Asset Management system implemented within this organisation?

I think before the Company that is currently running the whole Asset Management, here at this site, was introduced… we had systems, unfortunately they were not properly managed and now having a Company that is focused only on mining that is where the improvement is and it can be able to track what is happening and then see the results thereof.

To what extent does Senior Management support or commit to this programme?

I can't… I think that is sort of a question that should be asked at an individual level and ask each and every Senior Management, but for myself, number one, I didn't understand the power even if this thing has been implemented while I was here. I never took it that serious until I met one of the Engineers from Company B and then he started to show me some of the reports and some of the work they had been doing and all that. That is when I started to realise the power that is harnessed in this tool. As an individual I started to really be supportive around these things in my sections, I am a Superintendent. If you have got issues that really requires planning and tracking some of the issues I will have to go to the planning team or the guys who run the whole Asset Management to assist and to put systems in place for me to be able to improve. So as an individual I support this thing.

You said prior this you were not in support. Is it because… or what could have led to that? Was this communicated to you when the Company started or what would you say?

Look, definitely as a standard or as a rule there as an introduction that was done to say that this is what is going to happen from now onwards. This is the Company that is going to be implementing 1, 2, 3, 4, A, B, C. Unfortunately, that was just an introduction, but the in-depth benefits of this tool or what this tool can do was never explained to us. The only way or the only time I realised the power behind this tool is when I was looking at the work that was being done in some of the problems. For example, the CT System issue with the RLT conveyors and how those things were eliminated and the improvement thereof looking at that 80:20 rule, how they applied it there. I mean to me it sounded like something serious. You can even see the results of the work that we are putting in place. That is when I started to realise. However, initially when they kicked off they did give us an introduction but it was not that deep for us to understand the power behind this tool.

Okay. Does coal washing plant have a clear strategy and a vision for Asset Management activities?

You see it's… to answer this question properly, again this depends on the individual. This lies around knowing the power behind this tool. For example, initially we had certain leaders who understood and believed the whole Asset Management concept and then they were so supportive that it became very important. Actually it was a priority, but now with people who do not understand this, hence the question of saying do people support this thing? If you do not understand it definitely you won't support it as it needs to be. So the first thing, people should understand the need for this thing and the power behind this tool for them to be able to rely on it. That I think can be proven beyond a reasonable doubt that if you are not supporting it the results are very negative. That can be put in black and white.

How do you think people can support this? What is it before people can support? What is it that you think needs to happen?

I always believe in projects and each and every time we do a project in order to address people who were not involved in the project you would have to have some kind of presentation be it on PowerPoint, be it in the form of a report. What I will suggest or what I will strongly believe can change peoples' mind is compiling a PowerPoint presentation and have all the stakeholders or Senior Management people in one room where you can present the scenarios where the system was not in place, or the Asset Management was not in place, and when it was implemented. Show them the results of when it was put in place and then when people started to pull back what happened. Those three pictures, if you paint them in the mind of the people then they will understand the power behind this tool and the need for us to embrace this tool.

Does it only have to be Senior Management or even the people on the ground level or lower level? Do you think they need to be involved?

Definitely there is a huge or a significant gap or line between the Senior Management and the people on the floor, however, you have to cater for everyone. The setup should be you might start with Senior Level Management and then at a later stage again you can present at the lower level and definitely your focus will be different. When you are presenting this tool to

the Senior Management it will be different, the approach will be different when you are presenting it to the Operators and the guys down there on the floor.

Do you think Asset Management has any significant role towards the Company competitive strategy?

I strongly believe… if I understand your question I strongly believe it does. For the Company to be competitive that is measured by how it is doing in the current economy or the way the industry is running. If first you have the Asset Management in the right place and it is being implemented and supported in the right way definitely you will be competitive. It is a need. It is needed.

Are you aware of a Technical Meeting or a Steercom meeting or both of them? Do you know the difference?

Okay this is how I understand them – I can't really give you a definition as per the dictionary or something, but in the Steercom what I understand is the setup that we… or let me say, the guys have at Client B where you will have a group of different disciplines coming together and then share amongst each other the projects that they have been doing, the work that they have been doing, their experiences and all that. Whereas in a Technical Meeting you will sit down and you will be discussing technical things that are affecting your operations be it improvement, be it challenges that we are having at a technical level.

Do you attend any of these meetings?

I do attend Technical Meetings. I used to attend Steercomms at Client B, but unfortunately I am no longer taking part in the Steercomms, but I do attend Technical Meetings.

Okay. What can you say with regards to stakeholders' involvement at each of these meetings?

I think going back to the Steercom and under the concept which I defined it, the involvement of the Senior Management is very much important. First, that sort of gives confidence to the guys who are presenting or sharing the knowledge to say that whatever they are doing is of importance because of the importance of the Senior Management. The second is the learning for the Senior Management as to what is happening at the ground level because most of the things that gets discussed there are the projects that are happening in the field. So that is when the Senior Management can be able to understand or gain the knowledge of what is happening. The third thing would be the issue of coaching and transferring knowledge from the Senior Management in some of the things are being discussed. I mean if there is something that is offline they can just bring the light there hence motivating and teaching. I think it is important for the Senior Management to be involved in such forums.

With the Technical Meetings…

With the Technical Meetings definitely…

Who is involved there? Do you think every person that is attending that needs to be there or do you think there are people that are not attending?

I think in the Technical Meetings definitely the Senior management and the HODs because the HODs then they will carry the information… actually they sort of... they are carriers of

information into the Technical meeting and taking it back to the floor. After the Technical Meeting definitely when we've got our morning meetings that is where some of the points which are crucial we tend to share them with the guys at the ground level.

Have you been taught any skills in relation to Asset Management?

Not in a formal way. So what I have learned was in a form of questioning. Fortunately, I started to… like I said, I started to understand the power behind this tool with the Engineer looking at his work. Since my involvement at the filter plant there were some of the things where I wanted to learn and I would go and ask for help, ask how can I do 1, 2, 3, 4 and those kinds of things. To me that was a learning curve.

So that brings it to me that your AM skills are not basically being evaluated and they are not updated?

Yes.

Because you don't have any training?

Any formal training if I may put it that way.

Do you think it is important to include AM courses in your training matrix, or do you have a training matrix, let's start there?

Yes, I do have a training matrix.

Okay, do you think it is important to include Asset Management courses?

Very, very important.

Why?

I think in a way it is a rhetorical question if I may put that way, let me put it that way. I think it is very much important because I said, when we kicked off or when we started this conversation that in order to be able to realise the power behind this tool first you have to understand it. You need to understand it and then after understanding it you will have to understand the results that you would get out of this thing. So if you have proper training around it then it would be very much clear and easy for you to identify the result that you are getting out of it.

Okay. How would you describe the current state of Asset management in this plant?

I will say that currently we… it is declining. There was a point where it was like really growing exponentially and then we were at a point where things were really running smoothly. I mean we input values and numbers that we can use to measure that. We used to not struggle to meet our targets and all that. The number of breakdowns that we have, the biggest breakdowns like on the beams and all that those things were starting to fade away and that was simply because of Asset Management. Now if you look at the current state you can see that we are starting to have some funny breakdowns. We seem to not be in charge or in control of that and that has everything to do also with Asset Management. So we are declining from where we were. That is the current status.

What are the contributing factors to this?

I think the understanding. If I am… in confidence I must say, particularly at this site. There was a significant change in terms of the senior Management and the time when this thing was introduced we were having particular individuals who were in charge who were part of the Senior Management. Now suddenly the CEO introduced a shock into the system which is this site and you expected to absorb that and by doing that… by absorbing it I am talking about the knowledge transfer where you have to interact, transfer the system in place, this is how it works – I think that never happened hence the negative results we are getting now.

What happened with the Senior Management?

Some they moved to greener pastures. Some just transferred from one plant to another. It was just a combination.

You basically lost people who were driving Asset Management?

Who were part of that, yes.

And then what other contributing factors are leading to the current decline?

I think it has been there for… like when we started and it is the issue that we touched on in terms of presenting this thing or informing or educating people about this thing. I can't say training because I think there is a significant difference between training people and informing people about the system. When you are training them you are training them to be able to use it. When you are informing them you are making them aware of what we have, the tools that we have. If ever they want to use them they can use them. I think the other contributing factor is people at the ground level understanding and knowing that we've got a system in place that is called Asset Management that we can use. I think people when they see Company B they just see people that you go there and they give you job cards and all that. They don't understand what else they can do for them.

Are you aware of an annual AM audit taking place in this plant?

Yes.

Do you think the actions suggested from the findings are in line with the organisational strategy?

I don't understand that…

Okay so from the audits there are findings whereby there are certain actions that need to be done to move from one level of Maturity to the next or to maintain that level of Maturity, but you give certain actions to say these are the things that need to be done in this particular year. What I am asking is, knowing the organisational strategy for that year, are those actions in line with what the Company wants to achieve?

Most definitely. They are, they are in line. I think the question there should be, does the organisation have the plan in place or the necessary resources to be able to close the gap between what is required or the findings that need to be closed out and what they have. I think there is a huge gap which needs to be closed there. I think the thing that needs to be done is we need to have the necessary resources or the necessary skills and knowledge to

close out the gaps that we have. Currently what I can say is 50/50 there. There are some that get closed. There are some that get pushed to close that. There are some that need other people to assist in order to close that because some of the findings are departmental. So again that is also an issue with… I can say it is the issue of competency within that specific area. I believe training or knowledge sharing can be of importance there. Like for example, if I can give an example with the Filter Plant. There are things that I see… what is that system? There is another system which the safety guys have which shows the things which are closed out, things that are still outstanding. There are some things that appear in the plant which some people are not even aware of. The other thing I think, the communication, which… I am going to emphasise on that, which is informing people of what is happening around. Sometimes that is lacking – the communication around what is happening. That we need to improve.

Okay. All right. Thanks for that. Do you believe employees are aware of the benefits that the coal washing plant can gain from Asset Management?

No.

You don't think they are aware?

I don't.

Why?

First thing, I am going to go back again and the reason why I am saying this is because if you go out now and pick at random any employee of your choice and ask them about Asset Management they are not going to tell you about that. If they don't know about this tool, then how are they going to know the benefits thereof? For you to know what this thing can do, the benefits we can get from this, you have to understand it first and what its functions are and the purpose. If you understand its purpose, then you will understand its benefits and you will start appreciating it. I think that it is not being communicated properly but we must find a way in order to do that.

Are there any challenges noticed on the present Asset Management system?

I can't really say there are challenges on the system itself. The challenges that I as an individual have seen or observed from a distance is the… it is like working together or people who are out of the system who need the system to work for them and appreciating what it can do for them. You see you will always hear them say that normally a patient… a doctor will never follow a patient but the patient will go to the doctor. For me to go to the doctor first I need to understand what a doctor is and understand what he can do for me. So if I feel sick and I am in need of this then I will go to him. I think that understanding amongst people that we really need… because for example I am sitting at the Filter Plant, there are things that I need to do and this Asset Management can make it very simple for me. Like today it is Wednesday, tomorrow is Thursday it is maintenance. The plant is going to run and I have to maintain my Filter Plant. The Filter Plant is the heart of the plant. I have got about nine presses which are different. I am going to have an assistant of the Company A engineering support that is coming. I have to utilise those guys and my planning must be very proper and

up to scratch in order for me to utilise those people. So what I have to do is I have to go and sit with those guys down there at the Planning Department and tell them I am going to have so many people, these are the problems that I am having. The plant is going to be running, I am expected to run so many machines at a time and I will have to take maybe three or two machines at a time out and achieve this way. That is where they need to advise me on project plan to say okay do 1, 2, 3, 4 instead of me sitting the whole day not doing my work and trying to focus on drafting the plan. They can do that for me effectively and efficiently. Now that I understand the importance I just go to them and they will sort me out. So I think the bridge or the gap between the people who need the services from the asset management team, understanding what they can get from them. That is the challenge we are currently facing.

All right. Are there any Strategic Recommendations that you want to suggest towards Asset Management for the coal washing plant?

I think my recommendation is what I have been recommending throughout the interview. The recommendation first is get a way of informing us, and when I say us I am talking about from the cleaner going up to the General Manager. They must understand this thing and appreciate its power. Get a way of communicating or informing us about this tool and what it can do. Give us some examples of where we were and when this thing was introduced and where it took us. The other thing… as departments we have different needs. I mean the Filter Plants' needs are different from the DMS. The DMS' needs are different from ROM. So firstly we also have to address us from a departmental point of view to say, these are the services that we have for you guys. If you want to use them these are the people that you need to communicate with and these are the channels. We don't even know the channels that we have to follow. For example, I report to the Plant Manager (Company A) if I may put it that way, but if I have to do some investigation or I have to do something do I go straight to Company B; do I inform Plant Manager? How does it work? We don't have such in place. The issue of communication and all these things, us knowing these things is not anywhere. So that is my recommendation. That needs to happen.

Okay. What would it take for the Company to move from one level of Maturity to the next?

I think it is simple. For you to move from one level to the next firstly you have to understand your current status or your current standing or position where you are. That is the first thing. You have to understand where you are and then you have to measure that against where you have to be. It is like we call them baby steps. You are here, you want to go there. So to understand where I want to go I compare the two. Next month or whatever we've got a target I want to see myself here. Then again you do whatever needs to be done or you have your plan in place and then you do the measurement again to assess. Okay I was there and now I am here and still I have to go there. If we understand that then it will get us to the Maturity that we are looking for. The most fundamental thing that we look at is the understanding of our current status and where we want to go and we measure the two and slowly but surely closing that gap.

Okay. Maybe a closing question, out of 1 to 5 where 1 is firefighting and 5 is excellence where would you put this organisation?

