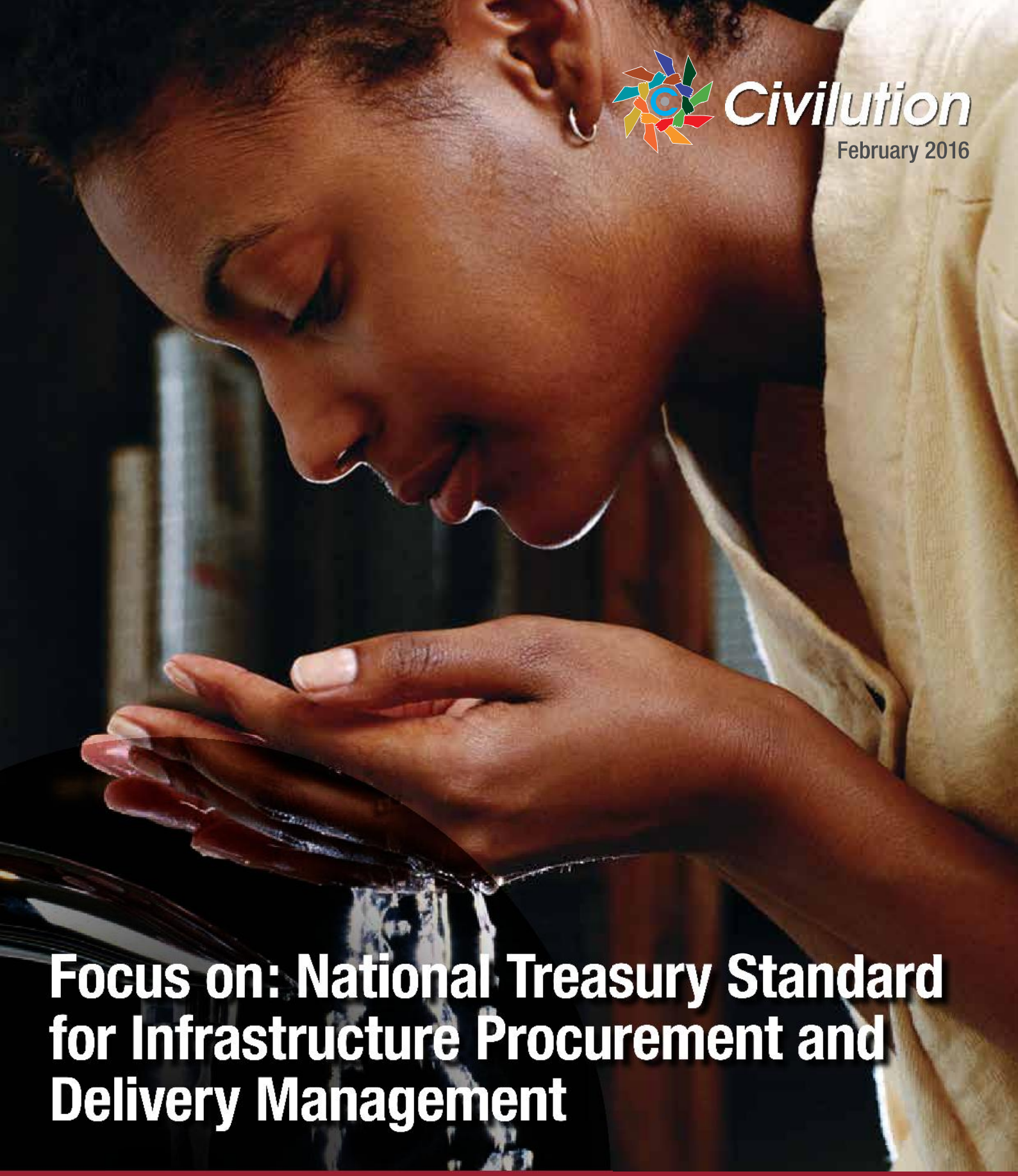

Civilution

February 2016

Focus on: National Treasury Standard for Infrastructure Procurement and Delivery Management

national treasury

Department:
National Treasury
REPUBLIC OF SOUTH AFRICA

Control framework for the planning, design and execution of infrastructure projects

The National Treasury *Standard for Infrastructure Procurement and Delivery Management* (SIPDM) provides a control framework for the planning, design and execution of infrastructure projects, the tracking of such projects and the monitoring of performance which enables risks to be proactively managed. This control framework can also be audited. An organ of state's supply chain management (SCM) policy for infrastructure procurement and delivery management is, in terms of the SIPDM, required to assign responsibilities for approving or accepting deliverables associated with a gate (control point) in this control framework.

