Energy and Natural Resources - Mining

Entity-Level Business Model

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External Forces & Agents

Stakeholders | Customers | Regulators | Natural Forces | Image / Public Perception | Suppliers
Economy | Labour | Competitors | Technology | Political Environment

Markets/Formats

Commodity Segmentation:

- Precious metals
- Base metals
- Specialty metals
- Iron ore
- Industrial minerals
- Coal
- Gemstones
- Uranium

By Operation Focus:

- Exploration
- Fully integrated
- Mine Services
- Single- or Multi-Commodity

Business Processes

Strategic Management Process

Core Business Processes

- Obtain Reserves
- Develop Reserves
- Extract Ore
- Process Ore
- Sell Product
- Close Mine

Resource Management Processes

- Health and Safety
- Information Management
- Supply
- Environmental
- Maintenance
- Human Resources
- Treasury Management
- Asset Custody

Alliances

- Customers
- Joint Ventures
  - Other mining companies
  - Utilities
  - Customers
- Contractors
- Engineers
- Royalty Owners
- Suppliers
- Trade Associations
- Governments
- Outsourced Suppliers

Core Services/ Products

- Minerals (including ore)
- Concentrates (including ore and slimes)
- Manufactured Products
- By-products (eg, sulphuric acid; industrial diamonds)
- Mine Services (Engineering [CRA, BHP], Technical Mining and Maintenance [eg, SA mining houses])
- Tolling / Custom Milling
  - Excess capacity

Customers

- Brokers (including De Beers)
- Commodity Exchanges
- Manufacturers / Fabricators (including steel mills)
- Governments (including mints)
- Utilities (eg, Coal)
- Refineries / Smelters

Contents

Introduction

1 Mining Segment Knowledge Base

The objective of the Mining Segment Knowledge Base is to assist and drive KPMG's mining partners, managers, staff and consultants to realise the KPMG vision:

> *To become business advisors to our current and prospective mining clients and to establish KPMG as the premier advisory firm to the international mining industry.*

The KPMG Mining Segment Knowledge Base is a living database that is accessible to all KPMG partners, managers and staff. The database will assist us in continuously improving our services to clients and with the completion of competitive tenders for business in the mining industry.

There is therefore a duty on all of us in KPMG to continuously update, improve and expand this knowledge base as markets, issues, products, methodologies etc. in the international mining industry change. As they arise, we therefore request you to send all your contributions to the mining knowledge base, as well as any other relevant information, to Carl Ballot at KPMG, Johannesburg (E-mail address: ZA/Mark400/KPMG/Ballot/Carl Fax no: 27 11 331 9517) who will co-ordinate the update of the database and ensure that it is made available to all KPMG members.

1.1 Business Model

As part of your audit you will prepare a business profile and a risk profile for your client. The principal objective of preparing these is to develop an understanding of the effectiveness of the design and management of the client's business and of the critical performance related issues it faces to:

- better evaluate audit risk;
- discuss the issues arising and potential improvement opportunities with the client.

The business model is a tool developed by industry experts to assist you to prepare these profiles for your mining clients. This business model is a generic mining business model and should be utilised to develop specific business models for the various commodities – eg, gold (deep and surface mining), uranium, coal, silver, nickel, chrome, gemstones etc. We request that all the specific business models that are developed for the various commodities be e-mailed to Carl Ballot (KPMG, Johannesburg, at the above address) who will arrange for the update and distribution of these.

Clients' businesses are complex and diverse and so this business model is provided as a starting point for investigating and ultimately understanding your client. It provides, at a high level, an outline of a generic mining model. However, you can be sure that your client will be different and that those differences will matter. The business template will be useful for documenting

your client's business and for making comparisons / contrasts. However, you should beware of trying to fit your client to the business model; it will not work.

The most important factor to bear in mind is that it is the analysis of the data collected that is important. At each stage, ask yourself the following key questions:

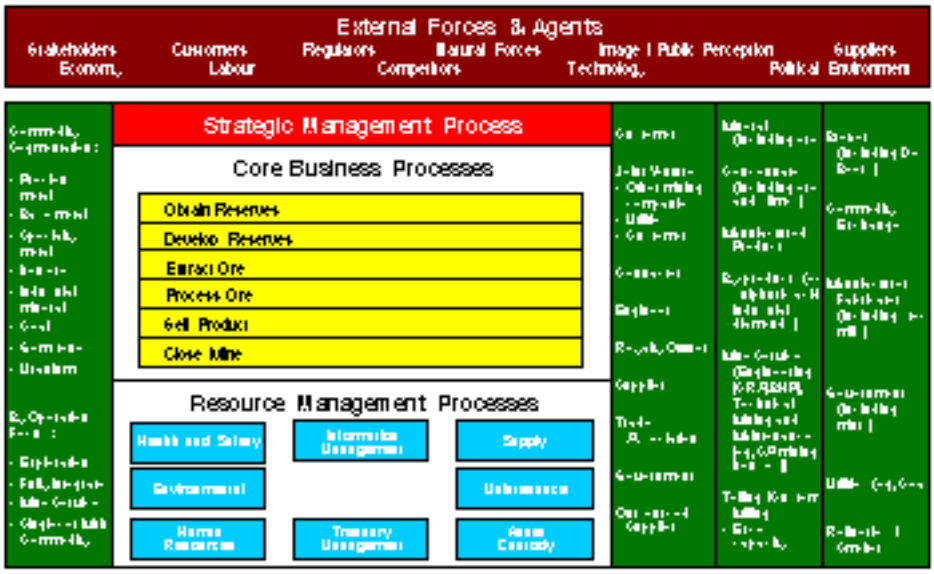
- do my client's strategy and the business relationships it has formed address the external forces in the industry?
- does the design of the business processes established by my client support its strategic objectives?
- has management developed a comprehensive understanding of the business risks that could affect achievement of the strategic / business process objectives?
- are management's assumptions about the significance of those risks reasonable?
- does the design of the control framework established by my client adequately address the risks identified?
- has management derived a set of critical success factors and key performance indicators which monitor progress towards objectives and management of the risks?

If you have understood your client's business well enough to answer these questions, you will have gained the following information in support of your audit opinion:

- an understanding of the inherent risks facing your client's business;
- an understanding of the design and operation of your client's control structure and its information systems (both financial and operational);
- an understanding as to what has really happened to your client's business during the year as a background to its results.

You will also have gained insight into areas where your client's business design may not be optimised. When you add to this the information gained from benchmarking your client's performance against similar organisations, you should be able to identify areas where your client may be able to improve its performance.

Business Model



Entity–Level Business Model

2.1 Entity–Level Business Model

As shown on the next page, the entity–level business model is used to describe the interlinking activities carried out within a business entity, the external forces that bear upon the entity, and the business relationships with persons outside the entity. The items included in the entity–level business model include the following components:

- External forces and agents are those factors, pressures and forces from outside the entity that often are threats to the attainment of the entity's objectives.
- Markets/formats are the segments of an industry that are applicable to the entity. Formats identify the design and location of the facilities.
- The strategic management process is the process that:
  - develops the entity's mission;
  - defines the entity's business objectives;
  - identifies the business risks that threaten attainment of the business objectives;
  - manages the business risks by establishing business processes; and
  - monitors progress toward meeting the business objectives.
- Core business processes are the processes that develop, produce, sell and distribute an entity's products and services. These processes do not follow traditional organisational or functional lines, but reflect the grouping of related business activities.
- Resource management processes are business processes that provide appropriate resources to the other business processes.
- Alliances are established by an entity to
  - attain business objectives;
  - expand business opportunities; and
  - reduce or transfer business risk.
- Core products and services are the entity's products and services.
- Customers involve relationships that are usually the entity's primary focus.

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Economy Labour Competitors Technology Political Environment

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Business Processes

Strategic Management Process

Core Business Processes

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- Process Ore
- Sell Product
- Close Mine

Resource Management Processes

Health and Safety	Information Management	Supply
Environmental		Maintenance
Human Resources	Treasury Management	Asset Custody

Alliances

Customers

Joint Ventures
- Other mining companies
- Utilities
- Customers

Contractors

Engineers

Royalty Owners

Suppliers

Trade Associations

Governments

Outsourced Suppliers

Core Services/ Products

Minerals (including ore)

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Tolling / Custom Milling
- Excess capacity

Customers

Brokers (including De Beers)

Commodity Exchanges

Manufacturers / Fabricators (including steel mills)

Governments (including mints)

Utilities (eg, Coal)

Refineries / Smelters

External Forces and Agents

2.2 External Forces and Agents

Introduction

The objective of this section is to act as a guideline to business teams to obtain an understanding of the external forces and agents that impact on their clients. Teams should use this section as a guideline to obtain a proper understanding of the Industry Structure in which their clients operate. Obtaining a proper understanding of the external forces and agents operating in your client's industry is a pre-requisite and the first step in completing a successful Strategic/Business Analysis of your client.

2.2.1 Stakeholders

Description of relationship

The main objective of any mining company is to provide shareholders' wealth. Maximising shareholders' wealth inevitably results in clashes with the interest of other stakeholders. Consider the interest of the following stakeholders:

- Shareholders;
- Banks;
- Suppliers;
- Workers;
- Community.

Risks

- Access to capital;
- Cost of capital;
- Restrictions on accessing ore bodies.

2.2.2 Economy

Description of relationship

Most major new discoveries are occurring in the so-called third world countries with undeveloped economies and infrastructure. Mining companies also operate in a world of ever changing commodity cycles. Consider the following:

- Commodity cycles;
- Infrastructure.

Risks

- Closing mine;
- Infrastructural costs;
- Inflation;
- Taxation;
- Interest rates.

2.2.3 Customers

Description of relationship

The globalisation of the mining industry has resulted in international competition between mining houses and, in many instances, in supply of commodities outstripping demand.

- Price;
- Timeous delivery;
- Contracts;
- Availability.

Risks

- Unprofitable long term contracts;
- Commodity cycles;
- Newly found reserves.

2.2.4 Labour

Description of relationship

Trade unions are becoming ever stronger in certain mining countries to the extent that yearly wage negotiations place a major burden on mine management. Consider the following:

- Unions;
- Skills set (training);
- Safety.

Risks

- Strikes;
- Loss of capital;
- Loss of production.

2.2.5 Regulators

Description of relationship

Mining companies all over the world are subject to governmental regulation, significantly impacting on their businesses from obtaining reserves to finally closing the mine down. Areas to consider are:

- Licence / Royalties;
- Environmental / Rehabilitation;
- Labour;
- Taxation;
- Native title.

Risks

- Share of profits;
- Closure of mine;
- Not granting permit;
- Availability of labour.

2.2.6 Competitors

Description of relationship

The globalisation of the mining industry has resulted in fierce competition for resources and customers amongst mining companies. Substitutes for certain mining commodities have in addition resulted in increased competition across industry borders. Consider the following:

- Resources;
- Costs;
- Skills (Employees and Management);
- Capital;
- Customers.

Risks

- Management control;
- Long term ore reserves;
- Lack of skills.

2.2.7 Natural Forces

Description of relationship

As resources become more scarce, mining companies are forced to mine deeper or to mine in naturally more unstable environments. Factors to consider are:

- Existence of deposits;
- Structure of deposit;
- Weather;
- Underground water;
- Seismic activity;
- Gases – Explosions.

Risks

- Bad publicity –> Loss of permit;
- Loss of capital;
- Loss of employees;
- Loss of ore bodies.

2.2.8 Technology

Description of relationship

Advancing technology results in more efficient extraction of commodities from ore rock. It is also enabling mines to mine even deeper in order to access payable reserves. Consider technological advances in the following functions:

- Extraction;
- Mining techniques;
- Exploration;
- Transport.

Risks

- Not keeping up with technology.

2.2.9 Image / Public Perception

Description of relationship

The mining industry historically does not have a good public image due to its impact on the environment and the safety of people. Consider the activity and sensitivity of the following:

- Environmental groups;
- Communities.

Risks

- Fines;
- Bad publicity;
- Drop in share price;
- Not getting permit;
- Rectification costs.

2.2.10 Suppliers

Description of relationship

Mining companies are dependent on their suppliers to supply vital infrastructural support and support materials to the core and resource management processes. Consider the following resources:

- Materials;
- Electricity;
- Water;
- Services;
- Outsourcing.

Risks

- Shortage of resources;
- Overstocked positions;
- Failure of timeous delivery.

2.2.11 Political Environment

Description of relationship

A number of the major new ore discoveries are in countries where fully democratically elected governments may not be in power or where political unrest is the order of the day. Consider the following:

- Stability;
- Personal security;
- Ethnic violence.

Risks

- Instability;
- Loss of production;
- Expropriation;
- Personal security costs.

Process Analysis Template

Process Analysis Template

Process Objectives

The objectives of the process are statements that define the direction needing to be taken with respect to the process. Objectives often relate to items such as customer satisfaction, efficient use of resources and compliance with applicable regulations.

Inputs

The inputs to a process represent the elements, materials, resources, or information needed to complete the activities in the process. *KPMG may be able to assist management in defining, reviewing or providing certain of the required inputs, for which the reader is referred to the 'KPMG Capabilities Matrix' (section 4 below).*

Activities

The activities are those actions or sub-processes that together produce the outputs of the process. For some processes, arrows are omitted due to the non-sequential nature of the activities.

Outputs

The outputs represent the end result of the process - the product, deliverable, information or resource that is produced. *KPMG may be able to assist management in defining, reviewing or providing certain of the identified outputs, for which the reader is referred to the 'KPMG Capabilities Matrix' (section 4 below).*

Systems

The systems are collections of resources designed to accomplish process objectives. Information systems produce reports containing operational, financial and compliance related information that make it possible to run and control the process.

Classes of Transactions

The classes of transactions are data and information that are related to the process for use in one or more reports to management or third parties. The classes of transactions, which are broken down into routine and non-routine transactions, accounting estimates, and internal transfers, provide a linkage from the process to the audit procedures.

Process Analysis Template

Risks Which Threaten Objectives

A process's risks are the risks which may threaten the attainment of the process objectives, as defined above.