I will be honest. I will be honest with you. If I understand the question are you saying…

Level of Maturity?

When you are saying in terms of Maturity are you saying the Asset Management of the organisation or…

The Company/this plant, the way things are being done?

I will give it a three.

Thank you so much sir for your time.

Interview 5:
Participant 5: 2016.02.03_11.57_01

Are you in Senior Management, Middle Management, Lower Management, Engineering, Maintenance or Production?

Engineering Maintenance.

Number of years within the organisation?

This one is one year two months.

And within… your experience?

Ten years.

Okay. What is your highest qualification you have obtained – High School, Certificate, Diploma, or Degree?

High school and Certificate.

What do you understand by Asset Management?

[Long pause]

Your understanding. There are no right or wrong answers.

Can we skip this one?

Okay. Do you think it is a good idea to have an Asset Management system within the coal washing plant?

Okay let me say this. Asset Management you are referring to the planning?

Yes, how you basically manage your systems in terms of assets.

The question was?

What is your understanding?

Well according to my understanding it is very, very handy as we do maintenance day and night and also breakdowns too. So it is better that we have Asset Management so that we can do planned jobs and that way we would be able to eradicate or be good in problem solving.

Do you think it is a good idea to have Asset Management system in the coal washing plant?

Yes.

Why do you think that?

Like I said in my first answer or should I say it again sir?

Okay it is fine you can skip that. In your opinion why is it important that you understand Asset Management?

No well if my job is to do with planning I have to understand Asset Management. The key roles and responsibilities and what is expected and not expected out of that, so yes.

Okay. Do you know when this plant was commissioned?

Yes.

When was it?

2009.

Do you have an idea when Asset Management was implemented?

It was after a year. I think 2010. Around 2010 yes.

All right. Do you know the reason why it was not implemented in the first place?

No.

Are you aware of any computerised or Manual Asset Management system implemented in this organisation?

Come again…

Computerised – like any software that you have that is part and parcel of asset management or a manual system?

Yes, I think we have on key and orbfusion.

Okay. To what extent does senior management support and commit to this programme?

Can you skip this question please?

You can answer. Remember this is open and nothing will be held against you, nor attached to your name. Just share your thoughts.

The question again?

To what extent does Senior Management support and commit to the programme?

Well I will say they do support because they are supposed to support it. To me it is not working for them as some of them do not even understand it. I will say they are doing it just because they have to do it due to the Client's requirements.

Okay. That was easy. Does this coal washing plant have a clear strategy and vision for Asset Management activities?

Clear strategy and…

Or a vision… where do they want to see Asset Management take them?

I am not sure about that one sir.

Okay. Do you think Asset Management has any significant role towards the Company competitor strategy?

Yes.

Please explain that?

There are things that they have done that we are not aware of and there is a lot of help that they put in that we guys are always busy that we maybe couldn't foresee, but due to their work, due to the implementation of the Asset Management we manage to see things that we couldn't see. We manage to plan things that we couldn't plan because of time and availability.

So does that help the Company/organisation in being competitive?

Yes.

Okay. Do you know of any Technical Meeting and Steering Committee currently happening on site?

Technical Meetings?

Yes. Asset Management Technical Meetings?

Yes.

And the Steering Committee?

[No verbal response]

Okay. What is being delivered at these meetings? Let's start with the Technical Meeting.

We talk about MTTRs and MTBF to everybody to let everybody know how long does it take to fix things, how long does it take to repair things, or how long is it going to take this thing to break and those kinds of things.

So you basically look at your KPIs?

Yes.

And then on the Steercom Meetings what happens there?

Steercom Meetings I would say that is where we do our ninety-day plan.

Okay. What can you say with regards to stakeholders' involvement in each of these meetings?

Well they must make money available.
Do you think they partake in those meetings? Do they attend those meetings?

Yes, they do.

Okay. Do you think there is another discipline that is probably not attending that you feel maybe should attend?

No.

Okay. So have you been taught any skills in relation to Asset Management?

Yes.

Okay. Are your skills in Asset Management regularly evaluated and updated?

Yes.

Do you think it is important to include Asset Management courses in your training matrix?

Very important.

Why do you think that?

You know when it comes to technology and everything one must be on top of his game. So every time when there are changes on Asset Management we need to know, we need to be trained. I think that would be a good idea.

Are you happy with the courses that are currently in your training matrix when it comes to Asset Management or are there any courses now in your training matrix?

So far we haven't gone through any courses only except for the one for On-Key.

Okay. How would you describe the current state of Asset Management within the organisation?

I will describe it as a good thing. I don't have any doubts about it because we use it and the job is going much easier every day. To me it is a fine idea. Asset Management is a fine thing to have.

Are there any improvements that you think needs to be suggested in the Asset Management?

For now, no. I haven't thought about that.

Okay. Are you aware of any Annual Asset Management Audits that are currently taking place in the plant?

No.

Okay. Do you believe employees are aware of the benefits that the coal washing plant can gain from Asset Management?

Employees like employees in general?

Yes. People that report to you from the worker's level and maybe you can say Senior Management?

I would say yes.

You think they are aware?

Yes.

Please explain?

The thing is everybody knows that when it comes to… when you do something like job cards… when you book stores that is where the [unclear 10:33] will come in so I will say yes they are aware.

What are the benefits there?

Benefits is to get whatever you want from the store.

From the stores?

Yes.

Okay. Are there any challenges noticed on the present Asset Management system?

Not that I know of.

Okay. Are there any strategic or any recommendations that you would like to suggest towards Asset Management for this coal washing plant?

Well everybody must be trained, especially on the HOD side and even on the… how do I put it… on the guys who they use to relieve senior personnel. They need to be trained. Also the store personnel need to be trained very well.

Any other recommendations?

No.

Why do you think people need to be trained?

The thing is some of the guys that are qualified are not around. We always have a problem of getting things done on time and that is wasting time.

They are not around as in how?

Like you are not at work or maybe you are in a meeting and then something happened that needs to be solved urgently. There should be a second person that can be able to do the job.

Okay. On a scale of 1 to 5 where would you rank this organisation in terms of asset management?

So far I will give it 5 because I have never had any problems with it so I will give it 5 out of 5.

All right I think that is the end of our conversation. Thank you.

Interview 6:
Participant 6: 2016.02.03_12.47_01

I would like to kick start by you telling me your position ranking in the organisation. Are you in Senior Management, Middle Management…?

Middle Management.

Middle Management. Okay I didn't need the position. That's fine. Number of years within the organisation?

Heading for 5 years.

Okay. What is your highest qualification you have obtained – High School, Certificate, Diploma, or Degree?

I'd say Certificate. I have an N5 Certificate.

In your understanding what can you tell me about Asset Management? What do you understand about Asset Management?

Asset Management is managing the assets of the Company. That is pretty much what our job is here. We… the Client owns the plant and we manage the assets that they are keeping here. The assets themselves are all of the equipment and vehicles and everything. Those are the assets. We manage their assets. That is our job.

All right. Do you think it is a good idea to have Asset Management systems within this coal washing plant?

Yes, I certainly do.

Please explain that.

We have to make sure that we are looking after, for the Client too, they need to make sure we are looking after their assets correctly. We have got to… the Client has to make certain that we manage the assets here correctly so you have to have correct Asset Management so that they can make sure what the assets are and that they are correctly managed and that the place operates correctly.

Okay. In your opinion what is the importance of you having to understand Asset Management in this organisation?

Well, being a foreman I manage a lot of the equipment so it is my job to manage those assets correctly so it is important for me to be able to do that.

When was this plant commissioned?

2009.

When was the Asset Management systems implemented?

Properly, I would say… I think about last year.

2015?

Yes…

When was Company B contracted to start?

Okay you guys started with it. In the beginning we never had you guys we just had one person running it and then they brought in Company B. Probably I would say 2013. 2013 that Company B started but it has been improving all the way since then.

All right so what would be the reason why the Asset Management Company was not employed at the beginning when this plant was commissioned?

On commissioning they have so many things that they have to do that I don't think they are as worried at that stage. They had to get the plant running and then it is also costs and everything else. They've got so many projects on the go so I would say that is why they had their own people employed. So they used their own people. As time went on the work

became more and more and they realised that Asset Management was more and more important so that is why they got Company B to come and run it for us.

Okay. Do you think it was important to have Asset Management implemented before the actual plant is commissioned or after or it doesn't matter?

I would say before because you've already got to manage your assets correctly from the beginning otherwise it costs you money. So therefore it should be done beforehand.

Okay. Are you aware of any computerised or Manual Asset Management systems implemented within the coal washing plant?

There is a computerised system. If you want to know manually, I am sure people have their own systems that they use for certain things we do. The system is computerised.

To what extent does Senior Management support the system and commit to it?

They do support it and they commit to it. I think that is where… they are the guys that instigated it and started it all and everything else.

Okay. Does the coal washing plant have a clear strategy and vision for Asset Management?

Yes, I believe so.

Why do you say that?

I think now as time goes along they have been learning more about it and as they implement it they see what they need. So yes I think they are starting to get a clear vision of what we need here and also the Company B personnel have helped a lot as well. It is their field and that and they have put in good systems in place. Each guy that has been here has done a good job.

Okay. Do you think Asset Management has any significant role towards the Company competitive strategy?

Competitive strategy, yes I think we do. The coal prices are low. There is a lot of competition in everything nowadays so you've got to operate your assets correctly otherwise it costs you money and at the end of the day… and especially for our Company, we are contractors so we have to look after the Clients' assets so it is very important. If we don't we would lose the contract.

Do you know of an Asset Management Technical Meeting and the Steering Committee Meeting?

Do they have Technical Meetings? Yes, they do

Do you think the people involved in the Technical Meetings should be there or are there other people that are missing that you think they should be attending the Technical Meeting?

I think most of the main people are there. All the Middle Management and Senior Management that are involved are there. The only people not are the Artisans and I don't think they should be there. I think the correct people are at the meetings.

Are you aware of Asset Management Steercom meetings?

Steercom, what is that?

If you are not aware we can carry on and then we'll discuss it later.

Okay.

All right. So you are not aware of that?

No. I don't know what Steercom is.

Do you receive or have you been taught any skills in relation to Asset Management?

We do get to go on courses yes. We do. I don't think they are very advanced courses but we do go on courses.

Are your skills in Asset Management regularly evaluated and updated?

I would almost say no. As I say they do send us on courses and so on and we have our meeting but I don't think they really evaluate it. They do give us training every now and then.

Do you think it is important to include Asset Management courses in your training matrix?

Yes, I do.

Why?

Because part of our job is Asset Management so yes I think we should be trained to be able to do it properly.

How would you describe the current state of Asset Management in this plant?

I think it is pretty good. With Company A doing it and with the First Engineer employed by Company A and the recent Engineer that just left, we're doing very well and now the current Engineer as well. I am only just getting to know the guy and he already helped me with something today. So yes, I think it is going pretty well.

Are there things that you think need to be improved?

Not from Company A side, No. On certain things with looking after the assets themselves yes, there is always room for improvement. The systems I think we are learning as time goes

on and it is not going badly. I think with the managing the assets there is always room for improvement and housekeeping to look after the equipment and so on.

Are you aware of an Annual Asset Management Audit that is taking place in the mine?

Yes. I am not really involved with that so much though. I haven't been up until now. Yes, I do know about it.

Are you aware of the organisation's Asset Management strategy?

I think I probably do. I would have to speak to you about it but I have a pretty good idea of what they are doing.

Okay. Does the strategy or objectives translated down into the Asset Management plans or activities that needs to be carried in that particular year?

Yes, I think so. There are regular meetings and that, where they do discuss it and do implement them and that. So yes they do.

How do you track them?

How do we track them? Well they have job cards and things as well where we have… on the assets you have inspections and so on and to make sure the assets themselves are managed correctly… and also from the stores if that is what you are talking about as well. On the stores with the assets and that too we also have everything computerised and on the system. We make sure we know exactly where it is, nothing goes missing and you don't run out of stock as well. So there are systems like that in place.

Okay. Do you believe employees are aware of the benefits that the coal washing plant can gain from Asset Management?

I don't know. Not all of them, I don't think so. A lot of them just do their jobs and don't worry any further. Some do and they try to… we have a lot of meetings and in the morning we have a meeting as well on KPIs and that and then they often have people speak and try to explain to the guys. In our mass meetings as well we do every week explain it and discuss it and that and try to get the guys to understand. I don't think everybody does and I don't think everybody worries. At the end of the day they worry about their jobs and the work they are doing. We have very good guys here. Just about everybody works very well, but I don't think they all worry really you know.

Okay. Are there challenges noticed on the present Asset Management system?

Yes, there are. Stores… with the stores, equipment gets taken without getting booked out. They are busy working on that all the time. Stock levels are always a problem as well so that is also getting worked on. That is about it.

Okay. On a scale of 1 to 5 where 1 is firefighting and 5 is excellence in terms of the Asset Management Maturity within this organisation where would you rank this plant?

I'd say about 3. Average.

Okay. What would it take for it to get to the next level or do you think there is a need for it to improve?

I think training. I think there is a need to improve training, not of management necessarily and of Company A, but training of the general personnel so they understand the importance of it. I think there is room for that. That would help a lot.

Okay. My last question would be, … are there any strategic recommendations you would like to suggest towards Asset Management for this plant?

I think more training of the people on the ground level for them to understand it better. They are the guys who work with it. They are the ones who use the equipment correctly or incorrectly. If things are wasted and go missing and damaged due to poor housekeeping and waste, you know throwing it away and things. That is the guys working with it. Management controls it. The guys on the ground with that connection will make the difference so I think they need to be trained.
Okay. That is about it. Thank you so much.