There is a need to understand the thrust and intent behind this control framework and what needs to be considered when assigning responsibilities for approving or accepting deliverables at the associated gates.

INTRODUCTION

A process can be considered to be an activity or set of activities using resources which are managed to enable the transformation of inputs into outputs. An organisation wishing to plan, design and execute infrastructure projects effectively needs to determine and manage numerous interrelated and interacting processes. Accordingly, the effective delivery of infrastructure necessitates that:

- the processes be identified and appropriately defined;
- procedures to ensure the effective planning, operation and control of such processes be documented;
- responsibilities for activities be assigned;
- procedures be implemented; and
- measures be put in place to ensure effective control so that the required results are obtained.

The starting point is to determine and document the processes associated with the planning, designing and execution of infrastructure projects, as well as their sequence and interaction. Thereafter, procedures associated with the performance of activities need to be documented and responsibilities assigned to persons with competence (demonstrated ability to apply knowledge and skills) to perform such activities. Controls also need to be put in place to ensure both the operation and control of these processes to ensure their effectiveness based on the conceptual thinking presented in Figure 1. Resources and information need to be made available to support the operation and monitoring of these processes. Finally, records which provide evidence of conformity to requirements need to be

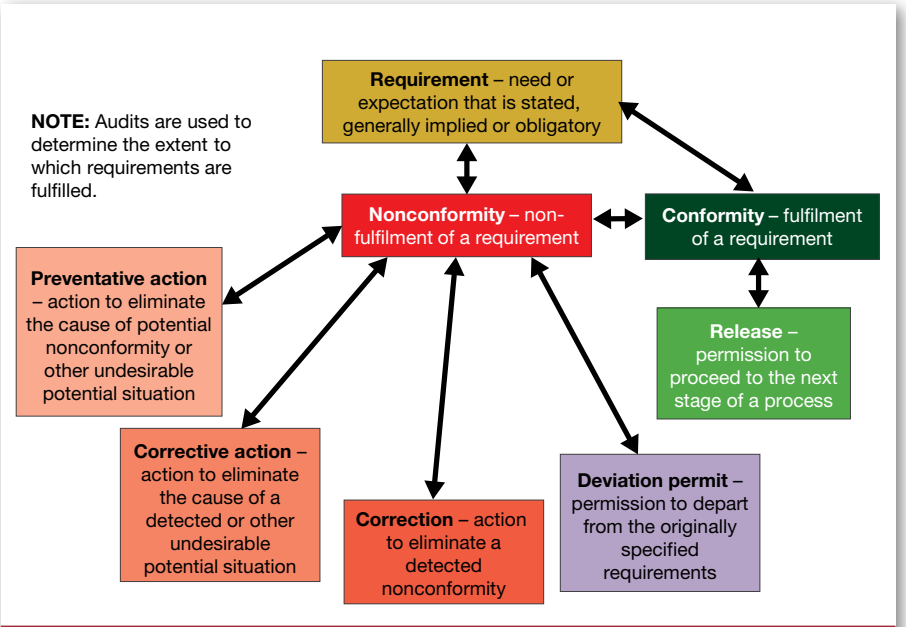

Figure 1: Concepts relating to conformity based on ISO 9000

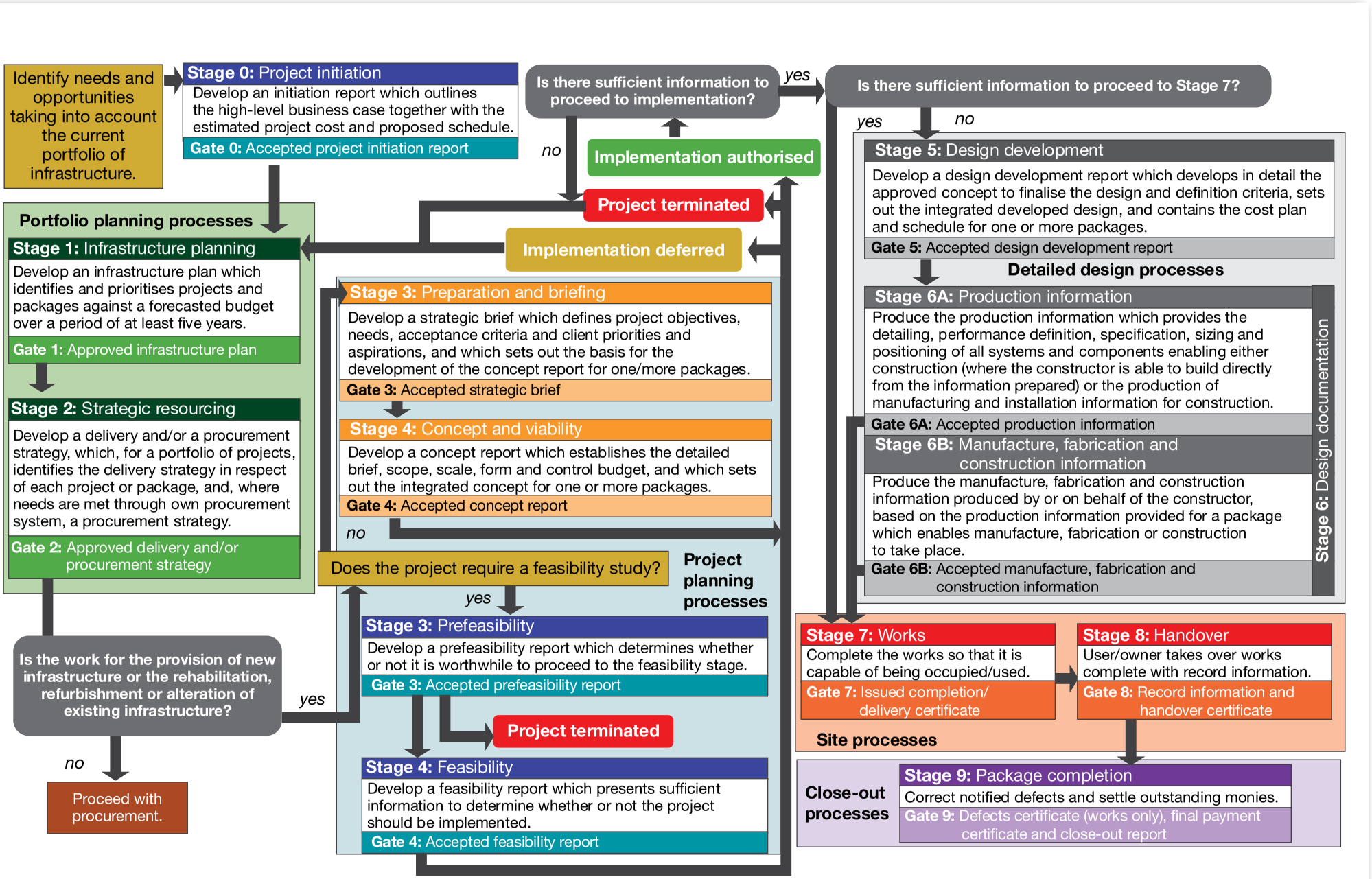

Figure 2: National Treasury's control framework for the planning, design and execution of infrastructure projects

identified, stored, protected and retained in a readily retrievable manner.

A control is a restraint or check point within a process where:

- decisions are taken before authorising the proceeding with an activity within a process or commencing with the next process;
- confirmation of conformity with requirements is required before completing a task or activity; or
- information is provided which creates an opportunity for corrective action to be taken.

Controls provide the means for directing an organisation towards what is aimed or sought, and for confirming conformity with requirements. They provide the opportunity to take corrective action or to confirm compliance with documented requirements. A control which authorises the proceeding with an activity within a process, or commencing with the next process, is commonly referred to as a gate.