Controls linked to Risks

Controls are the policies and procedures, which may or may not be put in place, that help provide assurance that the identified risks are reduced to a level acceptable to meet the process objectives.

Critical Success Factors (CSFs)

Critical success factors (CSFs) are the prerequisites and areas of dependency for a process to be successful. CSFs may be inputs, parallel or supporting activities or aspects of a business philosophy or infrastructure necessary to ensure the proper delivery of the process.

KPIs linked to CSFs

Key performance indicators (KPIs) are quantitative measurements, both financial and non-financial, of the process's ability to meet its objectives through trend analyses within a company or benchmarking against a peer of the company or its industry. The KPI's listed are not all of the KPI's that exist relative to each process, but rather are examples which the company may or may not measure. While most KPI's can be linked to CSFs, this may not always be the case.

Other Symptoms of Poor Performance

Other symptoms of poor performance represent other evidence which may exist that indicates the process may not be operating to its most effective level. The items listed here should lead to performance improvement opportunities listed below.

Performance Improvement Opportunities

Performance improvement opportunities are areas for performance or process improvement. This improvement may be achieved internally by the client or through KPMG or other third-party assistance.

Strategic Management Process

Strategic Management Process

Strategic Management Process

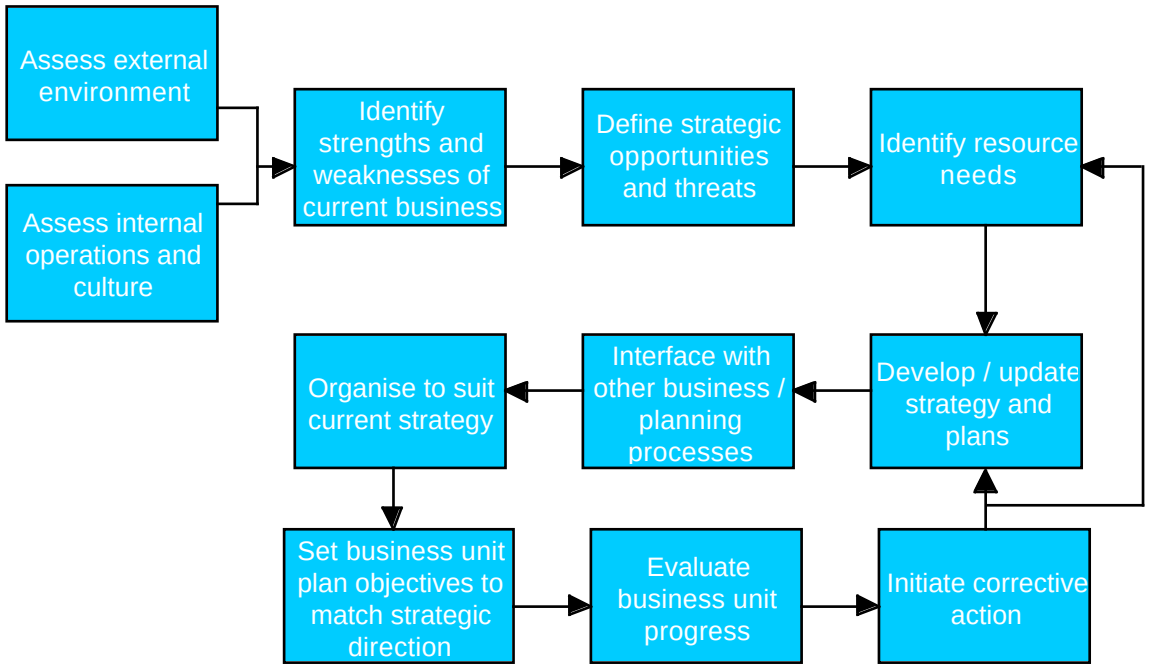
Process Objectives

- Provide a clear strategic direction to the business
- Determine strategic objectives for the company by commodities, markets, countries, etc
- Identify, source and allocate resources necessary to execute strategy
- Measure business performance against strategic objectives
- Promote culture of continuous improvement

Inputs

- Commodity studies / cost curves
- Economic factors
- Markets
- End users
- Suppliers
- Government
- Policy and regulations
- Stakeholders
- Share prices and indicators
- Previous strategy and performance
- Technology
- Community expectation
- Risk analysis (eg, country / politics / currency / natural forces)
- Customer needs

Activities



Strategic Management Process

Outputs

- Vision
- Mission statement
- Strategic goals
- Organisation structure
- Policies
- Analysis of customer needs
- Allocation of responsibilities
- Capital requirements
- Human Resources / needs
- Training needs and programs
- Performance reviews
- Competitive position statement
- Business plan
- Communications strategy
- Exploration strategy
- Research and Development strategy
- Environmental strategy

Systems

- Budget / forecasting
- Competitor / Industry database
- Environmental Management System
- Executive Information System (EIS)
- Project management systems
- HR management systems
- Mine planning systems (10-15 yrs)

Classes of Transactions

Routine

- Tenement acquisition costs

Non-Routine

- Merger and acquisition costs
- Non-routine investments and disposals
- Third party training contracts
- Executive compensation
- Divestment costs

Accounting Estimates

- Write-off's
- Provisions
- Recognition of intangibles

Risks Which Threaten Objectives

- Poor communication and implementation of strategy
- Lack of resources to implement strategy
- Inadequate allocation of resources to exploration / acquisition activities
- Poor alignment of core and resource management processes with the business strategy
- Missed opportunities / unforeseen and new threats; changing customer needs

Controls Linked to Risks

Formal board approval of strategy and establishment of targets and goals through the company to support same
Competitive benchmarking, customer surveys and performance evaluation
Competitive benchmarking and performance evaluation
Regular board review against strategic plan

Monitoring and responding to changing environment

Strategic Management Process

• Loss of focus and/or inability to foster change	Performance reviews; KPIs set to drive behaviours in desired direction, disciplined change management process
• Political instability	Political analysis of operating locations

Critical Success Factors (CSFs)

- Proper understanding of mining sector
- Proper understanding of company's competitive strategy
- Focused strategic plan
- Successful implementation and monitoring of strategic plan
- Adapt to changing environment

KPIs linked to CSFs

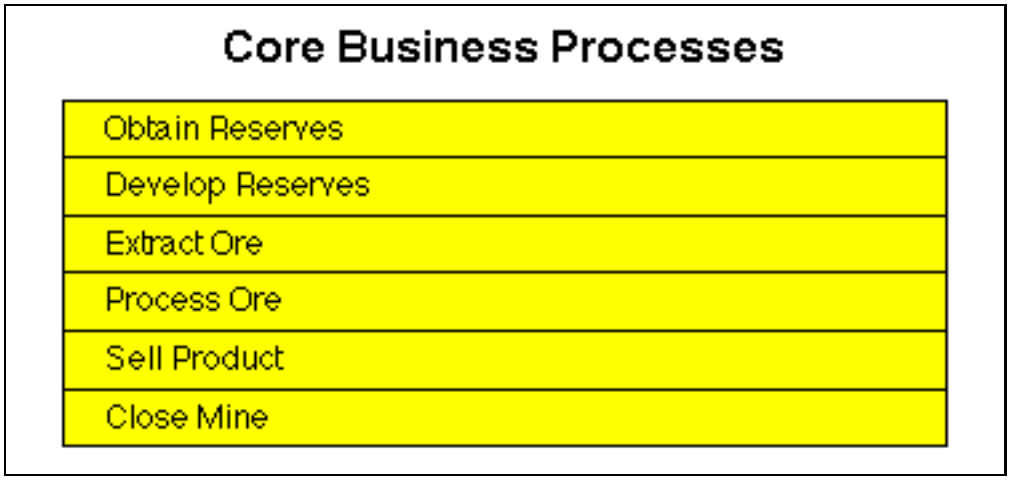
Return on equity; Share price comparisons; Analyst rating comparisons
Actual vs budget comparison
Return on assets
Actual vs budget comparison
Share price comparison

Other Symptoms of Poor Performance

- Lack of employee involvement
- Undefined responsibilities
- Past financial results
- Consistent failure to acquire quality resources
- Shareholder discontent

Performance Improvement Opportunities

- Clear direction
- More rigorous planning
- Focused communication
- Balanced scorecard



Core Business Processes

Energy and Natural Resources - Mining

Introduction to Core Business Processes

Obtain Reserves			
Targeting activities	Acquisition activities	Exploration and Evaluation activities	
Develop Reserves			
Planning	Permitting	Construction / Commissioning	Access reserves
Extract Ore			
Mining	Transportation		
Process Ore			
Stockpile	Metallurgical Extraction / Enrichment / Upgrading		
Sell Product			
Selling and Transportation			
Close Mine			
Salvage	Rehabilitation	Monitoring	

The mining business process model adopts a “value chain” approach to defining the full scope of activities in a mining operation. The core business processes that represent the main operational activities in a mine follow the process from obtaining and developing the reserves, through extraction and processing of the ore, and sale of the end product, to eventual closure of the mine. Each core process comprises one or more sub-processes, described in more detail in this section. The core business processes are in turn supported by the resource management processes, described more fully in section 2.6.

Core Business Process: Obtain reserves

Description

This core business process describes the key elements of targeting, acquiring and evaluating reserves in support of the mining entity's strategic plan. This includes identifying and evaluating potential targets, negotiating the acquisition of prioritised targets, and through exploration and evaluation determining the business case for proceeding with the acquired targets.

Sub Process components

Targeting activities	Acquisition activities	Exploration and Evaluation activities

Core Business Process: Obtain reserves

Sub Process: Targeting activities

Process Objectives

- Identify potential exploration plays
- Manage regional / political / commodity risks in terms of the business strategy
- Perform accurate analysis and interpretation of information

Inputs

- Available technical information
- Corporate strategy
- Knowledge on technical data of prospective areas
- Budgets
- Political risk information

Activities

Outputs

- Prioritised list of prospective targets

Systems

- Information systems – libraries, geological maps, surveys, etc

Classes of Transactions

Routine

- Disbursements relating to activities
- Consulting fees

Non-Routine

- Acquisition

Accounting Estimates

- Recoverability of deferred costs

Core Business Process: Obtain reserves

Sub Process: Targeting activities

Risks Which Threaten Objectives

- Targeting inconsistent with strategy
- Incorrect evaluation of information available
- Not having complete or accurate information available

Controls linked to Risks

Monitoring compliance with strategic plan
Hiring appropriate technical expertise
Performing thorough due diligence reviews

Critical Success Factors (CSFs)

- Understanding of corporate goals / strategies
- Complete and accurate information available
- Correct evaluation of information available
- Identify viable targets

KPIs linked to CSFs

[Mineral rights acquired consistent with strategy]
[Average time spent on evaluation of targets]
Number of failed mining developments; Successful mining developments not taken up
Dollars spent / mines developed

Other Symptoms of Poor Performance

- High turnover of relevant staff
- Actual cost exceeding (or less than) budget
- Missed opportunities

Performance Improvement Opportunities

- Logical approach to information gathering
- Clarification of corporate goals
- Better budgeting and reporting (eg, ABC, WCF, etc)
- Better information gathering and dissemination systems
- Better people, including consultants
- Assistance in corporate planning
- Due diligence
- Deal broking

Core Business Process: Obtain reserves

Sub Process: Acquisition activities

Process Objectives

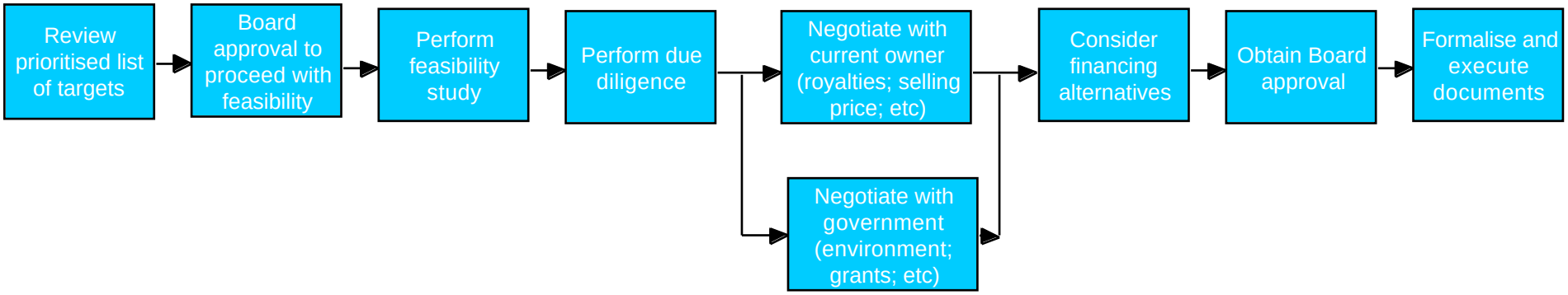
- Replace / build reserves to secure corporate future
- Obtain exploration rights – mineral and surface rights
- Negotiate the best possible deal (eg, price, environmental obligations, financing)

Note: 'acquisition' may be of a producer

Inputs

- Legislation requirements
- Prioritised list of targets
- List of potential joint venture partners
- Financing alternatives

Activities



Outputs

- Joint Venture agreement
- Title to the claims
- Agreement with government

Systems

- Approval processes: Board meetings, executive committees, etc
- Discounted cash flow analyses prepared using spreadsheets
- Acquiree's information systems (if producer acquired)
- Systems would be largely written and oral communication / presentations

Core Business Process: Obtain reserves

Sub Process: Acquisition activities

Classes of Transactions

Routine
- Consulting fees
- Expense claims
- Assaying fees
- Drilling

Non-Routine
- Deferred costs re potential acquisition

Accounting Estimates
- Impairment
- Purchase price allocation

Risks Which Threaten Objectives
- Inadequate reserve base for long term
- Being unsuccessful in obtaining exploration rights
- Failure to negotiate the best deal, including due to poor due diligence, incorrect evaluation and weak negotiation
- Inability to complete transaction timeously

Controls linked to Risks
Review performance against strategic plan
Review success rate against list of targets
Monitor compliance with established due diligence programme (eg, second opinions, specialist input)
Monitor progress against the agreed timetables set for completion of transactions

