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Standardising and optimising the project development lifecycle: Standardisation of project development lifecycle naming conventions

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STANDARDISING AND OPTIMISING THE PROJECT DEVELOPMENT LIFECYCLE

Standardisation of project development lifecycle naming conventions

RICHARD WITTIG

INTRODUCTION

In 2010–11, the Australian mining sector was spending at record levels, mineral exploration expenditure was double the average annual expenditure in the previous 30 years (BREE, April 2012). Although, since then, the industry has been reported to be in a downturn, BREE (Oct 2012)has identified that there are still 388 listed projects within Australia, with a total value of $663 billion. As listed in Table 1.1, 87 of these projects are currently in execution and 24 projects have recently been completed, having a combined value of $280 billion. There are 106 publicly announced projects in the project development phase and 171 projects in the feasibility phase, with a combined value of $383 billion.

TABLE 1.1

Status of Minerals Projects in Australia (BREE, Oct 2012)

STATUS OF PROJECTS	NO. PROJECTS	VALUE OF PROJECTS
Recently completed	24	$280 billion
In execution	87	
In project development phase	106	$383 billion
In feasibility phase	171	
	388	$663 billion

By value, project development holds 57% of the forecast capital expenditure and 71% of the planned projects. With average prices for projects increasing by 100 fold since 1998 (BREE, April 2012) the project development phases have never been more critical. These key study phases ensure that proposed projects align with current business strategy as well as provide confidence in long term asset viability during international economic downturns (Smith, Anderson, & Pearson-Taylor, 2006).

The project development phases in the Australian coal mining and processing industry are similar to those used in front end loading for oil and gas development in stages and maturity; however there is no common naming convention for the project development phases in the Australian coal sector. This is causing pricing and estimate accuracy confusion between government agencies, mine developers, engineering, procurement and construction management (EPCM) providers as well as vendors and industry bodies.

The aim of this paper is to outline the naming conventions in current use in coal industry project development phases, the variations between them, and how they can be standardised to assist the wider infrastructure industry to better understand the phases of the project development lifecycle as well as increase accuracy in government agency forecasting.

Standard naming conventions and standard estimate accuracy requirements are presented for the study phases through the project development phases. The use of standard terminology will reduce the ambiguities associated with estimate development and accuracy requirements which currently arise between government agencies, mine developers/owners and EPCM providers. In addition, this paper proposes an optimised standard project development lifecycle to promote a broader understanding of the project development lifecycle within the industry.

THE ROLE OF PROJECT DEVELOPMENT

The role of project development is to develop definition of the capital project scope and deliverables to meet business objectives and the required approval process through a number of distinct phases (Independent Project Analysis,

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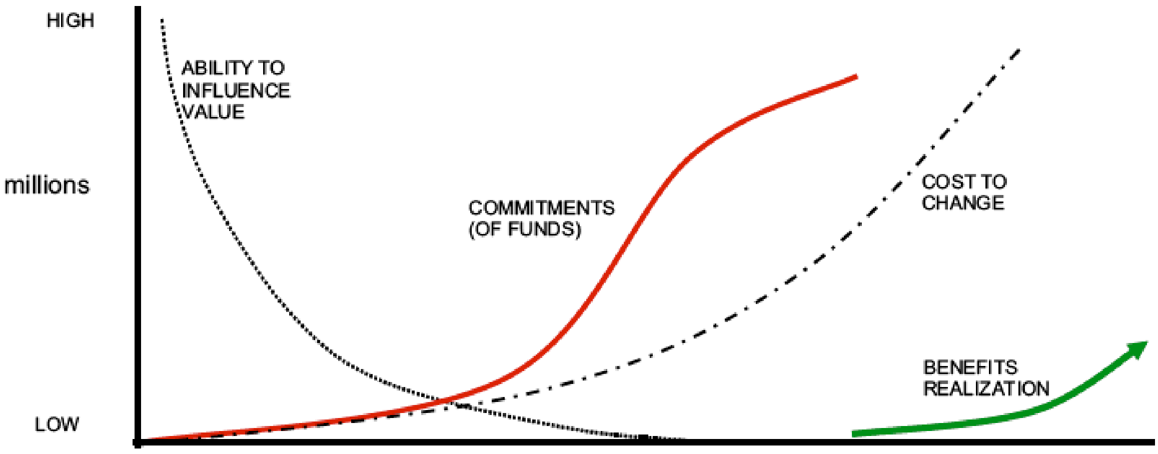
FIGURE 1.1

The influence and time relationship over a project lifecycle (linear) (Anglo American, 2009)



2004). The project development process starts from the initial business idea and includes all work prior to making the financial investment decision (FID) to start project execution.