Interview 7:
Participant 7: 2016.02.03_13 20_01

I would like you to state your position and ranking in the organization: are you Senior Management, Middle Management, Lower Management, Engineering Maintenance or Production?
Engineering Maintenance

Number of years in the organization?
In this organization is 7 years.

What is your highest qualification obtained: School Certificate, Diploma or Degree?
I have the N4F

What do you understand about Asset Management?
Asset Management is about the equipment, plant and the people that are working there. It is a total concern, the thing together – Asset Management. It is not just specifically about one thing. Am I correct or not?

There is no right or wrong answer.
I would say that is Asset Management in total – that is what I would take it for.

Alright. Do you think it is a good idea to have an Asset Management system in mining?
Definitely, you must have Asset Management, how do you control things and put things in place if you don't have Asset Management?

So your reason for that is.
It is a good thing.

It is a good thing because?
It allows you to put certain things in places.

Elaborate a bit.
Well it is the control of it, Asset Management is also 'what is the condition of everything, the condition of the work place, the condition of the people'. To me Asset Management is the control of that.

So it is important to have Asset Management in place?
Yes.

Okay, in your opinion what is the importance of you having to understand Asset Management in this organisation?
What is important for me?

Why is it important for you to understand Asset Management?
To understand Asset Management for me is to know what you have on the mine, to understand what you have and also to control and quality of things. So it is all to do with Asset Management.

When was the plant commissioned?
Oooh shooo. March 2009.
And when was Asset Management put in place?
I think Asset Management started when Company B started here.

When was that?
I can't remember dates but …

But was it when the plant was commissioned, or a year or two after?
About two years after. Because when I started here everything was still lying around. It was basically the commissioning of the plant and the conveyor and things when I started here.

Okay. Do you know the reason why it was not started with the plant?
It is a difficult thing to answer because there was a lot of contracts here, and you didn't know really who was responsible for them, but at a later stage they made people more aware who is responsible for what. And what they are to do. And when Asset Management came in, was when they drew up a proper Asset Management to say you have so many of this and this and this is how you can control it.

Okay. Alright, are you aware of any computerised Asset Management system within this plant?
I think with Company B there is. Ja.

To what extent does Senior Management support this system?
Fully. We support it fully. I am very serious about Asset Management because it tells you what is happening.

Does the plant have a clear strategy and vision for Asset Management?
Yes, we do.

Please elaborate.
There was never a structure in place, now we are more structured. It makes it more visible what is going on. You can go and pull from the Asset Management and always go back in

your history to see what you have, what are you short, especially when it comes to counting everything on site.

Okay. Do you think Asset Management has any significance at all towards the Company competitive strategy?
It does, and my reason for that is if you don't have a strategy in the Company you can just say I have got nothing, I haven't got planning, nothing – you must have a strategy especially with Asset Management

Okay. Can you differentiate between the Technical Meeting and the Steercom Meeting? Are you aware of the Steercom Meeting?
Ja, I am aware of it, but I am not really involved with it. The Technical Meetings, yes, sometimes I am involved with that, we discuss all the technical problems and thing we have and see how we can solve them. But the Steering Committee I am never involved with.

What do you think is being discussed at the Steercom Meeting?
I think it generalises the problems we have at the plant – all the general stuff gets discussed and also the targets that have been set for us, and the Steering Committee sets the target and why couldn't we make this target, and we also tell them the problems and things we have with the Steercom problem; there are sometimes certain decisions that they have to make and it is like the Steercom Meeting is like a committee, because these guys you can talk to and say 'we have to build another thing, say a water plant and then there is a big decision and then at the Steercom Meeting the committee will make that decision and say is there costs available or not

Great. What can you say with regard to stakeholders' involvement in these meetings?
It is very good thing to have the stakeholders involved with the decisions made; it makes it easier. For us to make a separate meeting without the shareholder – when the shareholder is involved it makes the things easier for myself, the representatives from Client A and B are the two persons that understand the process, they are very open minded and they are very clear what they want from us. So I believe in the involvement of the shareholders, I really like it.

Have you been taught any skills in relation to Asset Management?
I never really fully understand asset management, because we always used to place orders and get things but for the last few years this Asset Management is quite a serious thing because if something that tells you what is going on, the values that you have on site and you can also go back into the history of Asset management.

Okay. Are your skills in Asset Management regularly evaluated and updated?
Not always. It is something you have to do on your own because I am running the Engineering Department and the Asset Management on the mechanical side is the only thing I am interested in at the moment. But the last year I am more open minded to the Asset Management process, the Engineering and the outside sections.

Okay, do you think it is important to include Asset Management courses in your training matrix?
It is.

Why?
Because there is always place for improvement in each person and there is always something that you can learn that you don't know. So training is important, it makes you more understandable and also makes it more clear what Asset Management is about. Because sometimes you can be in doubt – and I am honest if I say sometimes I am also in doubt about Asset Management, because you don't always understand everything.

Alright, how would you describe the current state of Asset Management in the plant?
I think it is quite good to be honest – Asset Management is quite good. I think it is structured and we also receive a lot of help from Company B; Company B also support us a lot through this Asset management thing. And it helps.

Okay. Are you aware of an Asset Management audit taking place in the plant? If any?
Yes, but I am not sure when; I know it took place but I can't remember when. Because we are not involved in that audit. Normally HOD, the Engineering Manager, all the big guys – ja.

Do you think it would be important for you guys to be involved?
I think so. It is important because with any audit, it is not there to give you a hiding but to give you action; an audit is there to tell you what is wrong and how you can fix it and put things in place. That is how I see an audit.

Okay. Do you think the actions or findings from the audits are in line with the organisation's objectives?
I believe so, because it is well trained people, they know what to do.
Okay, so you say the organisational objectives are being rolled out
Yes, it does.

Do you believe that employees are aware of the benefits that the coal washing plant can gain from Asset Management?
I think so, I believe so.

You think they are aware. Why?
Because we get taught that. Normally when we talk Asset Management we discuss everything with the guys. From spares, work hours, everything – everything involved in Asset Management we do discuss.

So they are aware of what Asset Management can bring to them.
Yes.

Okay. Are there any challenges noticed on the present Asset Management system?
There is, there is a lot of challenges in Asset Management.

Please tell me
It is difficult sometimes you know, to control Asset Management, especially with the stores, it is going to stores – you know somebody will take a thing and nobody will be notified of that, you understand. And the next day when we do an audit in Asset Management, say you are counting or something and you see there is a problem and then sometimes you find that it hasn't been reported. So for me there is a problem sometimes.

And the job cards systems?
Job card systems is an excellent paper work, also sometimes it is a paper exercise, because what is really bothering me about Asset Management is that the guy will work on one job card and he will draw things out of the store, but he will use the same job card to draw something else on the same job. Do you understand? Where I say it must be a different job card for something else that you draw out of the store. Because sometimes they write it by hand on the papers and that makes it difficult for us. That is why I say it makes it difficult. I believe if you have to draw 20 bolts and nuts for a pump you have a job card specific for what you are going to use. If you want gland packing and gaskets, it must be a separate job card – that is how I see it. On the asset management side, if I just have an Asset Management card that says 20 bolts and nuts, and the guy writes that it on, I don't believe they always put that writing on to the record. And when the order takes place from the Asset Management, how do you explain it because that paper can get lost, where a job card is printed on to the screen and you can always take your job card and go back to the history. And look at what has been drawn. But if a guy takes something else out of the store and they write on that paper, that paper can get lost and who controls it then? That is the problem I have with the stores.

Okay. Any other?
Ja, I have had another thing with this. The Asset Management, the problem I have in the stores is Asset Management, if you are counting and you have a total valve, a complete valve. The guys in the stores will go to the store and they will say they need a valve to draw now, but they only need the actuator. Then they will go and strip off the actuator in the store, and leave the valve behind. Do you understand? On the Asset Management it shows you have a complete valve drawn out of the store but not in the field! If you go to the field you will find half a valve lying in the store - that was supposed to be booked out. And that is why I say it is small things that happen that we really have to look at. If you draw up something for an Asset Management out of the store, and you draw the whole thing out, you must make sure you take the whole thing. And that is what the guys do, and this Asset Management is very difficult sometimes because the guy in the store must make sure that the guy who is taking something out of the store takes the right stuff, the right amount, and when is he taking it – that must be in one job card. The second job card that he does in that job, must be a separate one. If he wants something else, he must go and make out a new job card. And the guys don't always do that. They don't do that, and that is where we sometimes lose some assets. Do you understand what I am saying?

I do.
And it makes it difficult for the stores people and for us to understand if there is an audit and they say but there are 20 cans missing here, but nobody knows where they are, and all of a sudden we have to fix it. And to fix it and place it at the right jobs makes it difficult for us. Because I don't believe in "telling a lie" – sorry for my words but that is the truth.

Okay.
Are you happy? Finished with me? Thank you

Just one last question: on a scale of 1 to 5, where 1 is fire-fighting and 5 is excellence, where would you put this plant, in terms of Asset Management Maturity?
Between 3 and 4.

Why would you say that?
Because it goes good, but we also sometimes do fire-fighting, where we don't have all the resources to do what we really need to do. We sometimes plan a job, with the people you have got and while that job is taking place there is a breakdown, and then you have to stop that job, go to the breakdown and then come back and do a rush job – and that is sometimes killing us – sometimes it is the resources that we have that is killing us.

What about the resources?
Resources is to say we don't always have enough people

Okay
Because the agreement was that we will hire in people – can I say this?

Ja, you can.
The agreement was that we will hire in people but this is on the Thursday maintenance, you understand? What happened on the Tuesday, Monday, Wednesday is when we got big instructions on jobs coming up on breakdowns. So sometimes it is difficult yes, and that is why I put the plant between 3 and 4. Sometimes it is fire-fighting, sometimes it is going very well.

Okay. One last one. What would be your strategic recommendations that you may suggest towards Asset Management for this Coal Washing Plant?
I can be honest and open, it is not only just regarding the Asset Management, it is in total: if you have spares, you can fix anything in any plant. If you don't have spares you cannot fix things, the plant will stand. And the follow up on the Asset Management is the store; they go and make five limit and the minimum store 2, but they never take in to account delivery times, and that makes it very long and that is why you sometimes stand without spares and stuff. So I personally think if you want to make this plant an excellent plant, the first thing is to start with spares, the second thing is to start looking at our people, and the third thing is to make sure that the people that we have can do the job properly, and the fourth thing I will do is a time study on the guys – how long do they take to do a job. And see what type of feedback you have.

Alright.
Because you will look at a boiler maker assigned to a job and give him a small job and it takes him three hours. You have got a foreman helping out on another job of the same problem and it takes him a half hour. And then I ask myself questions – why. That is all for me. Thanks.

Thank you so much. I really appreciate it.

Interview 8:
Participant 8: 2016.02.03_14.36_01

I would like to know your position in terms of ranking in the organisation. Are you in Senior Management, Middle Management, Lower Management? I am Senior Management.

Number of years within the organisation?

It is twenty-one years but I have basically occupied different positions at different venues. All in all, it is twenty-one years.

Okay. Highest qualification you have obtained – High School, Certificate, Diploma, Degree?

Diploma.

The first question is, what do you understand by Asset Management?

My understanding of Asset Management, it is basically I will say… how can I put it… you know the…

In layman's terms?

Asset Management – it is basically a process beyond maintenance. I mean back in the days we used to talk Preventative Maintenance but with Asset Management we basically look at other things outside just Preventative Maintenance. You look at the life of your asset. You look at the life that you should expect out of your asset. When you do your planning, your budgeting you basically do it around that asset. So you… what we are basically doing is you want to get maximum life out of the asset and you want to make sure that your asset, when you need it, it is available and it is also reliable. Asset Management… I think Asset Management nowadays in this type of business is something very important. You need it in order to be able to survive and make sure you are going to get a return on investment from your asset.

Do you think it is a good idea to have an Asset Management system in the coal washing plant?

Definitely. Definitely. Like I said, it actually helps you in a lot of ways. Like I said, reliability is very important. Availability is very important. Costs, very important. If you are not looking at those things you are not going to survive in this business. It is actually one of the most critical elements in running business nowadays.

In your opinion what is the importance of you understanding Asset Management in this organisation?

I think the importance is for you to be able to get value out of this process you need to understand it fully. To say it is Asset Management – what goes into Asset Management; what are the other elements to Asset Management which will make Asset Management work. It is very important that you fully understand what the other things are. There are other things which are needed which need to be in place for Asset Management to basically succeed.

Okay. Do you know when this plant was commissioned?

I am talking under correction; this plant is six years old. So six years old, I think it was commissioned around 2009 about.

All right. Do you know when Asset Management was implemented?

Asset Management… I am talking under correction again; I think it should be about three years ago. I think it basically starts when first Engineering Manager joined the site. I think it was round about 2011.

Okay. Do you know what could have been the reasons why it was not started or implemented when the plant was commissioned and in your opinion do you think it was a good idea to have Asset Management implemented two years after the plant was commissioned or was it supposed to be part and parcel during the design of this plant?

Look there could have been various reasons why it was introduced later. I think one of the reasons is the first couple of years you are basically still ramping up. This Plant is a very complex plant and during the commissioning phase and all that you would rather have… you know… you are still trying to find your feet, your structures as well within the Company itself. You are still basically trialling a lot of things so I think that was the reason why. I am also not sure when exactly asset management was introduced or sold to the site team.

I think it was two years after it was commissioned.

So it could be the reason why it also started then.

In your opinion would you say you rather have it implemented before or it was okay the way it was implemented?

Well… look it would have been nice for Asset Management to have been introduced from the word go but I think it would be very careless of me to say this site lost an opportunity because I was not around during that time. You know one doesn't know what were the conditions like. I mean this plant has actually been maintained and managed by contractors. It is not the Client A & B employees running it which also brings challenges in how to run the plant. So I think in an ideal world it would have been nice to have started from the very first day. Everything is still new. You know that you have complete life out of this asset and if you start from there you have full history, full information of the asset. Even now I don't think it is actually late at all.