Critical Success Factors (CSFs)
- Establishing a long term reserve base
- High success rate in acquiring strategic targets
- Cost per unit output acquired

KPIs linked to CSFs
Units of reserves available for development
Ratio of successful acquisitions / targets
Cost per unit produced

Other Symptoms of Poor Performance
- Overpaying
- Deals not closing
- Buying “duds”
- Negative press

Performance Improvement Opportunities
- Build reputation in financial community
- Technical expertise review
- Benchmark review
- Deal broking
- Network among prospective purchasers, vendors and government authorities
- Access external consulting and tax advice
- Information systems
- Analytical assurance (ie, Corporate Finance)
- Environmental management system

Core Business Process: Obtain reserves

Sub Process: Exploration and Evaluation activities

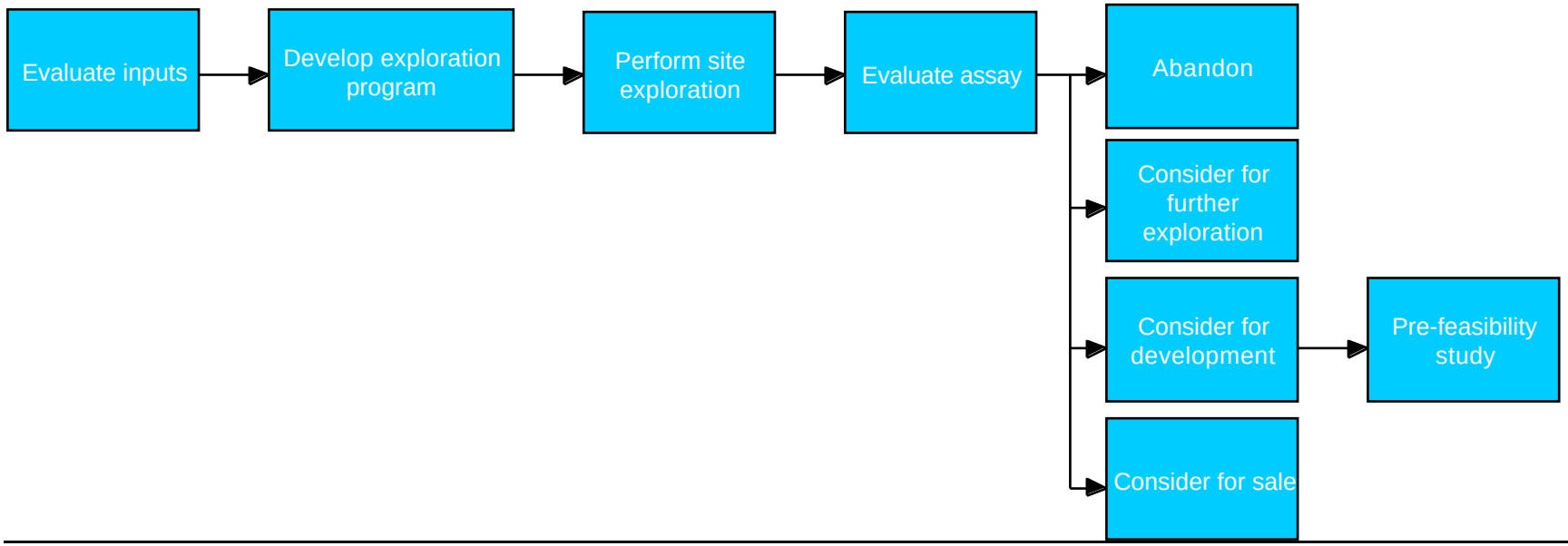
Process Objectives

- Identify economically recoverable reserves
- Define property
- Produce pre-feasibility study
- Revise mine plan for an existing mine
- Fulfill obligations – contractual / legislative / environmental

Inputs

- Available technical data
- Contractual obligations
- Natural forces
- Corporate strategy
- Budgets
- Available technology

Activities



Outputs

- Pre-feasibility study
- Claims to let lapse
- Enhanced technical data – ie, defined reserves

Core Business Process: Obtain reserves

Sub Process: Exploration and Evaluation activities

Systems

- Geological modeling systems
- Cash flow systems
- Evaluation of technical data
- Budget and cost control
- Continuous monitoring system (licence control system)

Classes of Transactions

Routine
- Drilling costs
- Consulting fees
- Assaying costs

Non-Routine
- Capitalisation of internal costs
- Relinquishment of rights

Accounting Estimates
- Recoverability of deferred costs

Risks Which Threaten Objectives

- Lack of quality technical data
- Poor evaluation of results
- Claims lapse unintentionally
- Failure to meet obligations

Controls linked to Risks

Technical expertise / quality control over drilling / assaying
Technical expertise / quality control over drilling / assaying / due diligence
Claims monitoring system
Monitoring compliance against determined obligations

Critical Success Factors (CSFs)

- Complete and accurate technical data
- Effective programme for interpretation of technical data
- Maintaining title
- Successfully fulfilling obligations

KPIs linked to CSFs

Cost per unit produced
Cost per unit produced
Number of titles lapsing unintentionally
Penalties per unit produced

Core Business Process: Obtain reserves

Sub Process: Exploration and Evaluation activities

Other Symptoms of Poor Performance

- Poor drill results
- Failed exploration programs
- Failure to fulfill obligations
- Lapsed title in key areas
- History of unprofitable operations
- Unexpected future operating results and/or mining conditions
- Missed opportunities
- Success by others in relinquished areas

Performance Improvement Opportunities

- Use of appropriate expertise – drilling, assaying, modeling
- Benchmark performance
- Additional analysis of information
- Independent review / audit of feasibility study
- Better use of technology
- Strategic focus
- Assurance on systems and controls (financial and operational)
- Outsourcing
- Risk Management
- Taxation Research & Development

Core Business Process: Develop reserves

Description

This core business process describes the key elements of the development of the reserves, once obtained, to translate the mining entity's strategic plan into operational plans. This includes negotiating financing arrangements, development of the mine plan, obtaining the necessary permits, constructing and commissioning the facilities, and preparation of the mine and necessary infrastructure for ore extraction.

Sub Process components

Planning	Permitting	Construction / Commissioning	Access reserves

Core Business Process: Develop reserves
Sub Process: Planning

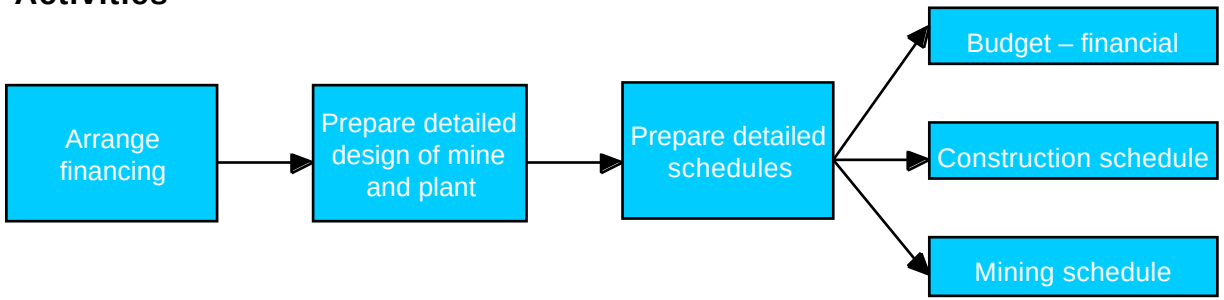
Process Objectives

- Produce mine plan
- Co-ordinate timing of access to reserves and plant development
- Prepare mine budget and determine financial implications
- Manage risk – eg, through joint venture selection and operations selection
- Commence planning for ultimate closure

Inputs

- Feasibility study, including pit/mine design, cut-off grades, equipment specifications
- Definition drilling
- Regulatory requirements
- Environmental assessment
- Marketing plan

Activities



Outputs

- Detailed engineering plan
- Plant construction plans
- Mine plan
- Mining schedule
- Budget
- Access to funding

Systems

- Budgeting systems, models, etc – included in accounting package or separate
- Marketing Department systems
- Treasury Department systems
- Mine modeling
- Environmental management system
- Project scheduling

Core Business Process: Develop reserves
Sub Process: Planning

Classes of Transactions

Routine
- Disbursements and payroll
- Sales contract costs

Non-Routine
- Currency and commodity contracts

Accounting Estimates
- Carry forward costs (eg, E & E, Development)
- Mine life

Risks Which Threaten Objectives
- Inaccurate or inadequate information / evaluation
- Poor planning / delays
- Oversupply in market (commodity cycles)
- Currency risk
- Inexperienced personnel
- Cannot raise the required funding
- Poor joint venture or operations selection

Controls linked to Risks

Oversight controls; technical expertise; due diligence
Project management in support of mine plan
Secure contracts; scenario analysis
Hedging programme; monitoring by Treasury
Independent review / audit; training
Monitoring quality of ore body
Comprehensive joint venture contracts

Critical Success Factors (CSFs)
- Effective evaluation of data and plan preparation
- Flexibility of mine plan
- Managed financial risk

KPIs linked to CSFs

Budget vs actual production statistics
Estimated remaining mine life / original projected mine life
Proceeds and cost per unit realised; price realised vs spot; price realised vs competitors

Other Symptoms of Poor Performance
- Changes to mine plan
- Unforeseen mining and operating complications
- Volatility
- Costs in excess of budget, high on cost curve
- Failure to meet production statistics
- Low ROI
- High costs exacerbated by sales price at low end of market

Core Business Process: Develop reserves
Sub Process: Planning

Performance Improvement Opportunities

- Enhanced information technology
- Independent review / audit
- Hedging programs
- Better marketing of company
- Government assistance to secure export sales
- Packaging finance proposals
- Design and review of budgets
- GAINS
- MAS
- Treasury
- Outsourcing
- Taxation Research & Development

Core Business Process: Develop reserves
Sub Process: Permitting

Process Objectives

- Ensure timely approval
- Negotiate environmental operational and reclamation processes / plans with government agency and other stakeholders
- Determine financial implications of environmental operational and reclamation plans
- Minimise financial burden of environmental operational and reclamation plans

Inputs

- Political, legal, environment data
- Baseline environmental studies
- Native claims
- Mine plan

Activities

Outputs

- Permits
- Reclamation plan
- Bond requirements

Systems

- Permit renewal and compliance reporting system
- Environmental monitoring systems
- Financial modeling

Classes of Transactions

Routine
- Consulting fees
- Legal fees
- Registration fees

Non-Routine
- Securing title
- Expenditure commitments

Accounting Estimates
- Reclamation accrual

Core Business Process: Develop reserves
Sub Process: Permitting

Risks Which Threaten Objectives

- Political, legal and regulatory environment
- Native title
- Inadequate baseline environmental information
- Excessive cost to comply with requirements

Controls linked to Risks

Monitoring compliance and public relations
Negotiate agreement, monitor and evaluate
Independent review / audit
Environmental cost per unit produced

Critical Success Factors (CSFs)

- Knowledge of native title, political and environmental issues
- Successful negotiation
- Timely permits

KPIs linked to CSFs

Cost of permit; quantum of bond requirements
Time and cost to obtain permit
Delays to project (days)

Other Symptoms of Poor Performance

- Production delays
- Bad press
- Protracted negotiations
- Cannot go ahead to produce
- Unusual restrictions

Performance Improvement Opportunities

- Innovative financing ideas for reclamation bonding
- Environmental assessment review
- Environmental advisory services
- Environmental reporting to stakeholders and assurance thereon
- Systems improvement

Core Business Process: Develop reserves
Sub Process: Construction/commissioning

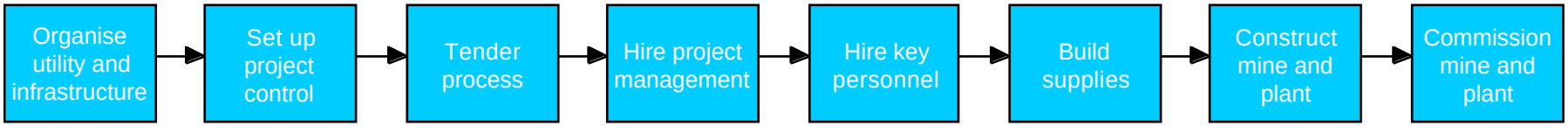
Process Objectives

- Construct an efficient mine and processing facility
- Control capital expenditures and optimise capacity
- Reduce risk of loss, improve safety and protect environment

Inputs

- Detailed engineering plans
- Feasibility studies
- Mine plan

Activities



Outputs

- Mine construction plan
- Plant construction plan
- Commissioning certificate

Systems

- Cost control system
- Procurement procedures
- Personnel hiring procedures
- Fixed asset system
- Materials management system
- Health and safety procedures

Classes of Transactions

Routine
- Disbursements, including payroll
- Depreciation
- Insurance expense
- Maintenance expense

Non-Routine
- Overhead capitalised
- Capped interest
- Equipment leasing
- Major asset procurement

Accounting Estimates
- Costs carried forward
- Depreciation methods and lives
- Provision for restoration

Core Business Process: Develop reserves
Sub Process: Construction/commissioning

Risks Which Threaten Objectives

- Insufficient or excessive capacity
- Over-charging by constructors
- Uninsured or underinsured losses
- Inability to acquire construction resources timeously
- Cash flow not sufficient to fund capital expenditures
- Unexpected events (eg, natural, political)
- Problems with access to site due to native title
- Risk associated with operating in remote locations

Controls linked to Risks

Market research, forecasts
Capital project review
Conduct reviews, monitor legal and regulatory requirements
Maintain relationships with suppliers, obtain competitive bids
Monitor capital budgets and cash flow projections
Monitor contingency plans
Negotiate agreements, maintain relationships with native title holders
Monitor contingency plans

Critical Success Factors (CSFs)

- Accurately size mine and processing plant

- Completing construction within budget and on time
- Compliance with safety and environmental regulations

- Disaster recovery plan
- Proper procurement procedures

KPIs linked to CSFs

Plant utilisation, actual recoveries vs budget recoveries

Actual vs budget capital costs, timing of commissioning / projections
Number and cost per unit of production of safety and environmental fines
Units production lost due to late commissioning
Actual vs budget cost; days late commissioned