The purpose of each project development phase is to further refine the level of maturity required for sound investment, risk and project portfolio evaluation purposes to ensure the maximum benefits are realised (Mackenzie & Cusworth, 2007; Madic, Trujic, & Mihajlovic, 2011). Project development phases consist of multiple studies which provide outputs to support the mine development investment process. These phases proceed via a stage-gate approval process and each phase further defines the maturity of the project to ensure the maximum project value is realised.

The maximum ability to influence value for the project occurs in the early project development phases. As the project progresses through the subsequent phases the implementation of change has a disproportionate effect on cost, as seen in Figure 1.1 (Mackenzie & Cusworth, 2007).

Therefore the project development phases are a staged approach to identify, develop and propose the best value option for execution of a proposed project.

GOVERNMENT NAMING CONVENTIONS

The Bureau of Resources and Energy Economics (BREE) is an economic research unit within the Australian Department of Resources, Energy and Tourism. BREE provides independent, high quality economic and statistical research as well as data, analysis and advice to governments, industries and other stakeholders on issues affecting Australia's energy and resources sectors (BREE, 2012).

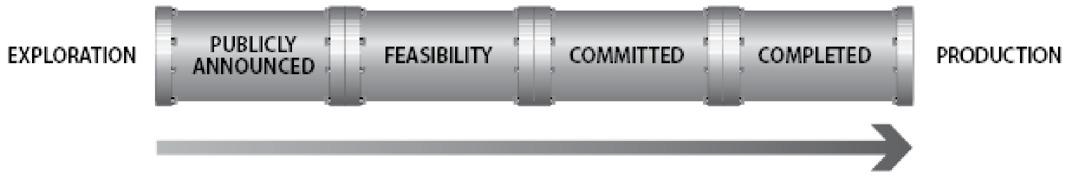
BREE was formed in July 2011 and prior to this it was known as Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES). ABARES provided a wider scope of research analysis and advice for governments and major stakeholders on significant issues affecting Australia's agriculture, fisheries and forestry industries. ABARES history dates back 65 years to 1945 (ABARES, 2012).

Until October 2012, BREE's standard naming convention consisted of a two-class binary method to identify energy, mining or infrastructure projects as being "less advanced" or "advanced". Projects that had not received financial investment decision (FID) were classified as "less advanced projects" and those that did have FID were allocated "advanced" project status. Therefore all project development studies fell under the classification of "less advanced" (BREE, April 2012).

BREE identified that this area required to be more transparent and in October 2012 released a revised naming convention comprising four stages which move from left to right, from exploration through to production as shown in Figure 1.2. The project development stages are classified into two areas, Publicly Announced and Feasibility. The remaining two project stages are classified as Committed and Completed.

FIGURE 1.2

Stages of the Investment Pipeline (BREE, Oct 2012)



The Publicly Announced stage includes projects that are either at a very early stage of planning or have been put on hold due to an unclear development path. Generally, these studies/projects have completed substantial resource and geological definition and undertaken some early studies to gain an understanding of the engineering required. In most cases they have also developed a commercial model to assess the economic viability of the proposed development. The objective of these studies is to determine if the project is viable and as a consequence not all projects in the publicly announced stage become operational facilities (BREE, Oct 2012).

The feasibility stage of the project development cycle is where initial pre-feasibility studies are complete and the economic assessment supports further development of the study/project. This stage includes all work required to further understand environmental impacts, risk exposure, and engineering development to support a final estimate that will be used as the basis for the FID. Once the FID is received, the project is classified as a committed project. If the project is does not receive FID it is then re-classified as a publicly announced project which may be on hold pending better market pricing or industrial conditions.

When projects are near completion, or have become operational, they can be classified as completed. The completed projects remain on the register for up to three years after construction to provide an on-going record of the Australian mining investment pipeline.