PROJECT LIFE CYCLE FOR THE DELIVERY OF INFRASTRUCTURE PROJECTS

Projects involving the construction, rehabilitation, refurbishment or alteration of infrastructure are delivered through a number of phases or work stages which may be broadly described as planning at a portfolio level, planning at a project level, detailed design, site processes and close-out. These project life cycle stages are structured in such a manner that the

Table 1: Local and international project life cycle stages

Project life cycle stage					
National Treasury (2015)	**Engineering Council of South Africa (ECSA)**	**SA Councils for the quantity surveying profession (SACQSP), project and construction management professions (SACPCMP), landscape architectural profession (SACLAP) and architectural profession (SACAP)**	**Construction Industry Council (2007)**	**ISO 29481-1 (2010), Building Information Modelling**	**Royal Institute of British Architects Plan of Work (2013)**
0 Project inception				0 Portfolio requirements	
1 Infrastructure planning					
2 Strategic resourcing					
3 Preparation and briefing or prefeasibility	1 Inception	1 Inception	1 Preparation	1 Concept of need	0 Strategic design
				2 Outline feasibility	1 Preparation and brief
4 Concept and viability or feasibility	2 Concept and viability (preliminary design)	2 Concept and viability	2 Concept	3 Substantive feasibility	2 Concept design
				4 Outline conceptual design	
5 Design development	3 Design development (detailed design)	3 Design development	3 Design development	5 Full conceptual design	3 Developed design
6A Production information	4 Documentation and procurement	4 Documentation and procurement	4 Production information	6 Coordinated design and procurement	4 Technical design
				7 Production information	
6B Manufacture, fabrication and construction information			5 Manufacture, fabrication and construction information	8 Construction	
7 Works	5 Contract administration and inspection	5 Construction			5 Construction
8 Handover			6 Post practical completion		6 Handover and close-out
9 Close-out	6 Close-out	6 Close-out			
					7 In use

viability of a project may be tested and monitored and controlled as it progresses. They are crafted around the work breakdown structure required to plan, design and implement such projects, and as such present the workflow to deliver projects and to make decisions as to whether or not to proceed from one stage to the next.

The process of delivering infrastructure projects can be broken down into nine collections of logically related activities (stages), with end-of-stage deliverables and gates established in the control framework for the planning, design and execution of infrastructure projects contained in the National Treasury *Standard for Infrastructure Procurement and Delivery Management* (SIPDM) as shown in Figure 2. This control framework includes portfolio planning, project planning, detailed design, site and close-out processes for the delivery of infrastructure, but excludes procurement and management processes. It has forward and backward linkages with planning and budgeting and asset management systems as indicated in Figure 3.

National Treasury's control framework shown in Figure 2 deals with the generic workflow associated with the planning, design and execution of infrastructure projects, i.e. the project life cycle for the delivery of infrastructure projects. It generates information which informs decisions at particular points in the process. It is not aligned to any particular funding or procurement procedure. The framework is independent of the procurement strategy (i.e. design by employer, design and construct, or develop and construct) that is pursued to appoint engineering and construction works contractors. It is also not dissimilar to local and modern international work stages for construction projects, as indicated in Table 1.

STAGES AND GATES

A stage in the infrastructure gateway system is only completed when the deliverable has been approved or accepted by the person or persons designated to do so. Activities associated with Stages 5 to 9 may be undertaken in parallel or series, provided that each stage is completed in sequence. Stages 3 to 9 may be omitted where the required work does not involve the provision of new infrastructure or the rehabilitation, refurbishment and/or alteration of existing infrastructure. Stages 5 and 6 may be omitted if sufficient information to proceed to Stage 7 is contained in the Stage 4 deliverable. Additional gates may, if necessary, be added to the control framework.