Other Symptoms of Poor Performance

- Costs in excess of budget
- Delays
- Poor housekeeping
- Environmental
- Excessive workers compensation claims and accidents
- Employee turnover

Performance Improvement Opportunities

- Benchmark construction costs
- Procurement review
- Environmental assessment review
- Systems
- Management reporting review
- Capital project review
- Assurance on environmental reporting

Core Business Process: Develop reserves
Sub Process: Access reserves

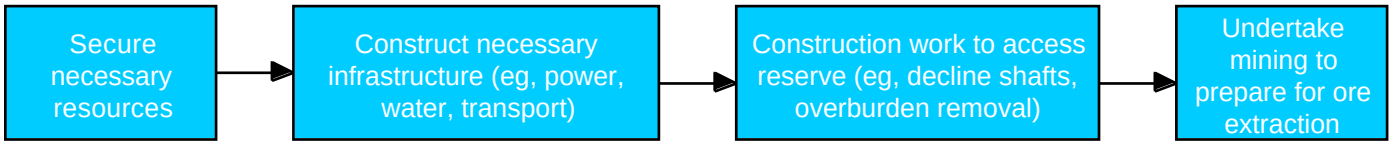
Process Objectives

- Economically and efficiently access ore body

Inputs

- Mine plan
- Equipment
- Personnel

Activities



Outputs

- Inventory
- Accessible ore body
- Infrastructure

Systems

- Mineral resources database
- Mine planning and modeling
- Project scheduling
- Production planning
- Payroll
- Purchasing
- Cost control

Classes of Transactions

Routine
- Costs / expenditure
- By-products

Non-Routine
- Contractors
- Capitalise prestrip
- Deferred mining costs
- Development ore

Accounting Estimates
- Depreciation, amortisation methods / lives – carried forward costs and deferred costs
- Provision for rehabilitation, restoration
- Recoverability of deferred costs
- Point of commercial production

Core Business Process: Develop reserves
Sub Process: Access reserves

Risks Which Threaten Objectives

- Failure to open reserves timeously for mining
- Cash flow or financing not sufficient to fund capital expenditures
- Unexpected natural events
- Problems with access to site due to native title
- Risk associated with operating in remote locations

Controls linked to Risks

Monitoring the opening of reserves against mine plan
Monitor capital budgets and cash flow forecasts
Establish contingency plans
Maintain relationships with native title holders
Establish contingency plans

Critical Success Factors (CSFs)

- Having sufficient opened reserves to ensure continuous mining
- Accurately plan equipment and facility needs
- Health, safety and environmental compliance
- Access reserves within budget

KPIs linked to CSFs

Days delay in mining
Days delay in mining
Frequency and cost of health, safety and environmental fines / claims
Cost per foot of shaft constructed; Cost per ton stripped / mined; actual vs budget

Other Symptoms of Poor Performance

- Costs in excess of budget
- Unforeseen mining complications
- Employee turnover
- Poor housekeeping
- Depletion / amortisation lags depletion

Performance Improvement Opportunities

- Benchmark access costs (eg, shaft sinking, overburden removal)
- Environmental assessment review, including reporting on environmental issues
- Budget / cash flow assurance
- NPV assistance
- BRM Risk Management plan

Core Business Process: Extract Ore

Description

This core business process describes the key elements of the actual extraction of ore from the mine and transportation of this to the processing facility. This includes sampling, breaking and removal of the broken ore, grading and transportation.

Sub Process components

Mining	Transportation

Core Business Process: Extract Ore
Sub Process: Mining

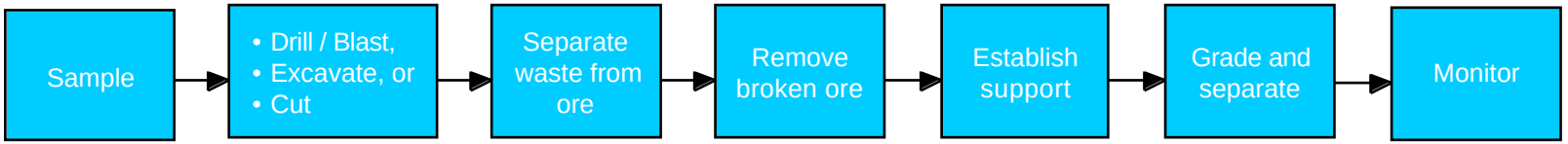
Process Objectives

- Produce ore cost-effectively
- Provide a safe environment
- Environmental compliance
- Meet mine plan
- Maximise utilisation of equipment and facilities

Inputs

- Mine plan
- Policies and procedures
- Operations budget
- Equipment, labour and material availability
- Infrastructure requirements
- Regulations
- Performance data
- Sampling and geological data

Activities



Outputs

- Mine plan
- Ore
- Production reports
- Safety reports
- Assay results
- Waste handling

Systems

- Payroll system
- Mine scheduling
- Geologic mapping
- Maintenance planning
- Purchasing and Inventory
- Production and Cost reporting

Classes of Transactions

Routine

- Time recording
- Stores requisitions
- Capital requisitions
- Depreciation
- Labour costs
- Equipment repair and maintenance
- Use of supplies and materials

Non-Routine

- Capital requisitions
- Sub-contractor negotiations
- Mobilisation
- Environmental / Contamination
- Labour disputes

Accounting Estimates

- Maintenance provisions
- Reserve base
- Reclamation provisions
- Mine asset carrying amounts

Core Business Process: Extract Ore
Sub Process: Mining

Risks Which Threaten Objectives

- Accidents, fatalities
- Lack and timing of resources
- Equipment break-downs
- Labour disruptions
- Unexpected quality (grade) and ore recovery; faulting
- Vendor incapabilities

Controls linked to Risks

Monitor compliance with safety standards and policies & procedures
Monitor compliance with logistics plan
Monitor compliance with maintenance plan
Human Resource management
Geologic monitoring against mine plan
Supplier evaluation

Critical Success Factors (CSFs)

- High quality ore
- Maximisation of ore recovered / minimisation of waste
- Low production cost
- Optimal utilisation of resources
- Safety performance

KPIs linked to CSFs

Unit output per tonne mined
Tonnes of ore mined per worker / per day
Cost per unit output; Units-of-production per man hour / face advanced
Cost per unit output
LTIFR (Lost Time Incidence Frequency Rate)

Other Symptoms of Poor Performance

- Breakdowns in transport
- Theft of ore
- High workforce turnover
- Absenteeism
- High volume and/or frequency of emergency supply orders
- High frequency of unexpected breakdowns / faulty equipment
- Graffiti in the mine

Performance Improvement Opportunities

- Training, motivation and scheduling of labour
- Inventory management
- Equipment maintenance planning
- Security planning to limit theft
- Business Process Re-engineering
- Technological improvements
- Activity-based management

Core Business Process: Extract Ore
Sub Process: Transportation

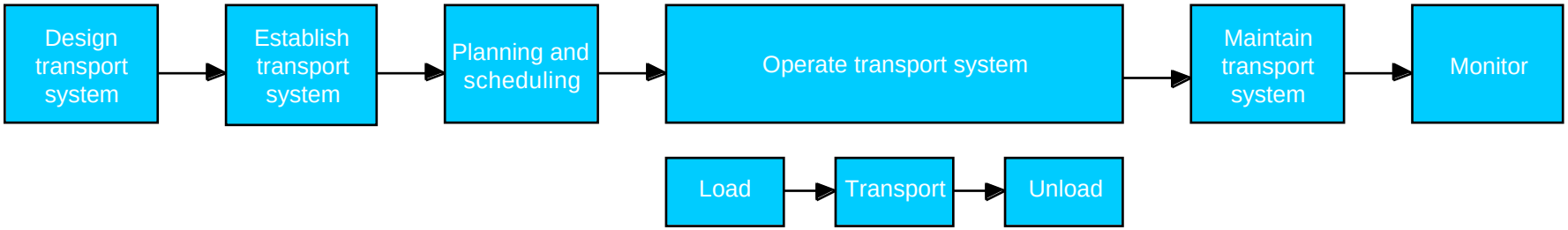
Process Objectives

- Timely transportation of labour and materials
- Timely transportation of ore for further processing
- Timely transportation of waste for removal
- Minimise haulage distances
- Minimise handling
- Control costs
- Maximise utilisation of equipment

Inputs

- Mine plan
- Equipment availability
- Labour availability
- Budgets
- Infrastructure requirements
- Regulations
- Performance data
- Capacity considerations

Activities



Outputs

- Ore at processing location
- Waste to dump
- Production report
- Safety reports
- Up-time reports

Systems

- Labour scheduling
- Trip sheets
- Mine scheduling
- Maintenance planning
- Production and cost reporting
- Time reporting

Core Business Process: Extract Ore
Sub Process: Transportation

Classes of Transactions

Routine
- Store requisitions
- Time recording
- Capital requisitions
- Design of conveyor system or haul roads
- Construction
- Labour costs
- Repair and maintenance costs

Non-Routine
- Capital requisitions
- Labour disputes

Accounting Estimates
- Maintenance provisions
- Impairment

Risks Which Threaten Objectives
- Bottlenecks in transport
- Breakdowns in transport
- Natural catastrophes and accidents
- Underutilisation of transport system

Controls linked to Risks
Monitor against transport scheduling plan
Monitor performance against maintenance plan
Contingency plans; training
Monitor the effectiveness of the scheduling and mine planning

Critical Success Factors (CSFs)
- Optimal utilisation of transport system

KPIs linked to CSFs
Trips per day or volume of unit per time unit; Amount of time/volume capacity used vs Amount of time/volume capacity available; Cost per time unit

Other Symptoms of Poor Performance
- Accidents
- Long queues
- Poor haul road conditions
- Spillage
- High transport costs

Core Business Process: Extract Ore
Sub Process: Transportation

Performance Improvement Opportunities

- Development of transport scheduling plans
- Development of maintenance plans
- Logistics scheduling
- Outsourcing
- Technological upgrades

Core Business Process: Process Ore

Description

This core business process describes the key elements of the processing of the broken ore removed from the mine. This includes management of the required stockpile, crushing, sizing and processing, and transportation to another stockpile.

Sub Process components

Stockpile	Metallurgical Extraction / Enrichment / Upgrading

Core Business Process: Process Ore
Sub Process: Stockpile

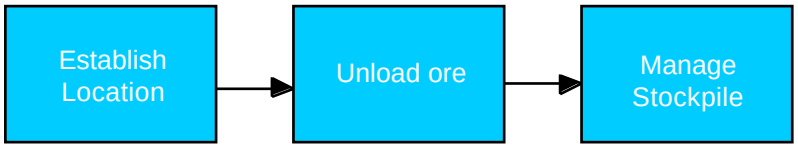
Process Objectives

- Prepare for efficient handling
- Adequate ore available for processing, without creating excess

Inputs

- Location planning / constraints
- Operating standards and constraints
- Transport facility
- Production scheduling

Activities



Outputs

- Stockpile plan (location, space)
- Stock information (volume, grade)

Systems

- Mine planning
- Surveying
- Sampling

Classes of Transactions

Routine
- Metallurgical accounting
- Inventory movements
- Surveying and sampling

Non-Routine
- Catastrophic loss

Accounting Estimates
- Inventory loss
- Impairment
- NRV / obsolescence

Core Business Process: Process Ore
Sub Process: Stockpile

Risks Which Threaten Objectives

- Environmental contamination
- Natural catastrophes
- Limited stockpile capacity
- Dilution of ore grade

Controls linked to Risks

Monitoring and containment system
Contingency plan
Monitor capacity against production schedule
Monitor the stockpile design

Critical Success Factors (CSFs)

- Managing size of stockpile vs plant capacity
- Managing consistency of grade
- Environmental compliance

KPIs linked to CSFs

Days of production (feed) in stockpile; Stockpile turnover ratio
Grade of ore recovered
Fines per tonne of ore recovered

Other Symptoms of Poor Performance

- Excess loss during stockpile
- Seepage / leeching due to poor stockpile design
- Processing delays due to no feed
- Environmental claims

Performance Improvement Opportunities

- Design and implementation of environmental management systems, and reporting and providing assurance on these
- Logistics scheduling
- Organisation of mine layout (location of stockpile)
- Quality control (blending of production)
- Working Capital management

Core Business Process: Process Ore
Sub Process: Metalurgical Extraction / Enrichment / Upgrading

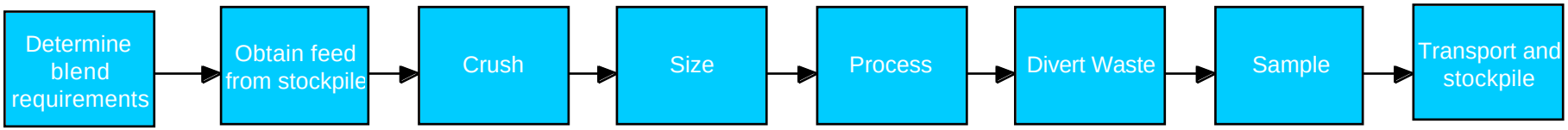
Process Objectives

- Maximise economic volume of refined / enriched product
- Maximise recovery rate
- Obtain targeted quality / grade
- Minimise theft of product

Inputs

- Metallurgical studies
- Materials / Chemicals
- Production plan
- Maintenance plan
- Location plan
- Technology
- Health, safety and environment policies

Activities



Outputs

- Stockpile
- Stockpile plan
- Finished Goods
- Quality reports
- External sampling
- Rejects
- Maintenance reports
- Operational reports
- Financial reports
- Cost/revenue appraisal

Systems

- Process control system
- Metallurgical accounting system
- Payroll
- Maintenance planning / register
- Plant scheduling
- Sampling / Quality control
- Purchasing and Inventory
- Production and cost reporting
- Security
- Amortisation

Core Business Process: Process Ore
Sub Process: Metalurgical Extraction / Enrichment / Upgrading

Classes of Transactions

Routine
- Time recording
- Store requisitions
- Utilities
- Maintenance

Non-Routine
- Capital requisitions
- Emergency repairs

Accounting Estimates
- Maintenance provision
- Impairment
- Restoration

Risks Which Threaten Objectives
- Lack of ore / lack of feed
- Low grade ore
- Ore grade below target
- Equipment failures / unexpected breakdowns
- Unskilled workforce
- Inconsistent quality (grade) or size of feed
- Theft of product

Controls linked to Risks
Scheduling / production planning
Monitor effectiveness of exploration against mine plan
Monitor mine call factor
Monitor against the maintenance plan
Training, supervision
Metallurgical studies / evaluation
Physical security; monitor mine call factor

Critical Success Factors (CSFs)
- Efficient and effective process
- Utilisation of processing plant
- Maximise productivity of plant
- Cost minimisation
- Efficiency of maintenance

KPIs linked to CSFs
Recovery rate; mine call factor
Percentage capacity utilisation
Units-of-production per time unit
Cost per unit output
Maintenance cost per machine hour

Other Symptoms of Poor Performance
- Accidents
- Demotivated staff
- Electricity frequency dips
- Excessive consumption of supplies (chemicals)
- System leaks
- Volume of re-work produced
- Poor housekeeping

Core Business Process: Process Ore
Sub Process: Metalurgical Extraction / Enrichment / Upgrading

Performance Improvement Opportunities

- Selection of people
- Training of people
- Clarification of responsibilities of all personnel
- Mechanisation vs labour
- Design and implementation of metallurgical accounting system
- Technological improvements
- Inventory management

Core Business Process: Sell Product

Description

This core business process describes the key elements of selling the product, including establishing the terms of sale, managing the delivery plan and associated logistics, and receiving payment.