NAMING CONVENTIONS USED BY MINERS, EPCMS AND INDUSTRY BODIES

The project development phases in the Australian coal mining and processing industry are similar to those used in front-end loading for oil and gas development. Unlike the oil and gas industry, the coal mining and processing industry has no common or standard naming convention for the project development phases. Each individual organisation generally has its own modified standards and terminology for each project development phase and deliverables. This creates a considerable amount of confusion between the parties involved in developing a project (e.g. mine developers, EPCM providers and suppliers) and also results in inefficiencies in engineering development and the estimating process because the same terminology may require different levels of engineering deliverables.

Generally, mine developers and EPCM providers have between three and four phases in the project development lifecycle, whereas BREE classifies this body of work into two phases for reporting purposes. The EPCM providers also use different terminology for the different phases of the project development cycle.

Considering the wide variation in naming conventions and estimate accuracy requirements across government agencies, mine developers, EPCM providers and vendors, a common or standard approach would have significant benefits.

The common approach proposed in this paper is a four-stage project development lifecycle, as shown in Figure 1.3, including standardised terminology and proposed capital cost estimate accuracy requirements (Anglo American, 2009;Golding, 2009). The standard description for each project development phase reflects the phase objectives and takes account of the wider responsibilities and integration requirements of each phase.

FIGURE 1.3

Standardised Project Development Lifecycle and Estimate Accuracy

The use of a standard approach to the project development lifecycle phases and estimate accuracy requirements will reduce the ambiguities that occur between all parties involved in project development, and increase industry efficiency during project development phases. It will also improve the capital cost accuracy on nationally reported projects which have been the focus of assessing if a project has been successful on a cost basis only.

RESOURCE PLANNING PHASE – STANDARD OUTLINE

According to Williams and Samset (2010) a project begins with the corporate strategy. This is particularly important for large one-off projects which usually start with the resource planning process when the initial idea is conceptualised.

The purpose of the Resource Planning Phase is to identify deficiencies and gain confidence in the geological data from existing assets as a basis for the project pipeline development (Anglo American, 2008). This phase also identifies all value adding business alternatives and outlines a preferred approach to develop a potentially viable asset (Anglo American, 2009). At this initial stage of the project development cycle, uncertainty about the future is high and tolerance of project uncertainty is required (Atkinson, Crawford, & Ward, 2006).

A company's project pipeline, developed in the Resource Planning Phase, provides internal competiveness between projects and strategies which ensure the focus remains on higher value projects (Anglo American, 2009). This focus on delivering corporate strategy is a key component of organisational success and long term growth (Aitken & Crawford, 2012).

The body of work involved in resource planning generally includes a high level assessment based on current resource assets overlayed with project costs based on benchmarking data or factored project pipeline costs from recently estimated or executed projects (Golding, 2009). This phase is usually completed within three to six months.

If the resource planning opportunity gains approval through the stage-gate process, it will proceed to the Concept Study Phase. If not, the opportunity will be re-assessed in the Resource Planning Phase and recycled as required.

CONCEPT STUDY PHASE – STANDARD OUTLINE

The purpose of a concept study is to define the future potential of a project, reduce sub-optimal alternatives and determine if there is sufficient justification to continue to the next phase of development (Noort & Adams, 2006). This work involves understanding and leveraging off the optionality generated in the Resource Planning Phase.

The Concept Study report should outline clear objectives, identify how the project fits into the program and project portfolio and is portrayed in a business perspective (Anglo American, 2009). It also outlines the project risk profile and its potential impact on development.

Generally the Concept Study is a mix of benchmark, production or capacity factored top down cost estimates based on typical industry processing technology (Golding, 2009). At the relevant time the Concept Study is reviewed through a stage-gate process and assessed against the maturity of optionality and alignment with the business strategy and risk profile.

If the project can demonstrate it has the capacity to deliver strategic objectives and has an acceptable risk profile, it will generally progress to the pre-feasibility study phase. If the project does not gain support through the stage-gate process it can be recycled to the resource planning phase or returned to the start of the concept phase (Mackenzie & Cusworth, 2007).

The concept study phase is usually completed within three to six months, excluding associated approval and review time which generally adds two months to large projects.

PRE-FEASIBILITY PHASE – STANDARD OUTLINE

The pre-feasibility study phase incorporates two stages, opportunity framing and go forward alternative.