Are you aware of any computerised or manual Asset Management system implemented within this organisation?

The systems that we have… yes we've got the Company B team. We have got an Asset Care Engineer looking after our assets and making sure that we have Asset Management systems carrying on here. They are using a system called On Key I think they moved from On-Key 4 to On-Key 5 now.

Okay. To what extent do you think Senior Management support and commit to this programme?

I think there is full support. There is full support from Senior Management as far as Asset Management is concerned because we know in terms of financial value it is very important to have it running and definitely it is our supportive backing. Hence the reason why we are sold into it.

Would you say the same thing with the contractors that are maintaining and managing the plant?

Well there is… I think there is an opportunity there. The reason I am saying there is an opportunity, I think it is either they don't fully understand what Asset Management is or it was not sold to them correctly or it is not… there is no benefit for them ensuring that Asset Management is basically implemented and running properly. Hence I am saying I think there is an opportunity. Everything that Asset Management requires I don't think it is running fully-fledged at this point in time.

Are you aware of or does this coal washing plant have a clear strategy and vision of asset management activities?

There is yes. There is.

Please elaborate?

There is a clear strategy as far as Asset Management is concerned, what we are going to achieve, what we expect. As I said the biggest thing is you want to make sure cost-wise you basically get the benefit out of the asset and things which need to be done as far as different assets are concerned is clearly stated. I mean your works orders are clear on what assets we've got and what maintenance needs to be done and at what intervals and all that.

From the organisational objectives do you think that cascades all the way down to the actions that need to be carried on a day to day basis in order to meet the organisational objectives?

You know this basically ties in now with the comment that I made earlier to say the whole Asset Management process, the value adds thereof, it might be understood by your senior Management and maybe your Middle Management. I don't think it has been sold very well at the other lower levels. I don't think that the guys understand it very well. Judging from that I don't think that everything is actually understood well all the way down. So I don't think it is basically flowing the way it is supposed to.

Do you think Asset Management has any significant role towards Company competitive strategy?

It does.

Why?

You know everything revolves around money. If it costs less for me to beneficiate coal it will basically attract a lot of people to come and do business with me. If the rand per tonne fed through the plant is lower than the other plants obviously no people would want to do business with you. It is very, very important. That is exactly the whole idea about Asset Management. To make sure you run your equipment optimally and your costs basically goes down and if you achieve that it is going to be very easy for you to keep the Clients that you have and to even attract other Clients.

Can you differentiate between Asset Management Technical Meetings or Committee Meetings and Asset Management Steering Committee Meetings?

I am not aware of Asset Management Steering Committees. I know the Asset Management Technical Committee Meeting. The idea behind the Technical Committee is a team of people that basically have experience from various businesses and which basically provides assistance and help in areas where we might have challenges and to basically share best practices and to also look at the performance of this plant. You know basically compare it to the other plants in order for us to basically constantly improve on our current performance.

Just a question on the Steering Committee – where does management meet and strategise with regards to Asset Management? Do they have a platform where the leaders in Asset Management within the organisation sit and strategise and say this is the level of Maturity that we want to achieve and these are the objectives and these are the actions that we need to do? Is there a platform like that?

For this site it is a bit different because remember this site is a composition of Client A and Client B. Basically the structure that we follow as far as Asset Management is concerned is more coming from Client A. From Client A, we've got… I will say we've got custodians or coordinators as far as Asset Management is concerned. Centrally we have a person that will basically advise and say this is basically the way we will basically be dealing with our asset management. So I think that is basically where the caucusing, the strategies, and the discussion basically takes place. Then as soon as they are done with that they will come and have a discussion with us and say this is basically a new way on how we are going to do this. Unlike the other Client A mines. There will be discussions with their Reliability Engineers to say in terms of strategy this is how we are basically going to deal with this and this. We don't have that kind of representation unfortunately at this site.

What can you say with regards to stakeholder involvement on these meetings?

I'll talk on the Technical Committee meetings. Their involvement is actually very good. I mean there is a lot of support. You can call on them any time if you need any assistance. I think they are very, very involved in what is happening.

All right. Have you been taught any skills in relation to Asset Management in the past twelve months?

I think as far as Asset Management is concerned I… what I know about Asset Management is basically through presentations, through discussions. I haven't attended a fully-fledged formal training where I get taken through Asset Management. Like I say it is basically through discussions with various people and reading some of the information from the different systems we can get hold of.

I think you are answering my next question which is, how do you update your skills with regards to Asset Management?

It is basically through reading. Getting information from different resources.

Do you think it is important to include Asset Management courses in your training matrix, or do you have a training matrix?

You mean my personal one?

Yes.

I think it is very important. It is very important. It is one of the things that I would like to achieve this year. Basically just go and start right at the beginning with the basics and say, asset management where does it come from and all that. I might be understanding certain things but I don't know the full idea behind how it actually came about. Having been around in the industry for long I can help myself to a certain degree but I think formal training would actually add a lot.

Okay. How would you describe the current state of Asset Management in this coal washing plant?

In terms of percentages?

The way things are, how you are running it?

I will say using terminologies that are widely used within the safety… I think we are compliant if you understand what I am saying. We do things to comply. We are not really proactive. We are basically falling a bit behind with what needs to be done as far as Asset Management is concerned. We haven't now caught up and I don't think we are where the other operations of this nature are. I don't think we are there.

Okay. What would be the contributing factors?

The contributing factors is the people that are supposed to make a difference, they are not on board yet. They are not where they are supposed to be in terms of this.

In terms of… maybe not mentioning names but in terms of the position for example who are those that are supposed to be involved?

I would say from GES level… superintendent level and going lower to a foreman level. The whole concept of Asset Management is not well understood. It is not well understood. I think a lot of people still think of Preventative Maintenance when they think Asset Management. Even though there might be some similarities Asset Management is definitely not Preventative Maintenance. It is at a very, very advanced stage.

Do you think the guys get training with regards to Asset Management, like you are saying they don't understand Asset Management? Are they receiving adequate… is Top Management or Senior Management giving training to these guys or are they saying they don't understand simply because management is not taking part in making sure that these guys are skilled?

I think the challenge might be the…

[Interruption – respondent takes a phone call]

I was asking with regards to these guys getting training. Is it because they don't understand Asset Management, is it that they don't receive adequate training or they receive training but they don't understand what Asset Management is?

I am talking under correction here. I came to the site and the Asset Management was basically in place. I am not sure if they received formal training. All I know is some of the

information that they have is through discussions with them to say this is what should be happening and this is what needs to happen. I don't know for a fact whether they received training or not. My observation is if they received training we need to maybe go back and either do some extensive coaching to understand whether they understood the message that was being put across.

Okay. Are you aware of the Annual Asset Management audits taking place on this site?

Yes, I am aware. I am aware. Unfortunately, with some of the commitments that we have, even though we… you know it affects sometimes things that happens that you haven't planned. The one that took place late last year I briefly sat in that one. I know for a fact they do have them.

The actions generated from those findings do they tie up with the organisational objective?

They do. They do.

Do you believe employees are aware of the benefits that the coal washing plant can benefit from Asset Management?

I don't think so. I don't think so because if they understood that I think the level of effort and excitement would have been different. I don't see that. I don't see that right now. I don't think they understand how they benefit at all and I don't even think they even understand there is a benefit for them as well. If you implement this and you implement it right and everyone brings their effort there is actually… it is a win-win situation for everyone at this site, you as an employee having to do… being involved at this site.

What are the challenges noticed on the present Asset Management system?

I think the biggest challenge that we have right now is we don't… I don't think we are actually managing our assets correctly. The reason I am saying that is you… you need to know that these are the assets I have and you should be able to go back in your history and say this is the asset, this is basically everything that this asset has basically experienced (I am talking repairs). You should be able to go back in history and get that information for you to be able to do proper management and budgeting and all of that. We are in the process of trying to serialise some of the assets so that when I say asset X I know exactly which asset I am referring to. We haven't concluded that. We haven't done that. So if you haven't done that it basically makes it very difficult to do Asset Management.

Okay. Any other challenges?

I think the other challenge, like I mentioned earlier, is the manner in which the contractor has been "managed" by Company A. I mean Company A is doing maintenance and they are running the process, they are running the plant for us. There is nothing in the contract the way I understand which basically talks to Asset Management. There is incentive for Company A as far as Asset Management is concerned. It is not within their business, for a lack of a better word, to really drive Asset Management hard. They are here for two reasons – to basically operate and make sure that the plant is available to be operated. They don't… they are not really focusing on Asset Management at all.

Will that be from the lower guys on the floor?

There I will say Company A as a whole.

Okay.

I will say Company A as a whole. Even though the Company A senior and top management might understand Asset Management and all that I don't think there is any driving from their side. It is not there. Each and every asset here at this site belongs to Client A and B, it has been bought by these Clients. So they (Company A) don't really lose much whether that asset doesn't reach its life or whatever, they don't lose much. It is in the interest of these Clients themselves to try and drive this but if you don't have the right commitment from the people that can make a difference it is quite difficult. I believe that you need to have buy-in from the people that has to implement, carry out, work or whatever. If you don't get the buy-in from them, it is always very difficult to achieve what you want to achieve. I don't think that we have that buy-in from Company A. I don't think we have that buy-in yet.

In your opinion where would you rate Asset Management Maturity in this organisation if 1 is firefighting and 5 is excellence?

I will give it a 2.

Why?

I will give it a 2 purely because of… the plant is basically operating and it is being able to deliver on results and with the help of some of the systems that we have in place there is a small fraction of Asset Management happening here. Even though it might not be understood very well there is a small element of it happening here. I wouldn't give it any other rating because anything above a 2 means you are stable and we are not. We are still battling with a lot of things. If you analyse some of the downtimes that we experienced in a couple of months or two years you will find that we have been caught by the same assets failing before they are supposed to fail. It basically tells you that the management of assets is actually not where it is supposed to be.

Where would you like it to be?

I would like to be… using the very same scale that you used now I would like us to be… obviously I would like us to be 5, but by now my expectations is for this site to be between 3 and 4. It is a big plant and all that but the assets that we have… even though we have a lot of whatever we are dealing with… we've got three reclaimers, we have four stackers. I mean those machines are identical. Before you understand how to manage one you already know how to manage the four stackers. You know how to manage one reclaimer you know how to manage all three reclaimers. Like I say there is a duplication. We should be sitting comfortably above 3 by now.

Okay. My last question will be; are there any strategic recommendations you may suggest towards Asset Management for this coal washing plant?

I think the… well first thing… the strategy needs to be updated… whatever strategy we need to come up with honestly we are still busy fighting fires and one hasn't really sat down and thought of what needs to be done. I think the strategy should basically look at, number one, we need to look at the gaps. Is Asset Management understood well in all different levels? Do

we understand the values of Asset Management in various levels? Do we understand that Asset Management now is part of doing business? It is not one of those things that are nice to have. It is not nice to have it is how we should be doing business if we are going to stay in this business and stay competitive and be the preferred washing plant for the two mines. As soon as we've basically addressed that, we need to look at what are the gaps? Where are we and where should we be by now in comparison with everybody else that Asset Management was introduced at the same time. Training and the other thing is to have the right… I think we need the right tools to make sure that the people who need it make sure that everything as far as Asset Management is concerned happens. We need to… we are not… I have realised there are some challenges. When people look at your Asset Care Engineer and the questions that he will be asking and the information that he will be looking at and everything else that the Asset Care Engineer is about, people basically see him as not one of us. They see him as that threat sitting there waiting to expose us. That is not the case. That person is there to make life easier for them if they utilise him the way they are supposed to. We don't utilise our Asset Care Engineer the way we are supposed to. We don't. It is unfortunately one of those things that I think we made a mistake when we set up, when we basically set up how this plant would be managed and maintained and all that. I think we made a mistake. The mistake that we made… and if I can correct that, that is one thing I would correct. The Asset Care Engineer should have been a person employed directly by both Clients A & B. That will basically give him the full rights that he deserves and the full powers that he deserves. Your Asset Care Engineer is the person that is able to see things looking at the trends, looking at the history, looking at everything. He will be able to do some analysis and tell you that you know what there and there and there we have problems so let's zoom into those problems and look at the things we can do. Right now the arrangement is Company A who is a contractor to Client A&B contracted the Asset Care Engineer through Company B to come and do this and so you basically have the people that are not really enthusiastic about Asset Management to manage the most critical person as far as Asset Management is concerned. You can understand it is very difficult to yield any good results from that.

Okay. I think that is about it. Thank you so much.

Interview 9:
Participant 9: 2016.02.04_13.39_01

I would like for you to state your position. Are you in Senior Management, Middle Management, Lower Management?

Middle Management.

Number of years within the organisation?

Currently at this site or this mine starting my fourth year.

Okay, total experience?

Total experience in the industry in mining and in engineering it is about thirty years.

Okay. Highest qualification you have obtained – High School, Certificate, Diploma, Degree?

High School Standard 8. I am still busy with my Diploma N6 Engineering. Also with my Diploma as I said I am busy studying with that still. I am busy with the second year on the Diploma.

Alright, what do you understand by Asset Management?

Asset Management is basically knowledge or at least the basic concept of what is at hand, what is in use, and how it is affecting what I am doing in that process where I am working.

Okay. Do you think it is a good idea to have Asset Management systems within the coal washing plant?

It is vitally important that there is such a thing as Asset Management because if you don't have at least a working knowledge of what you've got you can't move forward and you can't do any planning.

In your opinion what is the importance of you having to understand Asset Management within the organisation?