Sub Process components

Selling and Transportation

Core Business Process: Sell Product
Sub Process: Selling and Transportation

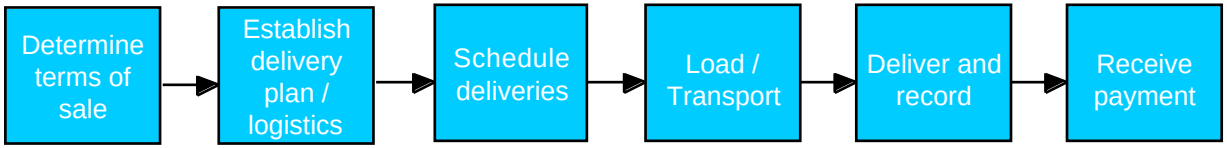
Process Objectives

- Maximise revenue
- Manage price and volume fluctuations
- Minimise delivery time and cost
- Minimise credit risk
- Develop existing and alternative markets and uses

Inputs

- Sales plan
- Contract sales terms
- International prices
- Delivery plan
- Production plan
- Cost
- Security
- Credit assessment
- Industry / competitor information
- Credit terms

Activities



Outputs

- Sales plan
- Delivery plan
- Customer feedback
- Contracts (sales and transport)
- Cost/revenue appraisal
- Invoice
- Cash receipt
- Marketing plan

Systems

- Transportation scheduling
- Contract administration
- Treasury system
- Customer service
- Market research and analysis
- Credit management system
- Invoicing / receivables
- Quality control
- Management accounts

Core Business Process: Sell Product
Sub Process: Selling and Transportation

Classes of Transactions

Routine
- Cash sales
- Credit sales
- Rail, road and shipping costs
- Insurance

Non-Routine
- Bad debts
- Loss recovery
- Assay difference

Accounting Estimates
- Doubtful debt provisions
- Price determination
- Provision for losses on long term contracts
- Assay difference provision
- Amortisation

Risks Which Threaten Objectives
- Commodity cycles
- Production shortfalls
- Transportation interruptions

Controls linked to Risks
Hedging programmes; long-term contracts
Production scheduling
Long-term labour contracts; maintenance program; alternative transportation

Critical Success Factors (CSFs)
- Revenue maximisation
- Minimise transportation costs
- Volume stability

KPIs linked to CSFs
Revenue received per unit sold
Transportation cost per unit sold
Inventory turnover

Other Symptoms of Poor Performance
- Excess or high finished goods inventory
- Customer rejected shipments / complaints
- Contract non-renewals
- Bad debts
- Demurrage charges (late shipments)
- Excessive hedging

Performance Improvement Opportunities
- Establish hedging program
- Provide assistance in contract negotiations
- Optimise logistics – transportation
- Financial reporting assurance

Core Business Process: Close Mine

Description

This core business process describes the key elements of closure of the mine, including establishing care and maintenance programmes, salvaging recoverable assets, executing reclamation plans, establishing and maintaining monitoring systems and programmes, and ultimately procuring release from obligations and liabilities.

Sub Process components

Salvage	Rehabilitation	Monitoring

Core Business Process: Close Mine
Sub Process: Salvage

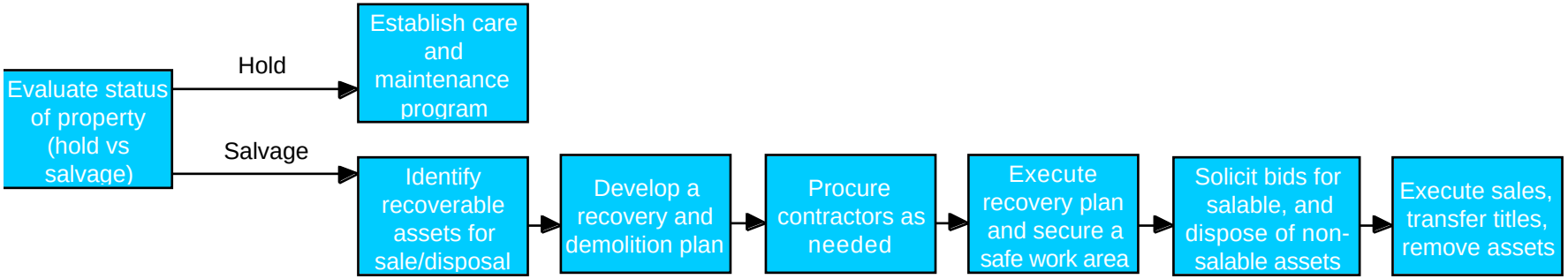
Process Objectives

- Maximise recovery of salable assets for disposal
- Secure safe and environmentally aware closure of operations
- Maximise the proceeds received from assets and/or alternative uses of assets
- Cost effectively dispose of unsaleable assets and/or waste

Inputs

- Economic analysis / cash flow projections
- Salvage workforce or contractors
- Asset inventory
- Potential buyers or internal users
- Area to store and display salvaged assets
- Asset register
- Detailed descriptions and advertisement material
- Time constraint information

Activities



Outputs

- Revised asset register
- Cash flow
- Safe property
- Disposal plan
- List of buyers
- Invoices

Systems

- Surplus asset tracking system
- Asset descriptions, information and histories

Core Business Process: Close Mine
Sub Process: Salvage

Classes of Transactions

Routine
- Payroll and contractor disbursements

Non-Routine
- Cash receipts
- Potential book value write-offs

Accounting Estimates
- Obsolete inventory
- Disposal and salvage costs

Risks Which Threaten Objectives
- Contamination of assets
- High cost of recovery
- Damage during recovery
- Accidents causing injury
- Poor market for used assets
- Unauthorised disposal
- Non-compliance with environmental legislation and permits

Controls linked to Risks
Health, Safety and Environment review of assets
Independent evaluation of salvage costs and time
Supervision of recovery activities
Monitor safety performance internally and for contractors
Management monitoring the sales process
Security systems and authorisation procedures
Monitor against environmental legislation and permits

Critical Success Factors (CSFs)
- Maintain optimal condition of assets
- No latent or future liabilities
- Minimise time and cost of salvage operations

KPIs linked to CSFs
Actual sales compared to estimated value
Percentage value of credits passed or claims settled
Ratio of cost to revenue from salvage operations

Other Symptoms of Poor Performance
- Accident rate of workforce
- Lack of interest by buyers
- Unsaleable assets
- Amortisation lags depletion

Performance Improvement Opportunities
- Improve value of assets through rebuilds or other enhancements
- Assist with marketing of assets
- Improve sales returns through attractive display, historical records, etc.
- Minimise waste disposal
- Develop waste recycle program

Core Business Process: Close Mine
Sub Process: Rehabilitation

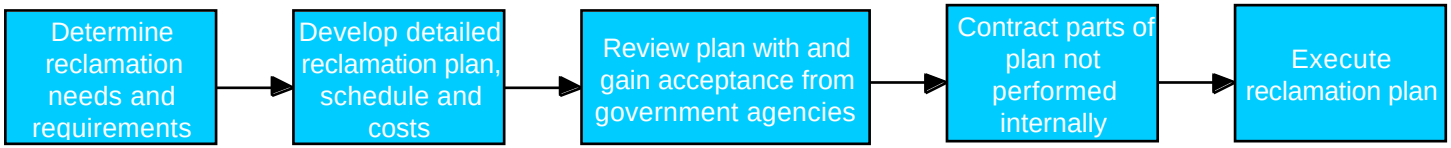
Process Objectives

- Restore areas affected by operations in accordance with relevant laws and permits
- Minimise long-term liabilities, maintenance and monitoring costs and responsibilities
- Create a positive public perception
- Maximise refund of reclamation bond
- Minimise cost of rehabilitation

Inputs

- Reclamation plan (per permits)
- Reclamation workforce and/or contractors
- Equipment and supplies
- Legislative requirements

Activities



Outputs

- Rehabilitated property
- Approved monitoring program
- Partial release of reclamation bond
- Closing reclamation plan

Systems

- Project planning, scheduling and monitoring systems
- Environmental management system

Classes of Transactions

Routine
- Contractor disbursements
- Payroll
- Materials and supplies

Non-Routine
- Refund of any funds or liabilities in escrow with government agencies
- Release of reclamation liabilities

Accounting Estimates
- Provision for rehabilitation
- Provision for monitoring

Core Business Process: Close Mine
Sub Process: Rehabilitation

Risks Which Threaten Objectives

- Excessive cost of rehabilitation
- Public or government agency objections
- Natural catastrophes (eg, weather, etc)
- Unresponsiveness of flora and fauna to rehabilitation efforts
- Unanticipated contamination of area
- Legislation changes

Controls linked to Risks

Monitor actual rehabilitation costs to budget
Constant communication and public relations
Contingency plans
Prior testing and monitoring
Regular testing and monitoring
Industry involvement

Critical Success Factors (CSFs)

- Cost of rehabilitation
- Duration of rehabilitation process
- Positive public perception

KPIs linked to CSFs

Cost per unit of area rehabilitated
Duration per unit of area rehabilitated
[Awards and/or recognition; negative press]

Other Symptoms of Poor Performance

- Visually unattractive results
- Accidents
- Increased government inspections
- Increased government restrictions
- Poor industry reputation / negative press
- Higher reclamation bond requirements

Performance Improvement Opportunities

- Creative alternatives to reclamation acceptable to parties involved
- Innovative reclamation methods
- Assistance for reclamation funding
- Government advice in developing countries

Core Business Process: Close Mine
Sub Process: Monitoring

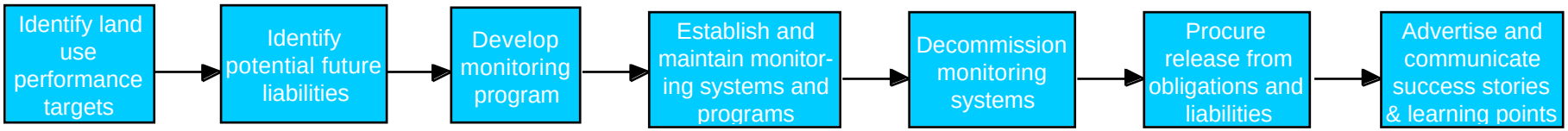
Process Objectives

- Establish intended land use for rehabilitated land
- Release of final reclamation bond deposit of company
- Minimise potential future liabilities
- Maintain a positive public perception

Inputs

- Rehabilitated operation
- Monitoring devices
- Employees or contractors
- Reclamation plan

Activities



Outputs

- Monitoring program
- Monitoring data supporting objectives
- Documents relinquishing rehabilitation obligations
- Refund of bond deposit
- Restored property

Systems

- Database for monitoring results
- Environmental management system

Classes of Transactions

Routine
- Payroll and/or contractor disbursements
- Release of liabilities

Non-Routine
- Release of deposits or bonds placed in escrow to insure reclamation compliance

Accounting Estimates
- Provision for rehabilitation

Core Business Process: Close Mine
Sub Process: Monitoring

Risks Which Threaten Objectives

- Natural catastrophes prior to completion
- Changed public or governmental perceptions and requirements
- Unanticipated rehabilitation results

Controls linked to Risks

Contingency plans
Communication and monitoring
Regular testing and monitoring

Critical Success Factors (CSFs)

- Time and cost of monitoring activities
- Positive public perception
- Productivity of land

KPIs linked to CSFs

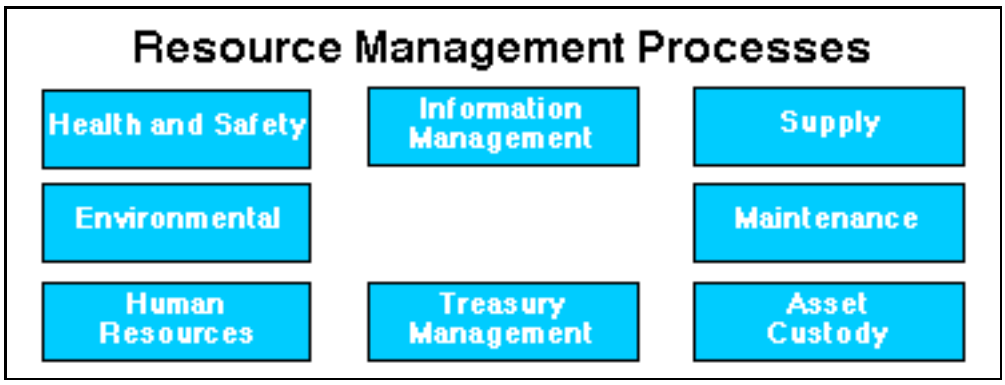
Actual time and cost of monitoring per unit of area monitored
[Awards and recognition; negative press]
Percentage productivity compared to adjacent land

Other Symptoms of Poor Performance

- Visually unattractive results
- Complaints
- Increased government inspections
- Poor reputation
- Higher future reclamation bond requirements

Performance Improvement Opportunities

- Enhance reputation for social responsibility
- Creative alternatives to monitoring
- Environmental reporting



Resource Management Processes

Energy and Natural Resources - Mining

Introduction to Resource Management Processes

Health and Safety

Environmental

Human Resources

Information Management

Treasury Management

Supply						
Determine demand requirements	Determine sourcing strategy	Determine replenish-ment requirements	Determine source	Order product	Deliver product	System update

Maintenance				
Maintenance strategy	Maintenance planning	Establish maintenance infrastructure	Maintenance scheduling	Perform maintenance

Asset Custody

This section describes the resource management processes present in a typical mining operation. The activities described below apply to several, if not all, aspects of the mine and therefore typically relate to all of the core business processes. Additional detail is given for *Supply* and *Maintenance* – ie, building on the overall process. It is generally not necessary to go to this level of detail on every engagement, although you may find this useful in both the selling and delivery of professional services to our mining clients. Over time, it is anticipated that similar 'second level' detail will be described for all of the resource management processes.