The opportunity framing stage is primarily focused on assessing all valid options and identifying the best value case. It also promotes creative thinking which captures strategic drivers and objectives to select a preferred option (Price Waterhouse Coopers, 2012). The second stage of the prefeasibility study involves validating that the go-forward alternative case will retain value as project maturity increases and the level of contingency decreases. The pre-feasibility phase is by far the most complex and ambiguous of the project development lifecycle due to the number of potential options as well as the change from top down factored capital costs to a mix of bottom up and factored quantities which need to be produced and assessed.

PRE-FEASIBILITY PHASE – OPPORTUNITY FRAMING

The mine development themes are generally combinations of options. These are developed in the Concept Study Phase through an opportunity framing process in which operational and business unit stakeholders identify the potential development options in a workshop environment (Da Siva, Gillespie, & Buckeridge, 2012). The themes generally include:

- High Capex/Low Opex
- Mid Capex and Opex
- Low Capex
- Speed to Market
- Efficient.

The high capex/low opex option is generally used for assets with a long operating life where there are considerable resources to sustain long term operations and to build for maximum throughput. This theme may also be known as the "Big and Bold" approach because it involves installing large fully automated equipment to gain the low operating cost benefits required for the long term operating facility.

The balanced approach, or the mid capex and opex theme, involves an industry standard option utilising designs from current profit-making operating facilities. This considers the initial capital cost whilst understanding the long term operating cost implications. This option also includes a provision for expansions although not usually for duplications.

The low capex approach or "scrooge" approach identifies the minimum capital required to develop the mining operation whilst incurring the associated operation cost increase with a low capex alternative, such as additional use of mobile equipment. This theme often includes major expansion and duplication allowances in later years to increase throughput when cash becomes more readily available.

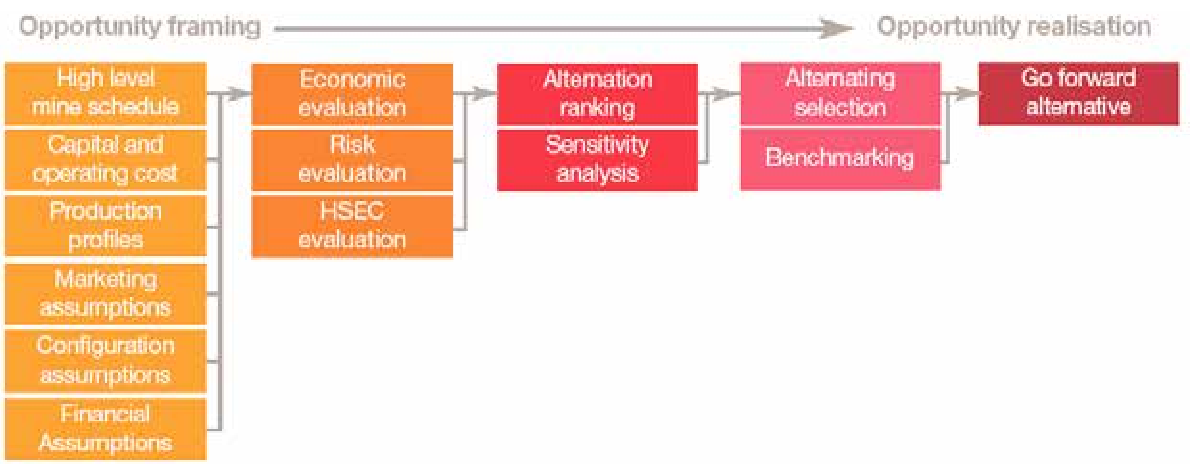
When there is product shortfall or the market forecast indicates an opportunity to increase production, the speed to market theme is incorporated. This theme assesses the cost associated with developing a producing facility within the opportunity timeframes. It is usually a variation of the mid capex or low capex approach.

The efficient theme is purely a production variation made up of the previous options which identifies the most economical operation considering the step changes in capital cost to which some of these options are exposed.

The themes are scoped and high level deliverables are developed from which capital and operating costs can be forecasted, as described by Price Waterhouse Coopers in Figure 1.4.