If I don't know what is going on how can I lead or how can I at least attempt my planning or the contribution that I need to make to get the level or to the level the Client expects of me?

Do you know when this plant was commissioned?

Apparently seven years ago.

Do you know when Asset Management was brought in?

I unfortunately don't know. Apparently for the first year or two my group as a Company didn't have or employ Asset Management systems in. Later on they went over to a Company and they got the people here and to help us maintain and install this Asset Management system we are currently working with.

Do you know what could have been the reason why it took those two years?

I think they were still busy with the start-up and with the guys trying to get this plant commissioned and running and getting it to a level where it is acceptable to the Client and also to them as well to know which way they are going to go for the future.

Okay. Would you say it was important maybe, according to your opinion, to have asset management implemented in the beginning or before commissioning?

I think that should have been in place alongside erecting this industry/this mine. That should have been part and parcel of how they erect and how they would have managed. To come afterwards and try to integrate your Asset Management system to what is already there that is a hell of a backlog so you don't know where they are coming from and where they are going to. You've got to establish that and you've got to get that into place. So yes I think time was lost and I don't think it was quite that seeing ahead in the future. Maybe a mistake on both the Client and the Company I am working for, for that period of time. I think it was a major mistake.

Are you aware of any computerised or Manual Asset Management system implemented within this organisation?

Yes, I am aware of two systems which I am working with. I won't call them by name but the one is the system where I currently do our planning department, and then there is a contractor also working for me working on the pumps which also has another system. It is very similar to ours and also similar to the SAP and Exactor and all the other systems around we've got currently going in the industry.

To what extent do you think Senior Management support or commit to these programmes?

Currently in our situation here there are still people grasping with the idea of what needs to be where, when and how it is. I don't think Top Management fully understands the quality that needs to be clarified and people need to be trained on and in. Currently we are still … as I said we are using the system now for five years running, we should have been sorted out by now, but we aren't close to that yet because basic limits/levels of items are not even in place yet and it is not yet… so no I don't think it is fully supported by management or understood by management because it is coming down towards us and it is still effecting us where we are sitting without any spares. That should have been cleared a long time ago. If you look at your big mining houses like Anglo, Exira, Xstrata, Impala and all those mines they've already got an established system like SAP for instance. Which is highly dedicated – you have your minimum/maximum levels and it fills in already when you draw out the last one or to the bare minimum level it already tops it up. Here we are still battling to grasp that concept.

Does coal washing plant have a clear strategy and vision towards Asset Management activities?

They've got the vision and they've got the strategy. It is a little bit time consuming currently to get these things in place because as I say these guys are working from a newly printed page. I think once it is in place it will run smoothly because it is basically the basic concept of your bigger programmes, like I said SAP for instance. So once it is implemented I think it is smooth sailing going forward but until then we are going to battle to reach targets or the required targets and the performances needed for this specific plant.

Do you think Asset Management has any significant role towards the Company competitive strategy?

Oh absolutely, absolutely. If you don't have that strategy or at least your vision and strategy combined to implement and have it running smoothly, because the biggest killer in any business is direct purchases and keeping to much stock on hand as well. So you've got to know what the balance is. If you don't know the basic concept and you don't get it into place you can run into big trouble with finances.

Are you aware of Asset Management Technical Meetings that are taking place?

I am aware of them but I am not part of them unfortunately.

Okay and the Steercom Meetings?

I am not part of those either.

Would you say there is no need for you to be part of the Technical Meeting or do you think you should be attending?

Yes, and no. Partly yes because ground floor level can give an indication as well but I think Top Management have already got the feedback they need to represent us as a Company so in that respect I am not needed there.

What can you say with regards to the stakeholder involvement in these meetings?

The stakeholder should actually… now this is a three-part answer actually if you want to come down to it. The stakeholder is looking to make the maximum profit with the bare minimum input and that is hampering or actually putting a lot of stress on ground floor level. If you look at the bigger Company's same size plant… I was looking at Mafube, there they have got four/five times the amount of resources/people and they've got just one module smaller than our module basically. You could say it is half a Filter Plant and one module. That is the size of the plant and they've got four times the resources we've got currently going trying to maintain this plant. In that respect the stakeholders are actually not worried about how the job gets done. It must get done at the least… I think this is the cheapest operation they've got. I don't think they see the broader picture, but I suppose there are other companies in the market who will do the same job with the same people or less so to that competitiveness, but I still think it is an issue. We are stretching the limits where it shouldn't be stretched.

Have you been taught any skills in relation to Asset Management?

Yes, I have been on some courses, a couple of courses actually. Also now with my Diploma I have been on courses on Asset Management and logistics and statistics and strategies. I have been on courses.

Are your skills in Asset Management regularly evaluated and updated?

Not at all here at this mine no.

How do you update your skills in Asset Management?

Well I have been working with the system I've got and I am only allowed, in my position, to work with certain levels… at a certain level. So I am not going to go beyond that because I am not allowed to go beyond that. There are certain levels where you can go to and that is it so you don't see the bigger picture. At least I have been working with the system we've got here currently at another plant where we fully utilised it and I was in a higher position. That is why my background of the Company B system, as we've got here, I have been educated much better than the rest of the guys here. At a Top Management level, I know how to delegate and how to work with the computer? on key five systems.

Do you think it is important to include Asset Management courses in your training matrix?

Absolutely. That only gives you the broader spectrum and the broader picture of what is required. Targets required and needed to go towards. That is a vital part of any industry. If you don't know where you are going you can't plan forward and you don't know where you are currently you will never reach your targets.

How would you describe the current state of Asset Management in this coal washing plant?

Currently as I say it has got teething problems that has to be sorted out. I would say we are about 40 per cent there.

What are the things that need to be improved or what are the contributing factors?

This system that we've got is supposed to be a paperless exercise but it is not. People seem to not understand how the concept is working. Either you approve or you decline and that is it but it doesn't work that way. You still have to walk around with papers and getting papers signed. It is time consuming and unnecessary because whatever you order you motivate. Either decline… yes or no. If you say yes it should be moving forward but this is not a paperless exercise. It is still a paper exercise very much so in that extent.

Are you aware of any Annual Asset Management Audits taking place in this plant?

Yes, I am aware of the annual audits that are being done. We have been part of it as well. I am aware of it.

What happens to the actions or the findings that are suggested?

Mostly they are communicated and rectified but some places not all information is relevant to all departments. So whoever is going to sort out what those people get to be informed and rectify whatever is problematic in that area.

Do you believe employees are aware of the benefits that the coal washing plant can gain from Asset Management?

I don't think they are fully aware of what advantages it has for us because if they knew they would have used it or utilised it much better. Contributing and shortening as well. Streamlining it and getting it into a better shape. People are still not understanding what comes before or after so they are still struggling with the idea and concept.

Are there any challenges noticed on the current Asset Management system?

There are major problems but as I say there is a teething project still running. The MRP System has already picked up that is a concurrent programme that is supposed to tell you how much stock you have got and how much you have to fill on and replenish, but that is as they picked up there are a bit of problems/hiccups there so it needs to be sorted out.

And another one?

As I said it is not paperless where it should be. Also the restrictions on ordering of some spares… yes I understand there are clear limits of each level of how to buy things if… say for instance my position is R50000 and the next level is R60000, but that is sometimes ridiculous because now you can order R60000 worth of things and the next thing you have to order R200000 worth of things. So there are no clear descriptive lines of who is doing what and when and how. So the guys are not differentiating yet who has got to do what and how it is going to be done by who.

You have mentioned earlier on that if you do not know where you are you will not know where you are going. In this case in terms of Asset Management Maturity on this mine according to your opinion where would you rate it between 1 and 5 where 1 is firefighting and 5 is excellent?

I would place it at a 2. As I said there are too many teething problems currently. There are too many gaps still open. The loops are not closed. I think a lot of training needs to get involved so that everybody gets a clearer understanding of what is needed to be done and by who and why and by when.

Are there any strategy recommendations you would like to suggest towards Asset Management in this coal washing plant?

Yes, training. The bottom line, it goes about training and information and sharing that information. As I said… I previously just said to you at one stage you are allowed to order R60000, you are not allowed to order more than that or buy more than that and the next day you might be told to order for R200000. So projects you? are not supposed to be doing… things like that. It is supposed to be clarified. I think people need to be told definitely and clearly what is the spectrum of their work and where they are fitting into the spectrum and what are their responsibilities towards this and how it should be handled. You can't one day say yes and another day say no. You have to understand, if you want to have strategy have a clear descriptive line to which we are aiming towards. Everybody understands, everybody goes in that direction. Other than that you are going to have a couple of stragglers next to you and you don't know which way they are going to go. They are going to hamper you reaching your targets and realities that you need to.

Okay. Maybe my last question would be, where do you think the organisation needs to be in terms of Maturity level?

Where we should be in terms of Maturity…

Between a 1 and a 5? You said you are a 2. Where do you think this organisation should be running at?

Optimal level I would say at about a 4. That is reachable. That is achievable and with the right recommendations and guiding the people and helping the people with the proper information and training. We should be able to reach that and maintain that at least.

Any other challenges why you wouldn't get to excellence?

As I said there is no clear cut picture towards what is allowed or not allowed and that is majorly a concern. A big concern regarding top management because they don't seem to understand that if you don't set an example or lead by example you are going to have people that are going to run around and not know what is going to happen. Unfortunately, that is going to keep you back.

Thank you so much for your time.

Interview 10:
Participant 10: 2016.02.04_15.07_01

I would like for you to state your position. Are you in Senior Management, Middle Management, Lower Management?

I am in Senior Management.

Number of years within the organisation?

I have been with Client B for thirty-three years. I have been at this site since June 2009, actually form May 2009 and so what is it now… I am going for my seventh year here.

Okay. Highest qualification you have obtained – High School, Certificate, Diploma, Degree?

Degree.

What do you understand by Asset Management?

Asset Management is the… basically taking care of your assets. You know in our business it is important to sweat the assets so you know for us to extract maximum value out of the assets we try and stretch it as much as possible and to be able to do that we have to have a very solid Asset Management programme in place to do the right maintenance at the right times that you can optimise the availability of your assets. I think it goes… obviously it is a much wider field. It is also about not overspending money. You can only spend the optimal amount of time and money to extract the most availability out of the assets. So it is always a delicate balance. You know, basically you need to reach that turning point where you invest enough time and money to give you the hours you require but not going overboard and spend another R10 million and only gaining a very small percentage. So that is my take on it.

All right. When was the plant commissioned?

In middle of 2009. So DMS 1 first went through in June 2009 and DMS 2 was October 2009.

When was Asset Management implemented in this organisation?

It was introduced at sort of a very basic level in 2010. In our structure the Engineering Manager function was mostly provided from the Client A side so we incorporated some of the Client A systems and structures until we went full board with Company B. So you know I think it was round about 2010. Was that before your time?

Yes.

I think it was around 2010 but we went through… you know the early days was very much commissioning, sorting out commissioning issues. We only really started to go into it in a more structured fashion when the first Engineering Manager came and that was… if I remember correctly that was mid-2011.

Okay.

But you can check with the Engineering Manager. You know we went through a huge improvement programme when the Engineering Manager was here. Before that the systems were very basic.

You mentioned that it was full throttle on Asset Management around 2011. Was there any reason why it was not implemented before or during when the plant was commissioned?

I think the reason was probably immaturity within the Company A Systems at that time because when we adjudicated the project, the Operation and Maintenance to Company A… or let me go one step back. When we decided to outsource the Operation and Maintenance of the site we went out on open tender. Company A were one of the companies that tendered and they gave us a presentation where they placed a lot of emphasis with their experience with Company B, who specialised in Asset Management. They even suggested that they were sort of awarded medals as being one of the best users or implementers of Company B AM system worldwide. They put that forward as a very strong motivator why we should employ Company A to do the Operation and Maintenance for this site. I think during commissioning it was very hectic and I think we were probably understaffed on the Maintenance Planning side and you know so over the years, especially when the Engineering Manager came, we identified it as a weakness and then we started to get the fulltime team in from Company B. Before that it was sort of done in-house within Company A, but I think they didn't really have the capacity on site to provide the service as we understood it initially. So they were lacking but then slowly it grew once we got the fulltime Company B team in.

Would you say Senior Management support and commit to the programme or the Asset Management systems in place?

Absolutely. The thing is from the site Board level there's a clear expectation for us to continue improving. I can just say that the whole site budget assumed that we'd get 567 running hours per month. We've never really achieved it. We got to it once in our entire history, but the Board says that is not good enough they want us to exceed 600. So we've still got a way to go.

Okay so there is a clear strategy and vision of Asset Management?

Yes, absolutely. Totally. From the Client A perspective, like I say, that function is being strongly supported from the Client A side and they've been doing audits on our system to make sure that we are on track.

Okay.

So their Reliability Engineers… I don't know if you've met one of the Principal Engineers, but he did an audit here about six/eight months ago and I think he will come and do it on an annual basis.

Are you involved in those audits?

No. He didn't personally talk to me. You know he obviously spends a day with the engineering guys and your planning guys.

All right. Do you think Asset Management has any significant role towards the Company competitive strategy?

Yes, absolutely. We… you know since we embarked on the Company B system and reliability engineering our availability has improved. If you go back for about eighteen months we could hardly get 500 running hours per month. Our first target was just to improve our systems and maintenance to achieve 500 hours per month and now the new target is 550 but like I say once we hit the 550 the target will shift up closer to 600.

Are the employees being taught skills in relation to Asset Management?

They are. They obviously must follow the procedures required to complete the job cards and do the required inspections.

Any external training?

You know they do get external training. We also make use of external consultants like Yellow Tech to do condition monitoring, but the guys have been sent on external training courses as well.