Resource Management Process: Health and Safety

Process Objectives

- Compliance with current regulations
- Minimise health and safety costs and liabilities
- Create a positive public and employee perception of the company approach to health and safety issues
- Reduce insurance, workers compensation costs and lost work days

Inputs

- Historical compliance information
- Monitoring equipment
- Workers compensation / insurance cost
- Census data of all health and safety information
- Baseline performance information (environmental monitoring prior to and during operations, health of employees, etc)

Activities

- Evaluate the existing health and safety of employees
- Review and analyse historical performance
- Manage health & safety programs to achieve co. goals
- Manage compliance with policies & procedures
- Manage audit, monitoring & improvement programs
- Routinely compile H&S performance information
- Provide information to government agencies
- Manage H&S claims & regulatory inspections
- Monitor and provide input to proposed regulatory legislation

Outputs

- Compliance reports
- Regulatory reports
- Self audit reports
- Performance reports

Systems

- Monitoring database
- Compliance database
- Audit program and follow-up
- Employee records

Classes of Transactions

Routine

- Workers compensation
- Regulatory fines
- Insurance expenses
- Legal expenses
- Production interruptions and losses
- Staff salaries and expenses

Non-Routine

- Accidents
- Employee loss
- Lawsuits

Accounting Estimates

- Provision for self-insured workers compensation, health insurance
- Regulatory fines, legal expenses

Resource Management Process: Health and Safety

Risks Which Threaten Objectives

- Lack of commitment to health and safety goals
- Regulatory violations
- Natural catastrophes
- Poor reputation and public perception
- Poor documentation
- Inadequate response to problems
- Poor implementation of policies, procedures and programs
- Accidents

Controls linked to Risks

Supervision, performance incentives
Monitor compliance with regulations
Contingency plans
Monitor public relations programme
Monitor compliance against standards
Monitor compliance against policies and procedures
Independent review / audit
Monitor health and safety system performance indicators; Supervision

Critical Success Factors (CSFs)

- Health and safety awareness
- Regulatory compliance
- Safety performance
- Positive public and employee perception
- Cost-effective health and safety programmes
- Adequate emergency response planning

KPIs linked to CSFs

Number of training hours vs total hours worked; Lost time incidence frequency rate
Number of reported violations
Lost time incidence frequency rate; Total employee lost workhours vs total hours worked
Number of complaints
Insurance and workers compensation expenses vs total cost of labour; Total employee lost workhours vs total hours worked
Number of mock drills; Number of training hours vs total hours worked

Other Symptoms of Poor Performance

- Low morale
- Graffiti
- Low productivity
- Low availability of equipment
- High accident rates
- High insurance costs

Performance Improvement Opportunities

- Health and safety incentives, awards and recognition
- External audits and risk assessment
- Improve training programmes
- Improved training
- Health and safety awareness campaigns
- Manage people out on disability
- Performance benchmarking
- ` Worker compensation management programmes

Resource Management Process: Environmental

Process Objectives

- Timely and efficient permit and approval process
- Compliance with regulations
- Minimise life-of-mine environmental costs
- Create a positive public and employee perception
- Minimise Board / Executive liability

Inputs

- Baseline environmental data
- Permit application
- Professional staff
- Mine plan
- Regulatory requirements
- Reclamation plan

Activities

- Monitor and evaluate environmental impact of operations
- Manage compliance with policies & procedures
- Develop reclamation plans and revise as needed
- Provide government agencies information as needed
- Manage environmental concerns, claims and government inspections
- Maintain public relations and employee awareness programs
- Monitor and provide input to regulatory legislation
- Acquire and modify permits as needed

Outputs

- Compliance reports
- Reclamation plans
- Permits
- Employee awareness program
- Public relations material
- Environmental reports

Systems

- Environmental management system
- Cost reports
- Regulatory reporting

Classes of Transactions

Routine
- Payroll
- Materials cost
- Insurance

Non-Routine
- Consulting fees
- External audit
- Capital expenditures
- Contamination clean-up costs

Accounting Estimates
- Provision for claims

Resource Management Process: Environmental

Risks Which Threaten Objectives

- Lack of commitment to environmental goals
- Regulatory violations
- Natural catastrophes
- Poor reputation and public perception
- Poor documentation
- Inadequate response to problems
- Poor implementation of policies, procedures and programs
- Accidents

Controls linked to Risks

Supervision; performance incentives
Monitor compliance with regulations
Contingency plans
Monitor public relations programme
Monitor compliance against standards
Monitor compliance against policies and procedures
Independent review / audit
Monitor environmental system performance indicators

Critical Success Factors (CSFs)

- Environmental awareness
- Regulatory compliance
- Environmental performance
- Cost-effective environmental management programmes
- Timeous permit approval
- Positive public and employee perception
- Adequate emergency response planning

KPIs linked to CSFs

Number of reported violations; Amount of penalties incurred
Number of reported violations; Amount of penalties incurred
Number of recognised awards
Cost / unit of land area
Delays to project (days)
Number of complaints
Days delay in resolving environmental mishaps

Other Symptoms of Poor Performance

- Visually unattractive sites
- Litigation
- Special government restrictions

Performance Improvement Opportunities

- Environmental management program
- Performance benchmarking
- External audits and risk assessment of environmental performance and reporting

Resource Management Process: Human Resources

Process Objectives

- Attract and retain skilled and motivated work force
- Control employee costs while maintaining morale and productivity
- Comply with regulatory / tax filing requirements
- Adherence to code of conduct
- Training and development of work force
- Maintenance of sound labour relations

Inputs

- Strategic plan
- Mine plan
- Resource requests
- Conditions of service
- Tax regulations
- Union contracts
- Labour legislation
- Industry statistics and market data
- Training goals/requests
- Personnel feedback

Activities

- Develop and maintain HR policies and procedures
- Establish and maintain compensation and benefits policies and programs
- Recruitment and hiring
- Provide training and development
- Provide performance reviews and counseling
- Monitor union contracts, grievances and discipline
- Monitor compliance with regulations, legislation and process filings

Outputs

- Regulatory filings
- Compensation and benefits policies and administration
- Personnel files
- Tax filings
- Human resource policies/procedures
- Training programs
- Performance reviews
- Payroll and benefits disbursements
- Staffing and cost data

Systems

- Human resource management
- Compensation and benefits
- Tax system
- Regulatory systems
- Cash disbursements/payables systems

Resource Management Process: Human Resources

Classes of Transactions

Routine
- Payroll and benefit expenses
- Training expenses

Non-Routine
- Pensions
- Other post retirement benefits
- Post employment benefits
- Incentive compensation accruals

Accounting Estimates
- Payroll related accruals
- Self-insured medical
- Self-insured workers' compensation
- Self-insured general liability claims
- Pension obligation
- Vacation pay accruals

Risks Which Threaten Objectives

- Labour unrest
- Low productivity
- Poorly motivated staff
- Non-compliance with regulations (tax, labour, etc)
- Lack of personnel with skill sets needed
- Non-competitive compensation packages

Controls linked to Risks

Monitor compliance with agreements and continuous communication with unions and employees

Time measurement, supervision and training

Conduct employee surveys with follow up on results; monitor labour relations and establish employee grievance committees

Monitor compliance with regulations

Monitor compliance with hiring criteria; develop and implement effective training programs

Compare salary costs and incentives to industry norms

Critical Success Factors (CSFs)

- Optimise employee utilisation and productivity
- Minimise downtime due to labour unrest
- Commitment to training and development
- Maintain competitive compensation/benefit packages
- Optimise human resource administration efficiencies

KPIs linked to CSFs

Tonnes mined per employee

Downtime in days due to lack of labour

Training hours per employee; training dollars per employee; percentage of payroll costs

Employee turnover; compensation/benefit levels compared to the industry

Human resource employees / total employees

Resource Management Process: Human Resources

Other Symptoms of Poor Performance

- Low productivity
- High level of absenteeism
- Poor internal communication
- Inconsistent employee management
- Lack of formal documentation
- Fines and penalties for untimely, inaccurate tax and regulatory filings
- High level of complaints from line management
- Employee actions against the company

Performance Improvement Opportunities

- Incentive compensation consulting
- Managed health care studies
- Employee performance reviews and counseling
- Training programme development and implementation
- Claims systems reviews
- Retirement plan reviews
- Tax compensation planning
- Counseling assistance
- Recruitment
- Conduct employee surveys
- Human resource department re-engineering
- Human resource benchmarking
- Policies and procedures manuals development
- Superannuation risk management

Resource Management Process: Information Management

Process Objectives

- Provide appropriate data processing systems which produce relevant operational, financial and compliance related information
- Ensure timely and accurate information processing and reporting, available where required
- Maximise the cost-effectiveness of collecting, processing and distributing information
- Facilitate effective monitoring by management
- Use technology as a business enabler for competitive advantage

Inputs

- Strategic plan
- Mine plan
- Information Technology strategy
- Technology opportunities / constraints
- Past and industry experience
- Trade and research materials
- Users' requests and feedback
- Capital and operating budgets
- Regulatory requirements
- Resource requirements
- Information Risk Management consultation

Activities

Determine the business information (& technology) requirements

Consider current and available systems and experience

Acquire necessary resources and develop / buy systems

Consider and perform required change management

Acquire / train necessary resources and implement system

Maintain the systems

Support the users

Facilitate on-going Info. Risk Management practices by management

Outputs

- User (business) requirement specifications
- User training, including change management
- Approved capital expenditure
- Systems implementation plans
- Information Technology procedures and standards
- Project status reports
- User systems and reports, including control reports
- Business Continuity Plan
- System development (and program change control) methodology
- Assets (hardware)
- Vendor contracts
- Management reports (eg, environmental and treasury)

Resource Management Process: Information Management

Systems

- Core business systems
- Resource management systems
- Financial systems (general ledger and sub-systems)
- Management reporting systems
- Tax and regulatory systems
- Payroll and human resource systems
- Communication systems, including internal (employee) and external
- Change control mechanisms
- All company systems, including software applications used and hardware installed
- All company databases
- Information Risk Management monitoring systems

Classes of Transactions

Routine

- Information technology related costs
- System development related costs
- Capitalisation of information systems costs

Non-Routine

- Depreciation
- Change management costs
- Research costs

Accounting Estimates

- Depreciable lives
- System maintenance costs

Risks Which Threaten Objectives

- The data processing systems do not provide useful, relevant and timely information where this is needed, or lack adequate capacity
- The information systems are not cost-effective
- Multiple software packages from different vendors prevent effective integration, intra-group communication and cost-efficiencies being realised (eg, through training, knowledge sharing and purchasing)
- Inadequate training of information technology personnel and users
- Failure of new systems to meet their intended business objectives
- Disasters prevent the system from operating as intended
- The system lacks reliability, integrity and/or responsiveness

Controls linked to Risks

IT steering committee (including users) to monitor utilisation and adequacy of system; monitor compliance with system development life cycle methodology that includes users

Monitor value-added to the business

Review software and hardware purchases to ensure they will support integration; Independent review / audit

Monitor compliance with training programmes and utilisation of support function

Monitor user acceptance against the system development project plan; monitor realisation of the pre-set objectives

Contingency Plan; Monitor compliance with back-up and record retention procedures

Review of system performance statistics

Resource Management Process: Information Management

Critical Success Factors (CSFs)

- Systems provide timely and accurate information, to the right people at the right place (including to management for monitoring)
- Maximise the cost-effectiveness of the system
- Involve users with acquisition, development and maintenance decisions
- Develop integrated systems that provide cross-functionality and commonality among applications

KPIs linked to CSFs

Information processing cycle time; response time for on-line requests

IT costs as percentage of total costs; cost of IT operations vs outsourcing services

Number of user complaints / requests for change

Number of different software packages from different vendors; number of custom programs vs purchased software

Other Symptoms of Poor Performance

- Slow response to information requests
- Users don't feel involved in development process
- Many manual processes and/or paper reports (especially working around the established system)
- No chargebacks to departments for system use
- IT "empire building"
- System is "down" frequently
- Systems are too old to support integration and other changing business needs
- Slow and reactive system changes, if any, despite user requirements
- High level of information management operating costs
- Re-keying performed
- High IT staff turnover
- Limited use of effective end-user computing
- Users maintain own databases (not integrated)
- Personnel are unproductive due to lack of skills
- Loss of competitive advantage due to delays, inadequacies, etc in the information

Performance Improvement Opportunities

- Contingency planning
- Technology and related controls benchmarking
- Efficiency and effectiveness reviews
- IT strategy
- Package solutions / enterprise package solutions
- Business re-engineering
- Information risk management (including security) analysis
- Outsourcing analysis
- Increased communication (including IT and users)