The level of detail contained in a deliverable associated with the end of each stage needs to be:

- sufficient to enable informed decisions to be made to proceed to the next stage; and
- such that it can be used to form the basis of the scope of work for taking

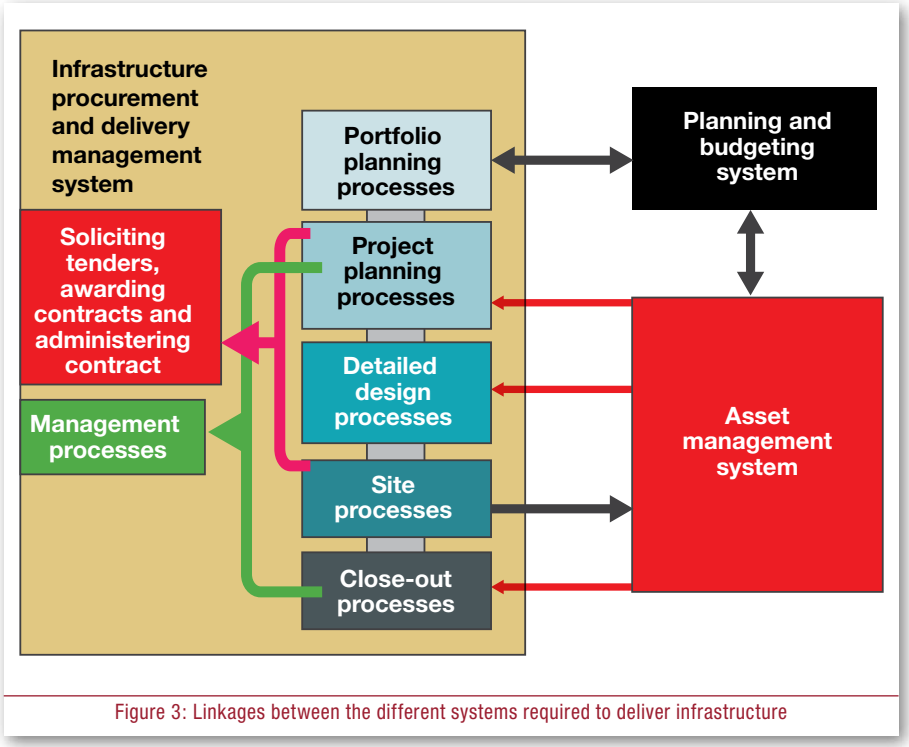

Figure 3: Linkages between the different systems required to deliver infrastructure

Table 2: Key deliverables associated with the scope of work of a contracting strategy

Contracting strategy		Key deliverable which forms the basis of the scope of work associated with a contract	
Strategy	**Description**	**Stage associated with the deliverable**	**Deliverable**
Management contractor*	Contract under which a contractor provides consultation during the design stage and is responsible for planning and managing all post-contract activities and for the performance of the whole of the contract	3 Preparation and briefing	Client accepted strategic brief*
Design and construct	Contract in which a contractor designs a project based on a brief provided by the client and constructs it	4 Concept and viability	Client accepted concept report
Develop and construct	Contract based on a scheme design prepared by the client under which a contractor produces drawings and constructs it	5 Design development	Client accepted design development report
Design by employer	Contract under which a contractor undertakes only construction on the basis of full designs issued by the employer	6A Design documentation (production information)	Completed and client accepted production information

* A management contractor can also be appointed after Stages 4, 5 or 6A, in which case the client-accepted concept report, design development report or production information respectively can serve as the basis of the scope of work.

the package (work which is grouped together for delivery under a single contract or an order issued in terms of a framework agreement) forward in terms of the selected contracting strategy (see Table 2).

The level of information increases with each successive stage. Different types of infrastructure and contracting strategies, as well as the scale and location of projects, present different risks. As a result, the level of detail at each stage necessary to make an informed decision at a gate is a matter of professional judgement, and varies between different types of projects and contracting strategies.

PLANNING STAGES

Infrastructure planning is a continuum and not an event which typically involves interactions between the different internal and external role-players as indicated in Figure 4. It is a highly iterative process involving the rationalisation of demand against available resources while maintaining required service levels. It is not a step-by-step process where the analyses are independent of each other and can be performed in sequence. Information needs to flow between the different analyses, and constant feedback mechanisms need to be put in place to ensure coherence. Such planning can be supply-driven by addressing the difference or gap between a desired state and a current state, or demand-driven by adopting approaches which change the perceptions and hence requirements as to what should be supplied.