All right. Do you regularly evaluate and update the skills in Asset Management?

I personally, not. I think there is still tremendous scope for improvement. You know it is actually one of our focus areas from a customer point of view. It is one of the issues that we raised with Company A that we want to urgently upskill the artisans. We think that is where we can have a massive payback if we can improve the quality of work.

All right. How would you describe the current state of Asset Management in this mine?

I think we have quite a way to go. You know if we look at the condition of certain critical areas of the plant we have got a long distance to go. The Filter Plant is a case in point. I think there we are not even 50 per cent of where we want to be. So we've done quite a lot of major overhauls on some of the filters, but it is not being sustained. I would say in the Filter Plant we've got more than 50 per cent to go still. The rest of the plant is actually not too bad. I would say in certain areas we are probably between 70 per cent and 80 per cent from where we want to be.

You mentioned earlier on in line with what you just said now in regards to where you want to be, do you measure the Maturity of Asset Management?

I think we… you know we've got a series of KPIs. Engineering KPIs where we measure our availabilities versus targets. We obviously measure the maintenance cost. We measure the performance of pieces of equipment. So there is a series of daily reports that come out. There are weekly reports for instance where we measure the Filter Plant performance against set KPIs. We've also got the monthly reports and the monthly reports get presented to the OPCO Forum where we look at things like lead time between failure, lead time to repair, on call running hours. We also analyse the top ten downtime items and trends. Are we improving or are we slipping?

Does the organisation have objectives for the year and from the audits that are being carried out are they somehow in line with the organisational objectives?

Yes, absolutely. We get it from two levels. We get the expectations from our shareholders. They have an annual budget process so the directives we get from the shareholders are firstly, throughput requirements. We need to process that amount of coal in a year. Secondly, cost requirements. So we present our budgets to the site OPCO, the site Financial Committee, and finally the site Board. They place… I think this site is a strategic asset for both Client A and Client B so they've put a lot of pressure on us to step up our performance and throughput and costs and obviously Asset Management on a year on year basis. We also get subjected to regular audits. You know with the two shareholders we often feel we get audited too often. It is not necessarily always on our Asset Management process but it is often a key component where they will look at our system and also on the results, what are the outcomes, are we improving.

Okay. Do you believe that employees are aware of the benefits that the coal washing plant can gain from Asset Management?

I am convinced they are. You know it gets discussed at various forums on a regular basis. From the weekly mass meeting to other forums. Like I say I think we can actually gain a lot more if we can get each individual to do his daily task in a professional manner. You know if we go into the workplace there is often sloppy work and lack of pride which is a bit concerning. I think that is an area where we need to focus on the skills and the motivation of each individual to take us to the next level.

You were just mentioning some of the challenges that are there. What other challenges are being noticed with regards to… or that are present on Asset Management systems?

I think the biggest challenge for us still remains around the Filter Plant. Company A took over the two filter contracts from the beginning of 2015. Before that the OEMs operated and maintained the filters. It is basically the TH filters and the Lasta filters and there was a huge learning curve for us or for Company A to understand the Operation and the Maintenance requirements of those filters to its fullest extent. So the Filter Plant became a massive bottleneck for us in the middle of last year. You know we were losing 50 to 60 hours per month because the Filter Plant couldn't keep up with requirements. Since then from about October last year we started to get the availabilities to a level where the filters started to fade away, but unfortunately in December/January we've had some issues again. So we still have a way to go. I think with the rest of the plant and the rest of the equipment the guys are more accustomed to it. It is more part of the experience that we have. The South African coal industry typically didn't employ filters. We used to pump the thick and under flow into a slimes pump so you didn't have the filters to Operate and Maintain. So they are slightly different in approach than the rest of our operation. It needs a lot more detailed attention.

All right. How would you rate, on a scale of 1 to 5 where 1 is firefighting and 5 is excellent, the level of maturity of this plant?

I'd say for the Filter Plant we are sitting at 3. For the rest at 4.

Where would you want it to be?

At 5 absolutely.

Is it achievable?

It is definitely achievable. I think the facilities that we have here are world class. This is a world class plant. So if we do everything in an excellent way our performance… we are still 10 per cent to 15 per cent shy of where we need to be. There is still scope for improvement.

A second last question tapping into what you are saying, you say if we do things right, what are those challenges that are being faced within the organisation to be able to get from the level where we are currently at to the desired level?

I think the biggest challenge is with the skills of the individuals. Artisan and Operator skills and obviously motivation. You know we must provide the guys with required skill sets, with the right tools, and get the team totally motivated and then we'll get there.

All right. I promised that that was my second last so my last question, are there any strategic recommendations that you could suggest towards Asset Management at the Coal Washing Plant?

You know we have embarked on this lean process from the end of 2014 which is like a strategic way of analysing your bottlenecks and rating your problem areas in terms of a payback chart. It has been very successful for us because we were always aware of some of our problem areas, but with the lean process we sort of transferred that onto a Boston Matrix and from there we identified the most critical areas that we need to address and we sort of placed it on a ninety-day plan with responsibilities, keeping the foreman responsible to deliver on certain outcomes. We've had great success with that. The Asset Care Engineer was instrumental in the Asset Care and the Engineering Manager. Conveyor belts for instance had always been a big nightmare for us and a lot of it is around instrumentation and the safety systems on the belts. You know we improved on the conveyor belt availability tremendously. We dropped the CT System downtime from about 15 to 30 hours per month to basically zero. So we basically eliminated that through strategic intervention to engineer out the problem. So that is still our strategy, to follow that same process. We've lost a little bit of traction when there were too many personnel changes. It is difficult to maintain that intensity of your team, but fortunately now I think for the last six to eight months we've started to stabilise again. I look forward to this year to get a lot of benefit out of that process.

You refer to personnel changes…?

You know we lost the Company A Engineer. This Engineer was replaced by another Engineer so it was a long… well there wasn't even a handover. There was a period where it was a bit loose. Then from the middle of last year the Engineering Manager left the site supported and by seconded by Client A, he left the Company and he was replaced by a New Engineering Manager. You know as new people come in and other people leave the new guys take time just to understand the business and get to grips with the people and the systems. So there was a period where we went through a bit of a dip and I think then the other issue was from the middle of last year, from about June/July to September/October, the entire focus went into the Filter Plant because that was our big bottleneck area/problem area. Some of the other areas got neglected. All the focus went onto the filters. So I think from now on the filters will still remain most critical but we can afford to focus on some of the other areas as well.

All right. That was it. Thank you so much.

Interview 11:
Participant 11: 2016.02.04_15.52_01

I would like for you to state your position. Are you in Senior Management, Middle Management, Lower Management?

I am in Senior Management.

Number of years within the organisation?

I have been with Company B now for one year and two months.

Okay. Highest qualification you have obtained – High School, Certificate, Diploma, Degree?

Government Certificate of Competence for Mechanical Engineering and I've done my MDP and my AMDP through Henley International School of Business.

What do you understand by Asset Management?

Asset Management for me is basically just monitoring equipment and proactively taking care of any findings. It is through programmes. Through predetermined timeframes and Condition Monitoring and so forth. Taking care to make sure that you get the maximum life out of all your assets at the lowest cost.

Do you think it is a good idea to have Asset Management systems within the Coal Washing Plant?

It is crucial in any business.

Why do you say that?

Because in every business you've got operating equipment, moving parts, and if you don't know what they are doing, if you don't know their life you are going to run them into failure and you may not necessarily have replacement parts in stock. So it is important to know the condition upfront and plan whatever you have to plan when you need to replace.

In your opinion what is the importance of you understanding Asset Management?

In my position it is crucial. I must understand what Asset Management is all about.

Do you know when this plant was commissioned?

I understand it was about seven years ago. I don't know the exact date.

All right and do you know when Asset Management was implemented?

In this plant?

Yes.

I don't know.

Okay. Are you aware of any computerised or Manual Asset Management systems that is implemented?

Yes, we have the manual… we have the Asset Management system that is provided by Company B as a service, they are doing the planning and prep scheduling.

To what extent does Senior Management support and commit to this programme?

Maybe not to the fullest extent that we need to. I think there is a bit of room for improvement.

What could be the reason for that?

I don't think it is because of reluctance I think it is just because of time pressures and other commitments.

Alright. Does the Coal Washing Plant have a clear strategy and vision for Asset Management activities?

It does yes.

Please elaborate?

Look we have the whole works order system. We've got people submit works orders for their maintenance on items which works on a predetermined schedule. The only thing that at this stage, in my opinion, outstanding is the feedback on outstanding works orders. So the system could improve a little bit there maybe if we have a feedback system whereby we can monitor how many tasks are outstanding in thirty days, sixty days, ninety days and longer.

Okay. Do you think Asset Management has any significant role towards the Company competitive strategy?

Yes, it will help overall in cost savings if you have an Asset Management plan working 100.per cent That will definitely give you the advantage of cost savings and longer life out of equipment.

Are you aware of the Technical Meetings and Steercom Meetings?

I have attended Technical Meetings. I attend those whenever I am here on a monthly basis. Steering Committee, I have only attended one but I am aware of them.

What is being discussed at these two meetings?

Technical Meetings, mostly discussed is the… no I can't tell you off the top of my head I have to go back to the minutes. It will basically be the Asset Management programme.

Okay. The KPIs?

The KPIs yes. That is in the Technical Meeting. The Steering Committee I remember we looked at some graphs and future plans and implementations.

So were you discussing the strategy basically?

Yes.

And what can you say with regards to stakeholder involvement in each of these meetings?

Look I think the involvement is there, the participation was good the time I was there. I didn't attend the full meeting I was there for a part of the meeting, but I thought there was quite an inclusive number of people who shared ideas and participated on new developments and current status.

Have you been taught any skills in relation to Asset Management?

I don't think I ever attended specific training on Asset Management. The general things that comes in with my training that is all but not specifically Asset Management.

Are employee skills regularly evaluated in Asset Management and updated?

For their Asset Care Management people… yes I honestly don't know how often they go for training. I just know that I am supporting training that is required for planning. Not necessarily Asset Care Management but specifically planning issues, anything around planning for asset care.

Okay. Do you think it is important to include Asset Management courses in employee training?

I think it is crucial because those are the tools that the people must use for planning.

With the rest of the guys that are in Operations and Maintenance?

I think if they have a general understanding why it is important to fill in a job card properly. Why it is important to capture what they have used, what they have replaced, what they have done. I think general overview but not as detailed as the planning guys.

Okay. How would you describe the current state of Asset Management in this Coal Washing Plant?

I think I will not be able to answer you properly because of my not 100 per cent involvement, but as is anything I believe it is there, it is working, and there is room for improvement.

Do you think you should be involved?

I need to be involved.

Are you aware of any Annual Asset Management Audits taking place in this plant?

That is generally with any plant, yes.

What would you say about the actions coming from the findings with regards to the organisational objectives?

Implementation thereof?

Hmm.

Normally those findings are valid and I don't think it always gets the necessary attention for implementation but they are valid inputs.

Do you think they are in line with your organisational strategy or objectives for that year?

The ones that I have seen already definitely yes.

Do you believe that employees are aware of the benefits that this Coal Washing Plant can gain from Asset Management?

I don't think so.

Please explain?

On a scale of 1 to 10 I think maybe 2. If you are talking employees, you are talking artisans in general.

Everyone that is involved.

I think… I am still a bit disappointed with the understanding. People seem to do a job because it is there it is not because they want it to last long. They want to fix it so it can work. If it doesn't work for another week that is fine. If it breaks in another week that is also fine. There is no pride in the job that the guys are doing.

What do you think it will take for these guys to realise the benefits that Asset Management can bring?

I think if they can just see for once that they don't have to work themselves to death every day because they are doing a job properly, they are doing it for long term, and they are doing it for saving their pride. If we can get to that point where they can understand that the machine can operate for a long time you don't have to fix it every day if you fix it properly then I think we will achieve.

Okay. Are there any challenges noticed on the present Asset Management system?

Not that I can think of at the moment.

All right. On a scale of 1 to 5 how would you rate the Maturity of Asset Management within this organisation?

3.

Why?

I never rate higher than 4 maximum and as I said earlier there are a bit of loops. We can still jack up a little bit. Maybe at this stage current Asset Care Engineer is still finding his feet. I think also with the previous guy that was here he didn't involve me in the process. He involved personnel from the Client A & B often but I was not involved. … I don't know if the Asset Care Engineer involves the Client A, but he doesn't engage with me so there is still room for improving. I think once he finds his feet it will establish.

Where would you like to see the Company be in terms of Maturity – 1 to 5?

I think it will never get a 5. That is not realistic. A 4. I would obviously like to see it at a 4 plus.

What would it take for it to get to 4?

I think commitment. You know if there is just more commitment on the peoples' doings, reporting, feedback to the Planning, Asset Care Management Department and actions coming out of that. Improved Failure Analysis. I have been asking a long time that I want to have some sort of a build-up/a history so if something breaks people make a history – this is what we did, this is the spares that we used, this is how we resolved the matter, this is what we tried and it failed. So that one day if I have a problem I can go into the Asset Care Management system and see, all right we had a similar problem two years ago on a similar machine and this is what we did. It will just eliminate that time of fault finding and correcting.

Okay.

I think so. I think if we get to that stage it will be 4 ½ out of 5.

Are there any strategic recommendations/suggestions towards Asset Management for the Coal Washing Plant?

I think the whole Asset Care Management thing is about being proactive. As long as we can remain proactive and ensure that whatever proactive work orders we put out we get feedback and we monitor what is not being attended to, that work outstanding 30 days, 60 days, 90 days. How it is progressing. Are we getting more jobs done in a shorter time or are we going further away from the point? I think if we can get that sorted, firstly, the turnover time reduced, I think then we will be on a big winning path.