Resource Management Process: Treasury Management

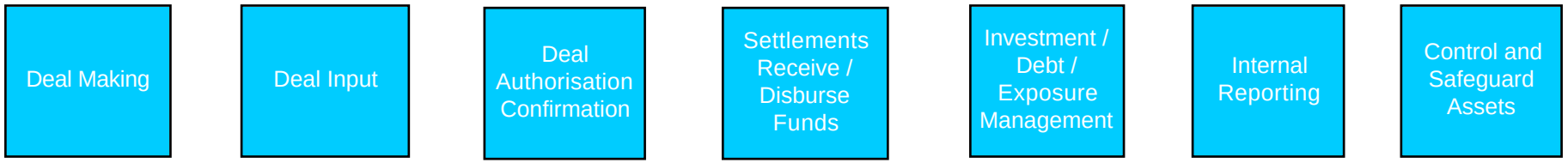
Process Objectives

- Maximise cash flow / investment earnings
- Produce timely, accurate and relevant budgets and financial reports
- Manage financial risk (eg, price, interest, credit, debt, liquidity)
- Produce relevant, timely and accurate information to management
- Manage foreign exchange and commodity price risk exposure

Inputs

- Business plans
- Budgets
- Flash / management accounts
- Financial resources
- Group funding requirements
- Economic environment
- Hedge reports
- Risk exposure reports
- Group company requirements
- Market data / information feeds

Activities



Outputs

- Budgets / forecasts
- Treasury accounting reports
- Investment management
- Investment exposure
- Confirmation, settlement reports
- Exposure management reports
- *Ad Hoc* management reports
- Financial market reports
- Credit exposure reports

Systems

- Cash management
- Settlements
- Financial reporting
- Treasury management
- General Ledger
- Budgeting
- Securities reconciliation
- Deposits / loans

Resource Management Process: Treasury Management

Classes of Transactions

Routine
- Cash receipts / disbursements
- Cash management
- Risk exposure management
- Money market activities
- Foreign exchange activities

Non-Routine

Accounting Estimates
- Mark to market valuation

Risks Which Threaten Objectives

- Liquidity risk
- Market risk (ie, forex, commodity price, interest rate)
- Counterparty credit risk / Exposure risks
- Inaccurate financial / management information
- Fraud / theft
- Unauthorised trading

Controls linked to Risks

Monitor compliance with investment policy; regular review of cash forecasts

Monitor effectiveness of infrastructure to track and react to market changes; monitor effectiveness of treasury management systems

Daily exposure review

Monitor financial information systems; review of reconciliations; internal audit; timeous reporting

Internal control system; segregation of duties; independent review / audit

Daily review of transactions by management; review of exception reports; independent review / audit

Critical Success Factors (CSFs)

- Timely, relevant, accurate financial information
- Relationship with external financing sources
- Efficient operating systems / qualified trained personnel
- Accurate assessment and application of market conditions

KPIs linked to CSFs

Time delay in reporting transactions; return on investment base

Return on investment base; cost of finance; bank charge costs

Costs due to errors made; employee turnover rates; cost of training vs total cost of employment

Return on investment base; cost of finance; quantum of forex profits and losses vs total forex exposure; average forward sales price

Resource Management Process: Treasury Management

Other Symptoms of Poor Performance

- Liquidity crisis
- Adverse movements in market prices
- Over- and under-hedging
- No strategic focus
- Inaccessible / inaccurate information
- Workflow / manual systems
- Divisional complaints
- High tax charges
- Treasury a “cost centre” rather than a “profit centre”
- Unmanaged risk

Performance Improvement Opportunities

- Improved Treasury management system
- Electronic data interchange
- Treasury control review
- Training
- Performance measurement
- Special audit reviews
- Benchmarking studies
- Risk reviews

Resource Management Process: Supply (Overall Process)

Supply						
Determine demand requirements	Determine sourcing strategy	Determine replenishment requirements	Determine source	Order product	Deliver product	System update

Resource Management Process: Supply (Overall Process)

Process Objectives

- To ensure the right product (material, service, information) is delivered to the customer where they want it, in the quantity specified, when required, at the best cost, to specification to meet the specified outcome

Inputs

- Required product
- Where required
- When required
- What quantity required
- Required specification
- Budget requirements ($)

Activities

Outputs

- Forecasts
- Insource / Outsource
- Safety stock
- Replenishment plan (eg, ROP, ROQ)
- Optimal replenishment quantity (eg, EOQ)
- Supplier identified
- Order placement
- Product delivered
- Liability satisfied (eg, AP)

Systems

- Inventory Management
- Purchasing
- Forecasting
- Warehousing
- ASRS (Automatic storage and retrieval systems)
- Accounts Payable
- EDI, EFT/EC
- Barcoding, RF Devices

Classes of Transactions

Routine
- Purchases
- Issues

Non-Routine
- Cataloguing

Accounting Estimates
- Obsolescence
- Provisions for wastage
- Provisions for theft

Resource Management Process: Supply (Overall Process)

Risks Which Threaten Objectives

- Forecast error, long lead times
- Incomplete or inaccurate maintenance and production schedules
- Incomplete or inaccurate material requirements
- Supplier's incapability to meet requirements
- Limited number of potential suppliers
- Costly or undependable transport options
- Lack of process definition
- Lack of understanding of expected performance
- Lack of a safety / hazardous material plan
- Untimely information
- Inaccurate information (eg, on-hand stock)
- Inadequate budgets

Controls linked to Risks

Safety stocks
Supply and operations planning process
Accurate Bill of Materials structure
Supplier reviews / performance management
Supplier agreements
Transport agreements
Supply procedures
Customer service performance measures; Service level agreements with the customer (product criticality)
Safety policies and procedures; Security / theft management
Real-time processing of data
Data input edit and validation checks; cycle counting
Improve planning

Critical Success Factors (CSFs)

- Minimal inventory investment
- Supplier delivery performance against specification
- Supplier delivery performance against commitment
- Customer delivery turn-around time
- Minimal procurement, transportation, warehousing and personal costs
- Obsolescence costs / write-offs
- Minimal shrinkage
- Scheduled delivery requests

KPIs linked to CSFs

Inventory turns
Percentage rejects
Percentage of products delivered in full on time; number of products on back-order
Percentage unscheduled requested delivered within agreed time
Cost of supply as a percentage of the operating budget
Percentage inventory written-off annually
Percentage inventory lost or unaccounted for
Number of work order requests not delivered on time, complete

Other Symptoms of Poor Performance

- Low morale
- Inconsistent procedures
- Late deliveries
- Staff turnover
- Maintenance downtime
- Production downtime

Resource Management Process: Supply (Overall Process)

Performance Improvement Opportunities

- Education
- Training
- Consistent performance management
- Rewards
- Benchmarking
- Supplier partnering programs
- Customer surveys
- Use of technology
- Business Process Re-engineering
- Activity based management

Resource Management Process: Supply

Sub Process: Determine Demand Requirements

Process Objectives

- To determine scheduled and unscheduled future demand requirements

Inputs

- Maintenance requirements
- Production requirements
- Item forecasts

Activities

Outputs

- Demand requirements identified
- Scheduled demand requirements
- Customer

Systems

- Forecasting
- Maintenance parts scheduling

Classes of Transactions

Routine
- Order

Non-Routine
- Cancelled orders

Accounting Estimates
- Demand variance

Risks Which Threaten Objectives

- Forecast error
- Long lead times
- Incomplete or inaccurate maintenance and production schedules

Controls linked to Risks

Safety stock
Supply and operation planning process
Timely, accurate material supply system

Resource Management Process: Supply

Sub Process: Determine Demand Requirements

Critical Success Factors (CSFs)

- Minimal inventory investment
- Minimal changes to demand plan within lead time

KPIs linked to CSFs

Inventory turns
Stability of purchasing schedule

Other Symptoms of Poor Performance

- Maintenance downtime
- Production downtime

Performance Improvement Opportunities

- Education
- Training
- Use of technology

Resource Management Process: Supply

Sub Process: Determine Sourcing Strategy

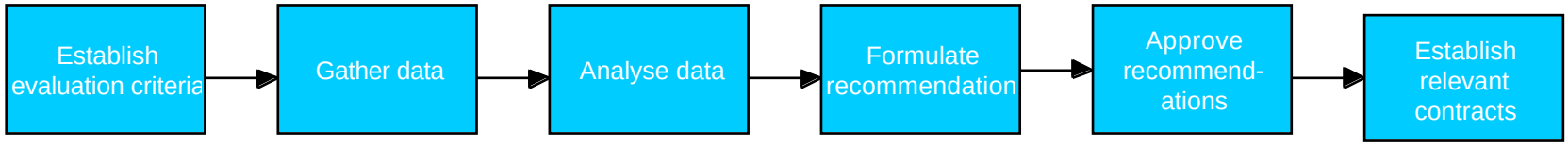
Process Objectives

- To determine the appropriate sourcing strategy to minimise total cost while ensuring service levels are met and core competency is retained.

Inputs

- Detailed requirements schedule
- Required product
- Required specification
- Existing capability
- Item criticality
- Lead time flexibility
- Strategic significance
- Economic options
- Cycle times
- Evaluation criteria

Activities



Outputs

- Sourcing strategy (inhouse / outsource)

Systems

- Vendor evaluation / outsource evaluation tools

Classes of Transactions

Routine
- N/A

Non-Routine
- N/A

Accounting Estimates
- Cost to re-establish in-house capability

Resource Management Process: Supply

Sub Process: Determine Sourcing Strategy

Risks Which Threaten Objectives

- Costs of supply being too high
- Supplier's incapability to meet requirements
- Limited number of potential suppliers

Controls linked to Risks

Safety stocks
Supplier reviews / performance management
Supplier agreements

Critical Success Factors (CSFs)

- Supplier delivery performance against specification

KPIs linked to CSFs

Cost of supply as a percentage of the operating budget

Other Symptoms of Poor Performance

- Late deliveries
- Too many suppliers
- Maintenance downtime
- Production downtime

Performance Improvement Opportunities

- Supplier partnering programs
- Alternate sourcing planning

Resource Management Process: Supply

Sub Process: Determine Replenishment Requirements

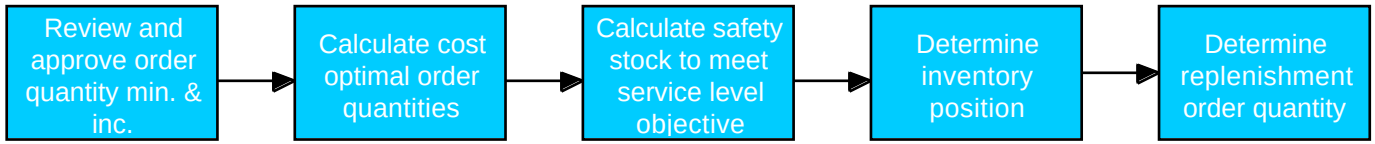
Process Objectives

- To determine replenishment requirements to satisfy demand while minimising changes within lead time, minimising total cost and maximising service

Inputs

- Required product
- Where product required
- When product required
- What quantity required
- Required specification

Activities



Outputs

- Replenishment plan
- Optimal replenishment quantity
- Safety stocks

Systems

- Forecasts
- Inventory management

Classes of Transactions

Routine
- Purchases

Non-Routine
- Order quantities

Accounting Estimates
- Inventory accuracy

Resource Management Process: Supply

Sub Process: Determine Replenishment Requirements

Risks Which Threaten Objectives

- Forecast error
- Long lead times
- Incomplete or inaccurate maintenance and production schedules
- Incomplete or inaccurate material requirements

Controls linked to Risks

Safety stocks
VMI programs
Supply and operations planning
BOM accuracy

Critical Success Factors (CSFs)

- Minimal inventory investment
- Minimum cost
- Delivering on time

KPIs linked to CSFs

Inventory turns
Average cost of supply item, order
Customer Service Levels

Other Symptoms of Poor Performance

- Maintenance downtime
- Production downtime

Performance Improvement Opportunities

- Education
- Training

Resource Management Process: Supply

Sub Process: Determine Source

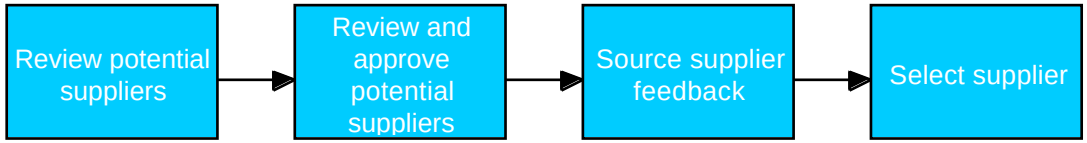
Process Objectives

- To determine the supply source for an order

Inputs

- Sourcing strategy
- Required product
- Where product required
- When product required
- What quantity required
- Required specification
- Supply contracts
- Vendor responses
- Manufacturing warrantee

Activities



Outputs

- Supplier identified
- Quantity
- Price
- Delivery data

Systems

- Purchasing
- Accounts Payable

Classes of Transactions

Routine
- Purchases

Non-Routine
- Order quantities

Accounting Estimates
- Inventory accuracy

Resource Management Process: Supply

Sub Process: Determine Source

Risks Which Threaten Objectives

- Supplier's incapability to meet requirements
- Limited number of potential suppliers
- Failure to realise target margins
- Not enough lead time

Controls linked to Risks

Supplier reviews / performance management
Alternate source contingency plans
Contracts
Inventory

Critical Success Factors (CSFs)

- Timely and complete merchandise delivery
- Realised margin to target
- Quality of product

KPIs linked to CSFs

Percentage of products delivered on time
Product return percentage
Reject percentage

Other Symptoms of Poor Performance

- Late deliveries
- Too many suppliers
- High cost of processing

Performance Improvement Opportunities

- Supplier partnering programs
- Contingency sourcing planning

Resource Management Process: Supply

Sub Process: Order Product

Process Objectives

- To order product from identified supplier

Inputs

- Identified supplier
- Required product
- Where product required
- When product required
- What product required
- Required specification

Activities

Outputs

- Order placement
- Product received

Systems

- Purchasing
- Inventory management

Classes of Transactions

Routine
- Purchases

Non-Routine
- Order quantities

Accounting Estimates
- Inventory accuracy

Resource Management Process: Supply

Sub Process: Order Product

Risks Which Threaten Objectives

- Supplier's incapability to meet requirements

Controls linked to Risks

Supplier review s / performance management

Critical Success Factors (CSFs)

- Customer delivery turn-around time
- Minimal procurement, transportation, warehousing and personnel costs

KPIs linked to CSFs

Percentage of products delivered on time
Gross margin

Other Symptoms of Poor Performance

- Late deliveries
- Maintenance downtime
- Production downtime
- Low gross margins

Performance Improvement Opportunities

- Customer surveys
- Profit analysis

Resource Management Process: Supply

Sub Process: Deliver Product

This Resource Management Sub Process is under development. Please refer to the overall Supply Resource Management Process for further information.