The planning processes within Stage 1 should enable the infrastructure plans which are developed to:

- be aligned and integrated with the long-term objectives and the spatial planning of the different spheres of government which impact upon the organ of state's mandate;
- contain projects which have been selected and prioritised on the basis of institutionalised prioritisation processes;
- satisfy all legislative requirements, including prescribed reporting requirements, organisational requirements and any conditions or requirements associated with grant funding;
- be linked to budgets for at least five years (i.e. three-year MTEF period and two outer years); and
- organise projects into categories such as new construction, alteration, extension, rehabilitation, refurbishment and planned maintenance.

The infrastructure plan developed in Stage 1 enables a delivery management plan and a procurement strategy to be developed during Stage 2.

Prefeasibility and feasibility reports developed during Stages 3 and 4 are required on major capital projects or projects which require significant capital investment over several years. They may also be required where projects are not of a process-based, somewhat repetitive or relatively standardised nature where the risk of failing to achieve time, cost and quality objectives is relatively high. Such reports may also be required when infrastructure has significant staffing and operation costs, the implications of which need to be understood before a decision is taken to proceed with an infrastructure project.

Stages 3 (preparation and briefing) and 4 (concept and viability) need to be repeated for each package if the acceptance at Stage 4 is for the acceptance of a project comprising a number of packages which are to be delivered over time. Stage 4 (concept and viability) results in a solution for an infrastructure project. The design or solution is 'frozen' at the end of Stage 4.

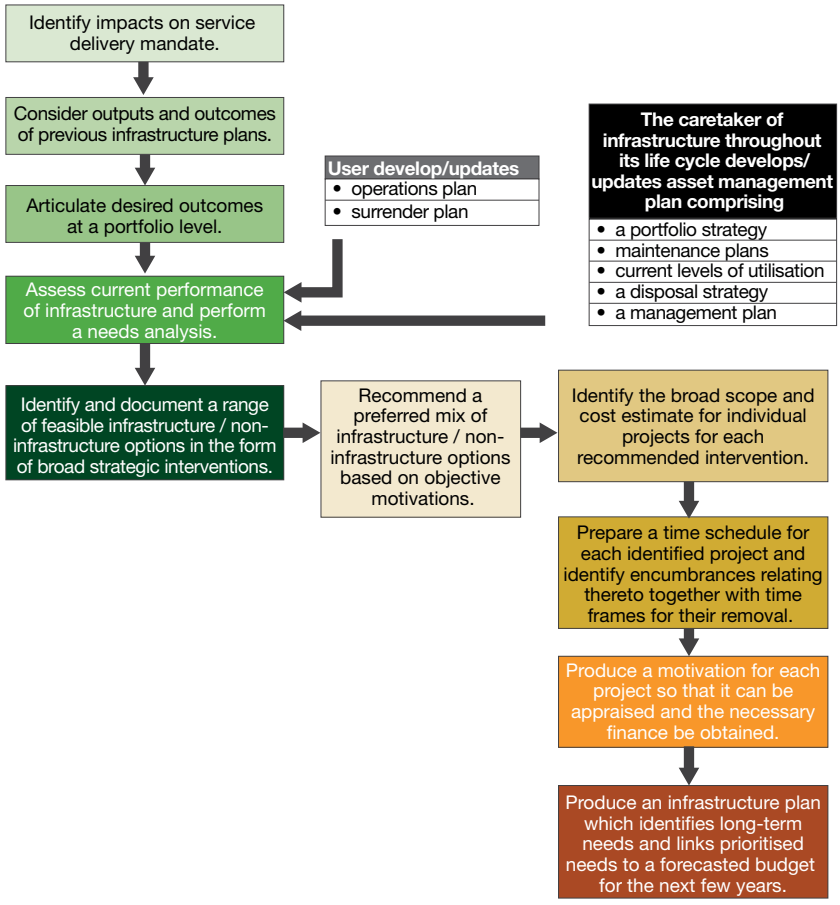

Figure 4: Activities commonly associated with the development of an infrastructure plan