What other things can you suggest?

Long before there was Asset Care management... when I was still a youngster there was no Asset Care Management and work orders and those things. We were just taught to go out into the field and fall in love with your equipment so you understand it. I don't think work orders replace that relationship you have with the equipment. So in my days we used to go… in the Underground Fridge Plant was where I worked. I would go and feel every motor bearing – is it vibrating, is it hot, is it noisy. Feel the next one. Feel all the pumps – is it shaking, is it right, are the bolts okay, are there any rust signs, are the glands leaking. Without anybody telling me. I think what is happening now is people are waiting for a work order to come through and when the work order comes they haven't got time to do all the work orders so they only do a few. Maybe they are in the office I don't know. They submit and some don't submit. So I think that if we can get back into people understanding the importance of looking after equipment then we will succeed.

How do you get them to think like that?

That is on-the-job training. The foreman must do on-the-job training and artisans must assist each other. I don't think the Asset Care Management team can do too much unless if we get PTOs done and we can get down to the artisan what they are not doing right.

Okay. That is about it. Thank you so much.

Interview 12:
Participant 12: 2016.02.05 16.56 01

I would like you to state your position ranking within the organisation, are you in Senior Management, Middle Management, Lower Management?
Okay I am in Middle Management.

Number of years within the organisation?
Four.

What is your highest qualification you have obtained, High School, Certificate, Diploma? Degree?
Diploma.

What do you understand about Asset Management?
So Asset Management is a very broad subject basically it outlines thirty-nine subjects that is basically put out there by global forum of maintenance and Asset Management according to ISO55000, it is all about improving performance, reducing or mitigating the risks and reducing costs in an organisation.

Do you think it is a good idea to have an Asset Management system within a Coal Washing Plant?
Yes, you need an Asset Management System in I think all types of facilities, it basically mitigates risk and risk is one of the biggest things, risks to your business, risks to your people who are working within the business, Asset Management actually provides a platform for that.

In your opinion what is the importance of you understanding Asset Management in the organisation?
You see also in my organisation they rely on me to drive Asset Management. So my understanding of Asset Management is very critical because I am basically steering them towards operational excellence.

Do you know when the plant was commissioned?
The plant was commissioned in 2008 and 2009.

Do you know when Asset Management was implemented within the site?
Probably 2011/2012 around there.

Do you currently have a computerised or a Manual Asset Management system that is implemented within this plant?
Yes, we have a computerised maintenance system in the plant.

To what extent does Senior Management support and commit to the programme?
Senior Management supports it; they don't contribute much.

Does the Coal Washing Plant have a clear strategy and vision for Asset Management activities?

They have a clear strategy, they have an Asset Management strategy, basically a policy and a strategy, also a maintenance strategy is all provided by Company B in the Asset Management with obviously the Company's business objective aligned basically.

Do you think Asset Management has any significant role towards the Company's competitive strategy?
Yes, ISO55000 basically if followed properly ensures reliability in the organisation. So also if I want to be working with another Company using methodology where we say just in time, now if I am an organisation who works towards just in time I need to be reliable. So I need to know when I am going to basically transact to the next person in the transaction phase of manufacturing or mining, but then I will also need to rely on the people that are giving me products. So if they are not aligned or they are not reliable that means that by me working just in time is not going to work, the whole supply chain needs to work just in time and basically they need to be reliable. So if ISO55000 is aligned throughout the entire value chain it is going to be better for the organisations downstream and upstream.

Can you differentiate between AM Technical and AM Steering Committee Meetings?
Yes, so our Steering Committee Meetings are basically looking at costs, looking at reducing costs, our AM Technical Meetings are basically looking at downtimes. So we use our downtime and relate that to costs going upstream because it does cost money to have downtimes, but on our Technical Meetings we focus mostly on those technical issues that we are having that we need to put in place. Things such as Root Cause Analysis, Failure Modes and Effects Analysis to iron out all of those issues in order to improve our costs and the costs that report to that at our Steering Committee.

What can you say with regards to stakeholders' involvement on these initiatives?
We have a whole bunch of different stakeholders in each of the meetings; there are similar stakeholders that are in the Technical Meetings that also feature in the Steering Committee Meetings. So I would say there is alignment there because we are taking information from one meeting into another meeting.

Do you think the people that are supposed to be in the Technical Meetings are the right people and the people that are supposed to be in the Steering Committees are the right people and if not what could be the reason?
I would say no because there should be higher ranking guys basically in our organisation. So we have our GM and financial guys that are not actually in our AM Steering Committee meeting although we are talking about costs these guys are not featured there, these guys need to be there.

And in the Technical Meetings do you think it is represented by the right people?
Yes, Technical Meetings we have got right up until the Group Engineering Manager. So I think the Technical Meeting is fine, it is just the Steering Committee that needs to have I think a broader base, but then also their understanding of Asset Management would seem that it is mostly inclined to engineering. So they would look at it as it is mostly engineering and it should be an engineering thing, but it is not mostly engineering, it is mostly a lot of other things that come into play.

Have you been taught any skills in relation to Asset Management?
Yes, I went through many courses, I have also done many case studies; I have also studied Asset Management by myself so I think I have quite a lot of knowledge in Asset Management.

Are your skills in AM regularly updated?
Basically through the Company I work for we have a skills matrix, we go through that skills matrix and we get assessed on that, but there are also other things that we do on a personal level. At the moment that is not being assessed, but basically I am studying towards an international accreditation.

Do you think it is important to include AM courses in your training and why?
Yes I think everybody needs to, I even think there should be AM courses at artisan level where basically the artisans are learning their technical stuff, but if they also learn Asset Management it is going to be a better culture within the organisation where we don't have these guys coming in there and resisting because they already understand Asset Management. So I would think guys doing N3, N4, N5, N6 qualifications should also have Asset Management built in there more especially Work Management, possibly reliability, maybe a bit of Reliability Centred Maintenance. They are also responsible for coaching people that are below them and if everybody is aligned to this type of methodology I think it is going to be best for the organisation.

How would you describe the current state of Asset Management in this Coal Washing Plant?
Coal Washing Plant I think we are relatively up there with benchmarking standards when it comes to certain aspects in Asset Management. I would take our plant availability is quite up there as compared to the other Coal Washing Plants in our area I think we are the best performing plant.

In the absence of the best the worst becomes the best so relative to the audits that are being conducted annually what would you say, what are the outcomes of those audits?
Okay so based on those audits we are fairly on the middle range of majority.

If we have to say between one to five?
We would we are between three and four.

What do you think of the actions that were suggested from the findings when these audits are done, do you think they are in line with the organisational objectives?
Yes, they are mostly aligned with the organisational objectives just that sometimes to go from firefighting to excellence there are some costs involved and mining now as a sector they don't have money now to invest in Asset Management. So they would be reluctant to actually invest in certain things that we need in order to take us up to a five level or an excellence level.

Do you believe that employees are aware of the benefits that the Coal Washing Plant can gain from Asset Management?
To a certain extent, the employees that I engage with, Foremen, Artisans, they all basically see the benefit.

Let's say everybody on average do you think there are more?
I think there are only 30 per cent that have actually changed towards a Reliability Culture, the rest of the guys I am talking production they don't understand, they don't see the need to understand because they also think it's an engineering function.

So you would say about 70 per cent are not aware of the benefits?

No, 70 per cent would include also Top Management guys.

Are there any challenges noticed on the current Asset Management system?
There are challenges, but they are mostly IT based challenges here and there, also there are challenges with skills transfer I think where guys will gain knowledge, but not transfer it to anybody else and that poses a massive risk for the organisation going forward.

You have rated the Asset Management system between three and four do you think it would be worthwhile for the Company to strive for excellence, which is a five?
Yes, when striving for excellence, when you are on a level of excellence it makes the organisation I would say agile, agile meaning they would already know how to react to commodity prices, changes, they would already know how to react, but basically they would already have a contingency plan for any unforeseen circumstances. So that's why I say it makes them more agile because they will be able to shift with commodity prices, they will be able to shift with water shortages, they will be able to shift with electricity shortages, it is a more agile way of working. So basically if a Company has to be in the excellence domain they are going to have the competitive advantage compared to the rest of them.

Are there capabilities within the organisation that it is possible to get there in the near future and when is the near future, what will it take for the Company to get to a four, let's start there and then excellence?
I think to get them to the four we need the rest of the people that 70 per cent that is lacking the knowledge to actually gain the knowledge and accept that this is the way that we need to drive the organisation. At the moment they don't see the need to do anything more than they are doing right now and they see Asset Management as an engineering function, engineering should be driving it, engineering should be doing all of the work, but they don't see any need to participate.

Whose responsibility is it to make sure that these guys are aware of the benefits and what is it that needs to happen?
GM, the top leader of the organisation, he needs to be the one that is going to bring home the message; he is the one that brings home every other message. When we did lead the implementation boom he was there helping drive the whole lean implementation, after some time when he saw that everything was working well he basically stepped back, but also with Asset Management you need your GM, your Top Management guys to actually understand that Asset Management is not only maintenance. It is not only an engineering function. It is a necessity for the entire organisation to understand that having Asset Management best practices is going to help the organisation basically get through the entire mill.

Earlier on you mentioned that the Asset Management system was implemented two years after the plant was commissioned, what could have been the reason that it happened like that?
They probably decided that they needed to have a better managed system, a better managed way of actually working and the step forward was to get a Computerised Maintenance Management System in order to have data history. You know whenever you want to try and get rid of defects or do defect elimination and stuff or whenever there is a safety even or unwanted event that comes into play the first thing they ask is where is your historical data, let's look at your historical data. So I think they saw a need to have historical data as a compliance initially, now engineering sees that this historical data is actually helping us

because we get lots of information where even the maintenance plans were basically handed down to us. So we got it from the OAM's and then it was all populated into the system. So it tells us for instance we need to do a pump overhaul every six months now a pump overhaul basically is an expensive process. We realised that our pumps at the six months are actually running quite fine why do we need to overhaul them. So we changed those maintenance strategies to save costs.

In your opinion when do you think Asset Management should be implemented?
It should be right in the beginning of the life cycle of the mine, you know when they decided that they were going to buy this place and they are going to build this operation that is when maintenance strategies needed to kick in. You know you are going to have this type of screen, this type of centrifuge, this type of conveyor belt we should already have been populating our maintenance management system so that when everything is running we know basically how to maintain it because I am not confident in saying that things were maintained properly before our Maintenance Management system.

My last question would be what are the strategy recommendations that you may suggest towards Asset Management for this Coal Washing Plant?
For this Coal Washing Plant one strategic thing that I would give them is when we have a Preventive Maintenance Programme they shouldn't think that this is a static thing written in stone. When I was there I was chopping and changing basically because I saw the need of chopping and changing. So I would tweak something here, tweak something there based on analysis and at the moment in mining and manufacturing they would think that this is something biblical, it is standard and you can't change it, it's written in stone, but it needs to be reviewed all the time based on basically your understanding of the plant and the environment that the plant is in and also the criticality of your equipment. It needs to be massaged so that it works for you at any given time. So I would say for them they would also have an understanding that Preventative Maintenance improves reliability. We have come to learn that Preventative Maintenance doesn't improve reliability it just maintains reliability where we tell you, you need to do this and this in order for your plant to be reliable. So it just maintains reliability, in order for you to improve reliability you need to continuously improve your Preventative Maintenance.

What other recommendations would you make with regards to the 70 per cent that doesn't understand Asset Management?
I think we need to educate them, we need to educate them from the bottom up approach, but also from the top down approach because there is also lots of guys on the top that don't understand what Asset Management is. They don't understand what ISO55000 is. So we need to educate them, they need to understand that just like how ISO9000 came in and everyone was resistant because they didn't want to actually learn it, it is the same issue we are going to have with ISO55000, but with ISO55000 I think the idea we should be looking at is looking at the best performing plants in the world and basically aligning them to ISO55000 and let them relate their successes. When companies down below see that they have come up because of ISO55000 as a pilot programme then it is going to be the new buzz word and everybody is going to want to understand and learn ISO55000 and how it helps their part.

Thank you very much.

Interview 13:
Participant 13: 2016.02.10 12.26 01

I would like for you state your position in terms of ranking in the organisation, are you in Senior Management, Middle Management or Lower Management?
Senior Management.

Number of years you have been in the organisation on this site?
Three years.

Your highest qualification, High School, Certificate, Diploma/Degree?
Degree.

What do you understand about Asset Management?
Asset Management in the basic form it is all about coordinating activities across the value chain of the operation to make sure we can optimise our life cycle cost of the asset, which is the plant. So those activities will involve all the way from procurement, HR, maintenance, operations to make sure all those are coordinated with one goal of lowering the life cycle cost of the asset.

Do you think it is a good idea to have Asset Management systems within the Coal Washing Plant?
For sure.

Why?
Because I think the Coal Washing Plant, the setup at site it is a contractor operation. So as a contractor operation we have got a lot of different companies who are delivering a service across the whole value chain. So if you don't have an integrator of everything else then you are not going to have a single view of the full value chain that is going to tell you the story of what is happening across the whole site from when the main mine stockpiles to the product stockpiles. So you need something to integrate to make sure that you have got a view of what is happening.

In your opinion what is the importance of you having to understand Asset Management?
I think the importance of understanding again is one to understand what my department needs to do to support the full Asset Management objectives of the organisation. So it is critical because we are a key stakeholder in the whole Asset Management system. So it is critical that you understand what your department or function should be to actually support the full objectives.

When was the plant Commissioned?
It was in June 2009.