FIGURE 1.4

Opportunity Framing Process (Price Waterhouse Coopers, 2012)



The deliverables are generally developed to concept level capital cost estimate which is a factored top down estimate. Once all deliverables are completed, each theme and sub-option is financially modelled and risk assessed to ensure the best long term value option is selected, as can be seen in Figure 1.4.

Prior to selecting the go forward alternative a rigorous benchmarking process is undertaken by a third party to validate the alternative selection estimates and assumptions. This process also identifies the key drivers and risks associated with each option and the organisation's risk appetite for the development of the preferred option.

At this stage of the project development, market conditions and short to mid-term supply forecasts have emergent strategy impacts and may introduce additional or reduced optionality into the assessment process which was not identified or taken forward from the Concept Study (Mintzberg, Fall 1987). This is primarily due to the time taken for the studies to get to this stage. The preferred option is subjected to a mid-point stage gating process where the optionality is assessed against the business strategy and objectives.

PRE-FEASIBILITY PHASE – GO FORWARD ALTERNATIVE

The second stage of the pre-feasibility study involves validating that the selected case will retain value as the project maturity increases and the level of contingency decreases. At this point the majority of the deliverables and estimates change from a factored or top down methodology to a more quantifiable bottom up basis and this has a considerable impact on the project resources and workload.

At the end of the options assessment, the best value case is audited via the stage-gate process to ensure it has the potential to deliver the benefits identified in the first stage of the pre-feasibility study. If the project submission is not successful in the stage-gate review, it may be recycled to the initial optionality framing stage of the pre-feasibility phase or even recycled to the start of the concept phase.

Overall this is the most complex of the four study phases because of the dynamic nature of optionality refinement, assessment and selection (Collyer, 2009). This complexity is compounded by the integration alignment of key stakeholders from business, project, program and portfolio management. This alignment and agreement to project success then transfers into corporate success (Cook-Davies, 2002).

FEASIBILITY PHASE – STANDARD OUTLINE

The main objective of the feasibility study phase is to validate all previous design and economic assumptions as well as ensure the project aligns with both internal and external benefits (Bruzelius et al, 2002). This is the longest and most detailed of the four phases.

The feasibility study provides a complete analysis of the project and its risk profile, justifies the project implementation, provides investment or funding basis for the project and supplies a detailed framework for monitoring cost control (Anglo American, 2008).

This phase includes considerable value improvement processes which according to independent project analysis (2004) are out of the-ordinary practices used to improve cost, schedule, and/or reliability of capital projects.

At the end of this phase, the study is subjected to the final stage-gate process in the project development cycle. If the project is successful in showing it can deliver the benefits and long term value originally forecasted, and provide confidence to the portfolio management team, it will progress to the execution phase. There may, however, be approval challenges even if the benefits can be realised. These challenges may result from higher performing projects receiving funding preference or changes in the strategic direction of the organisation, as seen in the Australian coal mining and processing industry in the recent past.

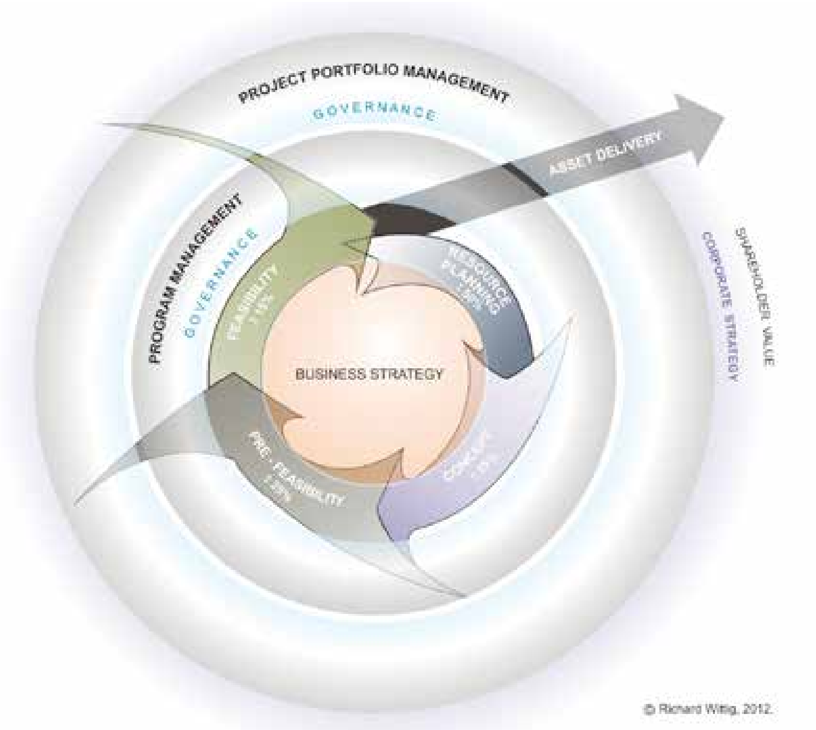
OPTIMISING THE STANDARD LINEAR LIFECYCLE