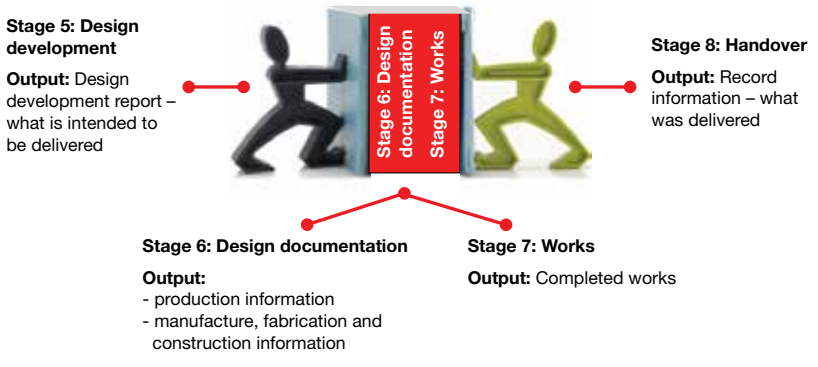

Figure 5: The bookends of implementation – design development report and record information

The portfolio and project planning activities, as indicated in Figure 2, are iterative processes with improved information with each iteration. Accordingly, portfolio and project planning (the first four stages of the control framework), being an iterative process, can involve a number of financial years, depending upon how early planning activities commence and how long it takes to bring a project to a state of readiness for implementation. The infrastructure plan (Stage 1), which is informed by demand-management requirements, initiation reports (Stage 0), decisions made during Stages 3 and 4, and work in progress in Stages 5 to 9, and the procurement strategy (Stage 2), needs to be reviewed and updated at least once a year.

Land acquisition planning should begin well in advance of implementation. It is therefore highly desirable to have planning time frames longer than the funding period under consideration, and to develop a land acquisition strategy which also considers the impact of disputes relating to land acquisition on the programme.

DESIGN STAGES

Detailed design during Stage 5 includes the selection of materials and components. At this stage there will frequently be an iterative process of proposing a component, checking its predicted performance against the brief, and amending selections if required. The design development report translates the concept report into a document which paints a picture of what is to be delivered. The report needs, as such, to describe how structures, services or buildings and related site works, systems, subsystems, assemblies and components are to function, how they are to be safely constructed, how they are to be maintained and, if relevant, how they are to be commissioned.

The design development report relates to what is to be delivered. Record information relates to what has been delivered. Accordingly, the record information is an updated version of the design development report (see Figure 5).

Outline specifications prepared during Stage 5 should be in sufficient detail to enable a view to be taken on the operation and maintenance implications of the design, and the compatibility with existing plant and equipment. The design should reflect the constraints of the budget for the overall project. To meet the brief, adjustment of either the budget or the service life requirements may be necessary. Where a specification is adjusted to meet cost constraints, the maintenance and operation implications should also be considered.

Production information is developed during Stage 6A of the design documentation stage, i.e. the detailing, performance definition, specification, sizing and positioning of all systems and components enabling either construction (where the contractor is able to build directly from the information prepared) or the production of manufacturing and installation information for construction. This information enables manufacture, fabrication and construction information to be produced during Stage 6B by or on behalf of the contractor, based on the production that is information-provided. This information enables manufacture, fabrication or construction to take place.

Commissioning is often misinterpreted to focus solely on testing during the end of the construction phase. Commissioning is actually a collaborative process for planning, delivering and operating works that function as intended. Commissioning procedures accordingly need to be scheduled in relation to other services or construction activities. Since the commissioning process is dependent on the progress of systems, structures and building fabric, the scheduling of commissioning activities needs to be carefully planned in relation to those activities. Accordingly, the interdependency problems need to be identified and considered as early in the project as possible, as they need to be included in the designer's outputs.

IMPLEMENTATION STAGES

The following activities are typically undertaken during Stage 7 (works) in relation to the works:

- Provide temporary works.
- Provide permanent works in accordance with the contract.
- Manage risks associated with health, safety and the environment on the site.
- Confirm that design intent is met.
- Correct notified defects which prevented the client or end user from using the works and others from doing their work.

Stage 7 can also include the design, supply and installation of plant which is incorporated into the works.

The following activities need to be undertaken during Stage 8 (handover):

- Finalise and assemble record information which accurately reflects the infrastructure that is acquired, rehabilitated, refurbished or maintained.
- Hand over the works and record information to the owner, end user or those responsible for the operation and maintenance of the works and, if necessary, train end user staff in the operation of the works.