When was Asset Management implemented?
In 2011. The plant was built and everything was constructed, I think during the construction phase the operator of the plant and the maintainer of the plant, which is Company A, they were brought on board to come and be part of the implementation team because they were going to be the operator of the Asset Management afterwards. So they were brought on board and I think after commissioning one of the issues that was realised was that you don't have a clear view of what is happening. So there was no system that gives you a clear view

of what is happening, which will be a reputable dependable system. So I think that's when Company A Contracted Company B to assist them with having a system that would be dependable to implement Asset Management.

Would you say it was a good thing to have an Asset Management system being implemented years after the plant was commissioned and why?

I think for any project if you have got a new project that is being rolled out I think it is worthwhile to roll out Asset Management during the feasibility phase where you start developing all the integrating factors, having the right ERP system and the right CMMS and everything like that or having your Asset register set up and all those things, but again there are plenty of operations where Asset Management only comes in when the operation is already operating. I think there are a lot of those operations where once the operation starts operating and they see that they want to move to the next level of performance and then they implement asset management. So again it is this way or this way. So for me it is all about if you have got a new asset yes you must implement it upfront however it if is not implemented then it is not a crisis to implement it during the operating phase of any asset because by design Asset Management normally starts with operating assets.

What are the challenges that would be face when you implement Asset Management during operation?

During operation there are no challenges because if you look at the Asset Management phases from when you plan and acquire the asset, when you Operate and Maintain it and then you dispose it. The key thing is the bulk of the Asset Management work lies during the Operation and Maintenance part of the phases of Asset Management. So the key thing for me is it is all about why do we have to implement Asset Management, do we see the need for it during the Operating and Maintaining phase and if we see the need that it is going to deliver value then we go ahead and implement it, but I think the notion is starting to change to say you need to do as much work as you can in your design and acquiring phase of the asset, but again I think that is still going to take some time to get there, but I think once you have an asset that is in front of you and is operating and you are looking to move and to have a step change in your performance and then you can look for a system like you can start implementing Asset Management. For me what I have seen is if there is no burning platform to implement Asset Management a lot of people don't because there is no burning platform.

Your take on that?

My take on that it is again Asset Management is still seen as a cost, it is still seen as more of maintenance other than Asset Management. So they are still focussing on one function around Maintenance Management. So there is still a long way to actually start integrating all the other elements of Asset Management, but the core of it now is around Maintenance Management.

To what extent does Senior Management support and commit to Asset Management in this organisation?

Senior Management I think is fully supportive of it because if it was not supportive of it then I think taking the decision to contract was not going to happen if that was not the case. So I think Senior Management is fully supportive of the process and also of the deliverables of an AMS.

To what extent do you think they understand the difference between Asset Management and Maintenance Management?

Again like I said there is a huge difference, if you are a practitioner you will understand what the difference is between Asset Management and Maintenance Management, but the key

thing again is at the core of Asset Management it is Maintenance Management and like I say most of the value lies around how you Maintain and Operate the assets because that is where you incur close to 60 per cent of your cost of looking after that asset. So the value lies there because if you can lower your cost there during your Operating and Maintaining phase you score, but the trick is you can avoid the cost you incur during Operating and Maintenance phase upfront. So by implementing Asset Management upfront, which is all the other elements of it you are trying to lower your cost during Operating and Maintenance whereas if you already have an asset in front of you, you already have inherent costs that you are not going to do anything about because the design and everything is already done. So you do not optimise that and all those kinds of things. So again it is a thin line, but I think a lot of people understand more Maintenance Management as compared to the fuller Asset Management.

Does the Coal Washing Plant have a clear strategy and vision for Asset Management activities?
It does have a strategy and a vision, but again honestly speaking there has not been what do you call it strategy has not been reviewed. It is to make sure that the documents are current and they are updated depending on the organisation needs at that time.

Could you elaborate why it has not been reviewed?
The review of the documents I think it is all about what is happening at that specific time within the organisation because I think the focus was more around the AMIP assessment rather than around the strategy itself. So again I think it is something that needs to be improved because the engagement has always been around the AMIP rather than developing a strategy and plans linked to what this site wants to achieve. So it has only been around the majority and the assessments and the next step is from there.
Do you think the guys at the lower level are aware of this AM strategy, has it been communicated to them?
I think that is broad when you say guys aware of AM strategy because like I say there is no AM strategy let me put if like because it is all about it was done and then it was put in the drawer accumulating dust. Like I say the engagement with the service provider has always been around AMIP and what do you call it, what does this site want to achieve and what is the AM strategy to assist in achieving those goals that we want to achieve instead of focussing more around Maturity. So I think the communication there is the strategy needs to be current, it needs to be linked to what this site wants to achieve.

What are the key things that are being discussed at Technical Meetings and Steercom Meetings?
I think at Technical Meetings it is pure technical development around what is happening around the technical space, new equipment and challenges that the plant is facing, which is the more technical debates and then the AM Steercom that is purely around us improving our Maturity on best practices around Asset Management and purely again focussing on the master plan for that specific thing. So there are two different meetings with one meeting purely discussing technical aspects of the plant and the other one just pure Asset Management aspects of the plant.

What can you say with regards to stakeholder's involvement on each of those meetings?
I think the guys that are required to attend the meetings everybody attends because Technical Meetings are attended by both processing people because it is purely technical discussion. The Steercom that is attended by both processing and engineering and the maintenance team and on the odd occasion we will bring guys from procurement and that's pretty much it.

Would you say their participation and engagement in the Steercom is sufficient?
I don't think there is a definition that says who should be the stakeholders in the Steercom meeting, I think that is always left up to whatever we see fit and whatever we think at that specific time are key objectives that we want to achieve because there is no point of bringing HR to the meeting where in the master plan there is absolutely no resourcing related aspects of AM. So for me it is always driven by the master plan, what is sitting on the master plan because each master plan will have who is responsible for what. So for me if we have got the team and we know who is responsible for what on the master plan then it is only those people in Senior Management that needs to be sitting at that Steercom and if there are procurement related issues on the master plan then we will bring in procurement, if there is finance related issues then we will bring finance. For me that's my view because you don't want to just be having people in the meeting for the sake of having them sitting in the meeting when they have got zero contribution in the meeting.

Have you been taught any skills with regards to AM training?
But again it depends on what you mean by AM training.

Asset Management courses, anything that has to do with Asset Management, it can be from planning, it can be from strategy overview.
Remember every role on the plant has got a training matrix and that rule and the training matrix is linked to a role. A Planner yes will have to do planning and scheduling pretty much those basics, an Artisan is not going to do planning and scheduling or work management he doesn't need to understand that. His role is to execute a task and what you train him on are the technical skills on how to install a bearing properly and how to take measurements for temperatures and how to use a thermograph machine and all those kinds of things. So each role has got a specific training matrix, which is driven by the job description of that specific individual, but that's why I say when you say AM training I think that is broad because it is all linked to a specific role and what the role does.

Do the Artisans do courses like Root Causes Analysis?
... the business requires them to do root cause analysis. So if we don't require them to do course analysis then we won't. So my view again is when it comes to Root Cause Analysis you might implement that, but again what value are you getting from it. You have got a Reliability Engineer who is going to investigate the failures, which are big failures and work from there. So I think every organisation would have a different strategy on how they are going to handle failures.

I am talking simple Root Cause Analysis whereby for example if they have to fill in a job card whereby they can take it and say these are the causes for failure.
But again that's what I am saying it is all about if in an organisation we think there is value in that then we will implement it, but if we don't think there is value in doing that we want to do something else like for instance looking at bigger failures and trying to investigate those in detail and implement actions. Whereas I believe that if you have got a Reliability Engineer who understands Failure Mechanisms and everything like that you can get to a proper Root Cause because the Root Cause that you get is from people who don't even understand Failure Mechanisms. So for me I have never seen the value of it actually.

You don't think it is important?
I think it is important to understand why things fail because an Artisan will only come and fix and replace what is broken and I think it is part of Senior Management and the Reliability

Engineers to understand why they have failed and what the failure mechanism was. So that we can look at, is it a design issue or the Artisan just doesn't have the skill to do that, to understand whether this is a design issue or is he going to get there and replace whatever is damaged or broken?

But surely they can furnish you with the info as in what has failed?
They write on the job card to say this failed, but to understand the Failure Mechanism whether this is fatigue or fracture or whatever that needs to be done because that is what will give you the detailed thing to say what needs to be done to prevent this failure from happening again.

What is the current state of Asset Management in this industry or in this organisation?
I think for lack of a better word would be it is still influx right now because as I say a lot of thing are happening and I think the key thing is really trying to find a landing and to stabilise the operation and get a more stable Asset Management structure going. I think like I said this is a contractor operation and we have got a lot of contractors that are working on site and again the management aspects of AM are different from a normal operation where maintenance and operations are not outsourced.

Would you say activities that are taken on a daily basis are aligned to the organisation objective?
Again like I said initially currently now there is just no link between what happens on a strategic level on AM and what happens in the organisation objective and that is what we need to work on to try and fix because again AM right now is purely driven by Maturity.

Do you believe the employees are aware of the benefits that this Coal Washing Plant can gain from Asset Management?
I don't think the employees even understand what Asset Management is, I think the key thing is that employees will understand that there is again a focus on being proactive and on how we maintain the assets and how we operate them. I think that bit they understand and they also understand the importance of us operating cost efficiently and continuously driving our costs down. So I think they understand those fundamentals, but not understanding Asset Management.

How would you rate the Maturity or the capability of this plant between one where one is firefighting and five is excellence?
I would say two.

What are the challenges currently noticed with the Asset Management?
I think like I said the critical thing is Asset Management is broad and it has got a lot of elements in it and I think the key thing is about what elements are going to work for us at that specific time and as you know this site is still a new operation, it is still on a ramp up. When you have got a ramp up operation you have got a lot of issues around design that needs to be fixed. So the operation has not reached a stable state and there are a lot of changes that are currently happening and I think once you reach stable state then you will start realising the better benefits of now your Asset Registers are pretty much static. So you can start then having more focussed improvements and everything like that, but now everything is just in flux because we are still ramping up.

How long would you say it would take an organisation of this size to get to a steady state?

That depends because as you are ramping up the organisation, the organisation has got a ramp up profile upfront. So it has got a ramp up to 60 million tons. So I think that will really depend on a lot of the challenges that are out on this journey to mature and sort out the stability issues in the organisation. Because in this plant it is not like an operation of one machine, it has got a multitude of assets.

Would you say these challenges are related to Asset Management?
Not necessarily Asset Management that's why I say I think the word Asset Management is limited, I think the thing for me is the challenge is that limits of getting you there could be challenges of stockpile capacities for instance, it could be challenges of not getting coal that is coming through, challenges of Premature Equipment Failures because the machines are new and maybe a bearing had a defect and all those kinds of things. So that's why I say there's a multitude of challenges that we must relate to Asset Management. Yes, there will be some Operating and Maintenance challenges where maybe we don't have the right skills of operator because we are still developing the operational team. The same on the engineering side we might not have the right skills because it is a new operation. So all those things coming together will restrict you on how quick we can stabilise the operation. So they won't necessarily be related to AM, there will be some related to Asset Management around Operating and Maintaining the asset.

Are there any strategic recommendations you may suggest towards Asset Management for the Coal Washing Plant, which would probably address how soon you get to a steady state or to a better majority level of Asset Management.
I think like I said how we engage with the AM service provider, which is Company B needs to change the reason being instead of focussing more on Maturity, we need to link what the plant wants to achieve and what are the specific plant objectives that needs to support what the plant wants to achieve and once that is done then we can start, what you call it looking at what our strategy is and what our Asset Management plans that needs to be in place. So I think that needs to happen to make sure that whatever is done on a day to day basis links back to what the business wants to achieve at the end of the day. So I think that whole model and how we need to engage with the service provider needs to change.

You are saying the way you have been engaging with the service provider who is Company B the focus you said has been on Maturity instead of focussing or driving activities that are taken from the AM objectives. So I am saying the way the Client who is the other main shareholder I understand they also conduct audits on Asset Management…
But I think we must separate the two, their audits are more of a Governance Audit whereas Company B has been brought on board as an AM service provider not just to do audits whereas the other Client it is a Governance Audit, but Company B are supposed to supply AM services to the plant not just audits. So AM is not just AM audits, but what needs to happen in the AM space and operation.

What are the key things that important for an organization to move from one level of Maturity to the next?
Again my honest opinion there, my view is I don't believe in maturing for the sake of maturing because Asset Management is all about optimising and realising value from your assets and you can only realise value from your asset by lowering your life cycle cost of managing that asset. So for me it is all about, that specific time as an organisation what are the external and internal factors that the organisation is facing and once you understand those and you understand exactly what the organisation wants to achieve because again you are

going to have constraints. So once you understand the constraints of the organisation and the operating context of the organisation and what it wants to achieve then you can come up and say fine these are the good practices and everything that the organisation needs to adopt right now to meet its obligation and survive in that specific time. So I think once that link is done then you can start implementing the right practices for the specific organisation instead of just maturing and adopting best practice, which is pretty much not helpful to the organisation because for me the view is to mature it is money and time that it will consume. For me the thing that I have always reiterated is maturing for the sake of maturing you are constantly putting the organisation in a state of change and in a state of flux. So it needs to not just mature for the sake of maturing, it needs to be maturing for a process that we know that it is going to deliver value because to change it is pain. So if we keep on saying now we are doing this practice, now let's go and do this one the following year. So how long must you allow the operation to absorb these new practices and make sure that it is embedded and everything like that nobody knows how long that window should be. So you cannot actually say how long you should move from here to there, from there to there. For me it is all about what we need to adopt for the business to achieve its objective at that specific time and I think that creates the burning platform for whatever practice to be implemented because if there is no burning platform for the practice to be implemented then it is just not going to be embedded in how we do things and become part of business.

Thank you very much for your time I appreciate it.