During the research and the interviews of personnel, it became apparent that there is a lack of awareness of how the project development phases integrate and the associated management obligations, especially recycling projects to earlier phases if they fail to pass through the toll gates because of misalignment with strategy, program and portfolio management objectives. It was also apparent that there is insufficient transfer of information about project development requirements between project developers and EPCM providers. These knowledge gaps were distributed evenly amongst employees of large companies and small to mid-tier mine developers.

The deficiencies mentioned above identified the need for an optimised "plan on a page" approach to the

FIGURE 1.5

Adapted Optimised Radial Project Development Lifecycle (Wittig, 2013)



project development lifecycle. The optimised project development lifecycle in Figure 1.5 is adapted from the standard linear project development lifecycle. The most important differences are that the optimised project development lifecycle links all phases into a radial life cycle and takes into account the wider management and stakeholder requirements.

In the optimised approach, each study phase is not only linearly integrated with subsequent study phases but also vertically integrated with business strategy, program and portfolio management. This increases the project's exposure to major corporate decisions which link deliberate and corporate strategy earlier in the study phase cycle (Mintzberg, Fall 1987; Bowman, 2001).

The resource planning phase is primarily supported by data developed within the business organisation from concept, prefeasibility and feasibility studies for projects currently in execution. Linking the start of the resource planning and the end of the typical linear feasibility study ensures the Resource Planning Phase has access to current project estimates and data. The cost benefit of this is seen immediately if the pipeline projects are similar to those being studied or executed as the estimates are considerably more mature than would be expected at the early stage of the development (Van Der Weijde, 2008).

Resource planning is developed directly from the business strategy which becomes the core of the radial project development lifecycle. In this case, business strategy is primarily focused on how the business competes in a particular industry or market (Bowman & Helfat, 2001). As the business strategy area is encapsulated by the four phases of the project development cycle, it creates axis points for vertical integration through each study phase.

As Ataya (2007) has described, program management is a structured group of interdependent projects that are both necessary and sufficient to achieve the desired business outcome and deliver value. With that in mind, a program management and governance layer was added to the radial project development lifecycle.

A project portfolio is a group of programs, projects or assets, selected, managed and monitored to optimise value (Ataya, 2007). In considering this value management requirement, project portfolio management and governance were added to the radial project development lifecycle. This provides the tool for optimising the business organisational returns from project investments by improving the alignment of project portfolios with corporate strategy (Koh, 2010;Bowman, 2001).

The radial project development lifecycle includes a time aspect. This is shown in a clockwise motion based on the development timeframes associated with each study phase. The stage-gate recycling process (non-approval) is shown as anti-clockwise movement. The project lifecycle phase can be reset so that the time impact can be clearly seen and further approval processes understood. When the project is approved at the end of the Feasibility Phase, it moves into the asset delivery phase which outlines the transition from project development to execution phase and shows the value increase to the asset over time.

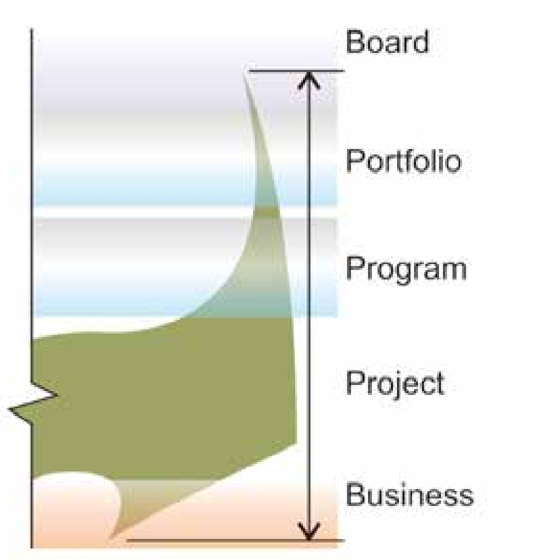
From a phased project approach, the utilisation of the radial lifecycle offers the following vertical integration benefits:

- Resource Planning Phase
    - A clear link with business strategy during initial idea generation.
- Concept Phase
    - Ongoing integration with business strategy and project pipeline optionality
    - Project optionality supported by business strategy area
    - Early integration to program management and governance requirements
    - Early project exposure to program management approvals.
- Pre-Feasibility Phase
    - Embedded business strategy and practices within the project
    - Project optionality supported by program management and governance and business strategy areas
    - Embedded program management approvals and governance requirements
    - Early integration with project portfolio governance requirements
    - Early exposure to project portfolio management approvals.
- Feasibility Phase
    - Project "option" supported by program, project portfolio and business strategy areas
    - Embedded program, portfolio management and governance practices within the project
    - Integrated with board level approvals and governance requirements
    - Provides ongoing integration with business strategy and project pipeline optionality via supply of real time pricing for resource planning optionality planning.

As can be seen in Figure 1.6, during the Feasibility Study approval process, the Board and the project portfolio, program and project management can be linked to the business strategy axis. This defines the current level of integration and forecasts the level of engagement required to ensure all stakeholders are aligned with the project requirements. Such strategic alignment is critical to optimum resource utilisation whilst working inside the mandated strategic boundaries and identified constraints (Smith, Anderson, & Pearson-Taylor, 2006).

FIGURE 1.6

Optimised Radial Project Development Lifecycle - Feasibility Approval Integration (Wittig, 2013)



The optimised project development lifecycle provides a broad "plan on a page" for project development, including outlining the key integrations of corporate strategy, program and project portfolio management, and asset delivery. The optimised lifecycle is a tool that integrates the project management community (government agencies, mine developers, EPCM providers and industry vendors) in mining project development.

CONCLUSION

Mining project development consists of multiple study phases which provide outputs to support the mine development and investment process. The project moves from one phase to the next via a stage-gate approval process which ensures that each phase further defines the maturity of the project and the maximum project value is realised.

Currently, in the Australian coal mining and processing industry, the many variations of naming conventions for the project development phases and estimate accuracy ranges in each phase cause confusion amongst government agencies, mine developers, EPCM consultants, vendors and industry bodies. This results in inefficiencies in project developments and creates potential for errors in industry performance reports.

It is proposed that a common four-stage approach to the project development lifecycle, including standard naming conventions and estimate accuracy requirements, would add clarity and value to the work of developing a project. The four stages are:

- The Resource Planning (± 50%) study phase develops a pipeline of projects to be evaluated to ensure growth from existing assets.
- The Concept (± 35%) study validates the business opportunity and identifies the scope options that will be the subject of a trade-off evaluation in the next phase (Anglo American 2009).
- The Prefeasibility (± 25%) study assesses all valid options, narrows the project to one scope and confirms project economics and the role of the fourth study phase.
- The Feasibility (± 15%) study phase validates all previous design and economic assumptions and ensures the project aligns with expected internal and external benefits (Mackenzie, 2007; Bruzelius et al, 2002).

A standard approach to the project development lifecycle phases and estimate accuracy requirements will reduce ambiguity between all parties in the project development fraternity and increase industry efficiency during the project development phases. It will also improve the capital cost accuracy of nationally reported projects which are often used as the base data for assessing if a project has been successful on a cost only basis.

The optimised project development lifecycle provides a broad "plan on a page" outlining the key integrations of project elements and requirements, including alignment with corporate strategy, program and project portfolio management, and asset delivery. Further to this, the optimised lifecycle is a tool that integrates the project management community with government agencies, mine developers, EPCM providers and industry vendors in mining project development.

The investment phase of the Australian mining boom has nearly peaked and therefore mining companies in project development phases require accurate forecasts to ensure projects have the best chance of proceeding to execution (Grafton, 2012). To provide the best opportunity for project success and performance, the standardised lifecycle approach should be utilised during the entire project development phase (Milosevic & Patanakul, 2005).

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