Resource Management Process: Supply

Sub Process: System Update

Process Objectives

- To update system for product purchase and payment of supplier

Inputs

- Quantity purchased
- Price
- Supplier

Activities

Outputs

- Liability satisfied

Systems

- EDI
- Inventory management
- Accounts payable

Classes of Transactions

Routine
- Purchases
- Issues

Non-Routine
- Cataloguing

Accounting Estimates
- Provision for obsolescence

Resource Management Process: Supply

Sub Process: System Update

Risks Which Threaten Objectives

- Lack of process definition
- Inaccurate information

Controls linked to Risks

Real-time processing of data
Data input edit and validation checks, cycle counting

Critical Success Factors (CSFs)

- Supplier satisfaction

KPIs linked to CSFs

Accounts payable ageing

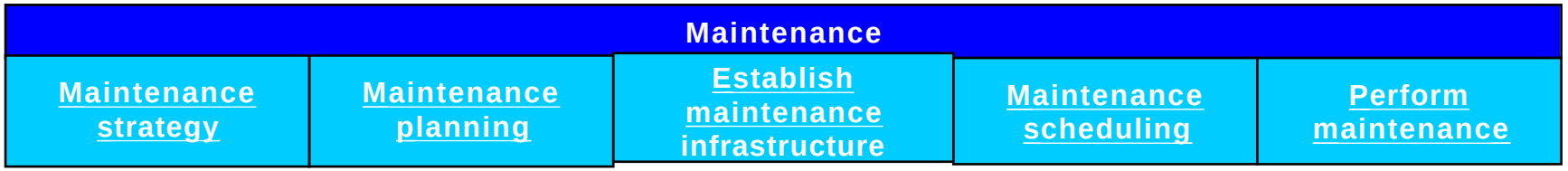
Other Symptoms of Poor Performance

- Low morale
- Inconsistent procedures
- Uncooperative suppliers

Performance Improvement Opportunities

- Education
- Training

Resource Management Process: Maintenance (Overall process)



Resource Management Process: Maintenance (Overall process)

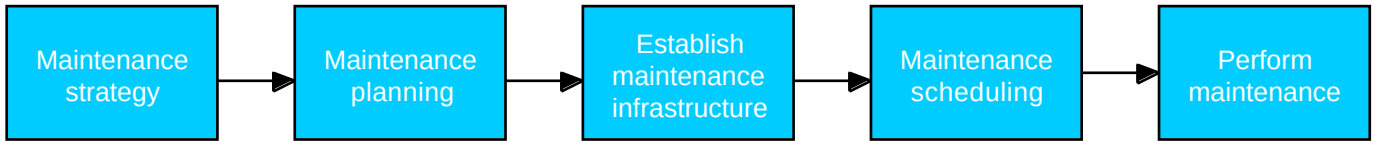
Process Objectives

- To ensure plant and equipment is available when required at the lowest possible life cycle cost

Inputs

- MTBF
- Availability requirements
- Resource availability / capability
- Budgets / cost targets
- Parts availability
- Warranty data

Activities



Outputs

- Plant and equipment available to meet customer requirements at target cost

Systems

- Database of equipment history
- Bill of Materials (BOM)
- Maintenance Bill of Materials
- Maintenance / parts scheduling
- Warrantee tracking
- Contract management

Classes of Transactions

Routine
-
-
-

Non-Routine
-
-
-

Accounting Estimates
-
-
-

Resource Management Process: Maintenance (Overall process)

Risks Which Threaten Objectives

- Information accuracy / availability / timeliness / accountability
- Inadequate skill (human resources)
- Deferring maintenance from scheduled requirements

Controls linked to Risks

Benchmarking; regular data updates; performance reviews
Training
Monitor compliance with, and manage deviations from, the maintenance plan

Critical Success Factors (CSFs)

- Skills of workforce
- Time to perform tasks
- Systems quality
- Cost of maintenance
- Percentage planned and unplanned maintenance

KPIs linked to CSFs

Percentage multi-skilled; minimum update training per year per employee; ratio multi-skilled / unskilled
Benchmarking and percentage time planned maintenance completed on schedule
Benchmarking
Budgets
Benchmark and set target ratio

Other Symptoms of Poor Performance

- Housekeeping
- Employee turnover
- Emergency repairs

Performance Improvement Opportunities

- Maintenance planning
- Life cycle costing
- Cross training
- Outsourcing

Resource Management Process: Maintenance

Sub Process: Maintenance Strategy

Process Objectives

- To determine how, by whom, where and when maintenance will be performed on a specific piece of maintainable equipment / infrastructure

Inputs

- Life and type of maintenance recommendations (hours use, time)
- MTBF
- Resources / competence

Outputs

- Repair / replace
- Insource / Outsource

Systems

- Database of previous, economically significant, performance of similar / same type of equipment / infrastructure
- Financial analysis process to determine repair / replace

Classes of Transactions

Routine	Non-Routine	Accounting Estimates
•	•	•
•	•	•
•	•	•

Risks Which Threaten Objectives

- Information availability
- Information accuracy
- On-going resource quality and availability

Controls linked to Risks

Supplier information
Benchmarking information

Resource Management Process: Maintenance

Sub Process: Maintenance Strategy

Critical Success Factors (CSFs)

- Extending the MTBF time (quality)
- Lowest cost consistent with targeted availability

KPIs linked to CSFs

Maintenance cost per unit of time (MTBF etc); Maintenance cost per productive output / throughput
Maintenance of equipment average target

Other Symptoms of Poor Performance

- Low morale
- Customer dissatisfaction
- Not meeting availability targets

Performance Improvement Opportunities

- Benchmarking
- Maintenance cost over time vs new buys

Resource Management Process: Maintenance

Sub Process: Maintenance Planning

Process Objectives

- Establish maintenance resources (people and infrastructure) required to perform task

Inputs

- Source / location of resources
- Costs of resources / choices
- Use profile

Activities

Analysis / Identify
- Infrastructure
- People

Outputs

- Maintenance hours
- Infrastructure requirements (extent / location)
- People requirements (skills)

Systems

- Data storage / retrieval
- Financial analysis process

Classes of Transactions

Routine	Non-Routine	Accounting Estimates
•	•	•
•	•	•
•	•	•

Resource Management Process: Maintenance

Sub Process: Maintenance Planning

Risks Which Threaten Objectives

- Poor data or use
- Unskilled planners

Controls linked to Risks

Benchmark and random audits of internal data
Training

Critical Success Factors (CSFs)

- Planning skills
- Analytical skills

KPIs linked to CSFs

Actual planned maintenance hours vs budget hours

Other Symptoms of Poor Performance

- Inadequate resources
- High costs

Performance Improvement Opportunities

- Maintenance infrastructure benchmarking
- Partnership relationship with contractors
- Extended equipment supplier performance warranties

Resource Management Process: Maintenance

Sub Process: Establish Maintenance Infrastructure

Process Objectives

- Provision of maintenance infrastructure in the form of facilities (plant / equipment) and people, and the training of people in use of same

Inputs

- Estimated maintenance time / unit or item
- Estimated required maintenance infrastructure: size, number of people, facilities

Activities – facilities

Activities – people

Outputs

- Infrastructure delivery
- Infrastructure acquisition
- Infrastructure establishment

Systems

- Procurement

Resource Management Process: Maintenance

Sub Process: Establish Maintenance Infrastructure

Classes of Transactions

Routine	Non-Routine	Accounting Estimates
•	•	•

Risks Which Threaten Objectives

- Overrun on time
- Skilled people not available

Controls linked to Risks

Late penalties
Outsource

Critical Success Factors (CSFs)

- Project management competency

KPIs linked to CSFs

Availability of resources to time and cost budgets

Other Symptoms of Poor Performance

- Time and cost overruns
- Excess resources

Performance Improvement Opportunities

- Benchmark other facility costs

Resource Management Process: Maintenance

Sub Process: Maintenance Scheduling

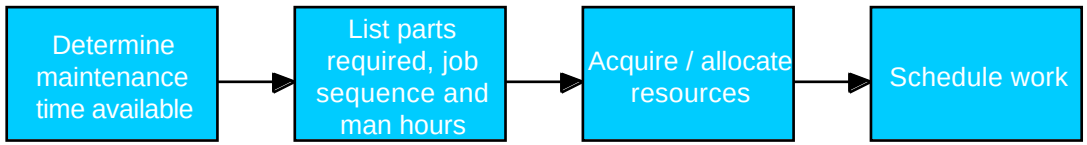
Process Objectives

- Generate maintenance schedules which deliver targeted availability at lowest possible cost
- Generate maintenance bill of materials and hence parts required
- Track warranty performance, item by item

Inputs

- Production schedule
- MTBF and last service
- Warranty position, item by item
- Maintenance resources: plant /equipment and people; in-house and external

Activities



Outputs

- Maintenance schedule
- Parts list
- Warranty list

Systems

- Link to supply
- MTBF database
- Warranty database
- Contractor list / job bid process

Classes of Transactions

Routine
-
-
-

Non-Routine
-
-
-

Accounting Estimates
-
-
-

Resource Management Process: Maintenance

Sub Process: Maintenance Scheduling

Risks Which Threaten Objectives

- Out of date / inaccurate data
- Implementation skills deficiency

Controls linked to Risks

Critical Success Factors (CSFs)

- Understanding practical limitations of maintenance jobs
- Sufficient but not excessive detail
- Database maintenance

KPIs linked to CSFs

Percentage jobs scheduled vs planned
Percentage jobs completed vs scheduled
Percentage parts available vs required

Other Symptoms of Poor Performance

- Poor scheduling outcomes
- Poor data
- Excessive time to deliver schedules

Performance Improvement Opportunities

Resource Management Process: Maintenance

Sub Process: Perform Maintenance

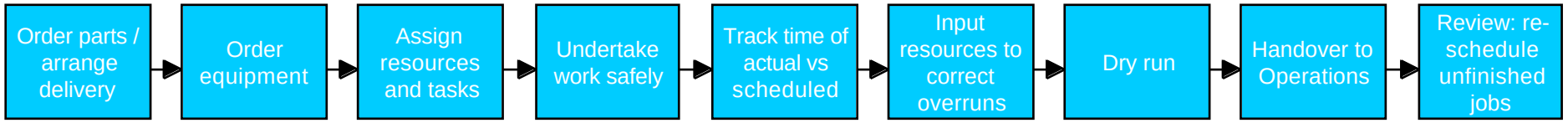
Process Objectives

- Undertake the scheduled maintenance activities within the allotted timeframe and budget

Inputs

- Maintenance schedule
- Parts available
- Job sequence / people assignment
- Equipment required
- Warranty list

Activities



Outputs

- Completed jobs
- Updated performance history
- Warranty claims

Systems

- Equipment life database (MTBF)
- Warranty list
- Service level (ex supply)

Classes of Transactions

Routine
-
-
-

Non-Routine
-
-
-

Accounting Estimates
-
-
-

Resource Management Process: Maintenance

Sub Process: Perform Maintenance

Risks Which Threaten Objectives

- Poor resource estimates
- Poor co-operation between maintenance and operations, and maintenance and supply

Controls linked to Risks

Benchmarking; historical data
Individual KPIs

Critical Success Factors (CSFs)

- Estimating skills
- Implementation skills (communication and resource skill level)

KPIs linked to CSFs

Percentage jobs completed vs scheduled
Percentage time taken per budget (scheduled); Actual costs vs budget

Other Symptoms of Poor Performance

- Time overruns
- Jobs not done
- Breakdowns

Performance Improvement Opportunities

- Supplier performed maintenance with warranty

Resource Management Process: Asset Custody

Process Objectives

- Reduce the risk of the loss of assets, principally through theft, to an acceptable level
- Encourage an increased responsibility and control consciousness throughout the organisation
- Minimise financial loss and disruption to the business in the event of theft
- Manage insurance programmes

Inputs

- Risk ratings (profiles)
- Past and industry experience
- Feedback from insurers
- Value of assets held
- Location of assets
- Asset inventory
- Cultural / industry specific issues
- Definition of responsibilities

Activities

Rate the risk of all significant assets (likelihood & potential impact)

Assess the cost-effectiveness of current security

Design / develop / modify security systems

Implement the system

Monitor the security systems in place

Perform special fraud investigation

Prepare cases for prosecution

Outputs

- Security policy
- Security systems
- User procedures
- Risk analysis
- Defined responsibilities
- Insurance certificates
- Unique branding / marking
- Effective communication (and reactions)

Systems

- Clean / dirty change houses
- Surveillance (manual and electronic)
- Gate checks and other spot checks
- Disciplinary procedures
- Insurance program
- Inventory stocktaking
- Requisition authorisation

Classes of Transactions

Routine

- Cost of maintaining the security systems

Non-Routine

- Write-off of losses through actual theft (known)
- Cost of installing security systems

Accounting Estimates

- Provisions for undiscovered losses (unknown)

Resource Management Process: Asset Custody

Risks Which Threaten Objectives

- Complacency
- Circumvention of systems

Controls linked to Risks

Supervision; training; monitor compliance with policies
Independent review / audit; security surveillance systems

Critical Success Factors (CSFs)

- Minimise losses
- Employee buy-in
- Back-up resources

KPIs linked to CSFs

Cost of losses vs total asset base
Cost of losses vs total asset base
Days delay in production; cost due to delay in production

Other Symptoms of Poor Performance

- Low staff morale
- Unusually high incidents of theft
- Unavailability of materials and supplies
- Employees living beyond their means
- Increasing premium costs (not being insurable)

Performance Improvement Opportunities

- Forensic accounting
- Advise on security procedures
- Criminal prosecution