It must be stressed that there is a difference between achieving completion of the works in accordance with the provisions of the contract and the handing over of the works to the owner, end user or those responsible for the operation and maintenance of the works. Upon completion, or soon thereafter, risks associated with loss of, or wear or damage to the works are no longer borne by the contractor. Arrangements may need to be put in place to secure and safeguard the works from the time that the contractor's liabilities cease until the time that the works are handed over.

The primary objective of the record information is to provide those tasked with the operation and maintenance of a building and associated site works with the necessary information to:

- understand how the designers intended the works, systems, subsystems, assemblies and components to function;
- effectively operate, care for and maintain the works, systems, subsystems, assemblies and components to function;
- check, test or replace systems, subsystems, assemblies or components to ensure the satisfactory performance of works, systems, subsystems, assemblies and components over time;
- develop routine and scheduled maintenance plans;
- determine stock levels for components and assemblies that need to be regularly replaced; and
- budget for the operation and maintenance of the works, systems, subsystems and components over time.

The secondary objective of the record information is to provide information pertaining to the planning and design of the works to inform refurbishments, alterations, modifications, renovations and additions that may be required from time to time.

Stage 9 (close-out) closes out not only the contract or order issued in terms of a

framework contract, but also the project. Such a report needs to outline what was achieved and make suggestions for improvements on work of a similar nature. It also needs to comment on the performance of the contractor.

GATEWAY REVIEWS

Gateway reviews deliver a team review in which independent practitioners, preferably from outside of a programme, but certainly outside of the project, examine the likelihood of the successful delivery and the soundness of a project, through a series of interviews and documentation reviews. Review teams can also provide valuable additional perspectives on issues facing the project team and are able to challenge the robustness of an end-of-stage deliverable after Stage 2. The gateway review process is designed to provide independent guidance on how best to ensure that projects are successfully delivered. They provide clients with the confidence that an appropriate level of discipline is being applied in the delivery process and the best options to meet needs are being selected. Alternatively they can be used to review the quality of the end-of-stage deliverables that were developed.

Gateway reviews are based primarily on the information contained in end-of-stage deliverables, supplementary documents, if any (provided by key staff obtained during an interview process), and interviews with key staff members and stakeholders. Aspects in the report produced by the team need to be flagged as:

- Code red: team considers the aspect to pose a significant risk to the project or package;
- Code amber: team considers the aspect to indicate a minor risk to the project or package; and
- Code green: team considers the aspect to have been given adequate consideration, to the extent that it is unlikely to jeopardise the success of progressing to the next stage, or minor adjustments may be required before proceeding.

The SIPDM requires a gateway review on all major capital projects above a threshold prior to the acceptance of a deliverable at the end of Stage 4. The focus of such a review is on:

- deliverability (the extent to which a project is deemed likely to deliver the expected benefits within the declared cost, time and performance envelope);
- affordability (the extent to which the level of expenditure and financial risk involved in a project can be taken up, given the organisation's overall financial position, both singly and in the light of its other commitments); and
- value for money.

The SIPDM requires that the relevant treasury be afforded an opportunity to participate in the gateway reviews. This standard furthermore permits the relevant treasury to initiate a gateway review of any of the end-of-stage deliverables associated with the control framework, irrespective of the estimated cost of the project.

APPROVAL OF HIGH-VALUE NATIONAL AND PROVINCIAL MAJOR CAPITAL PROJECTS

The SIPDM requires Cabinet or the Executive Council to approve the Stage 0 (initiation report) and Stage 4 (feasibility report) end-of-stage deliverables for high-value national and provincial major capital projects above a threshold, after taking into account comments and recommendations of the relevant treasury. The Stage 3 (prefeasibility) end-of-stage deliverables need to be approved by the relevant member of Cabinet or the relevant member of the Executive Council, whichever is appropriate, after taking into account the comments and recommendation of the relevant treasury.

PERFORMANCE MONITORING

A package is defined in the SIPDM as "work which is grouped together for delivery under a single contract or an order", while a control budget is defined as "the amount of money which is allocated or made available to deliver or maintain infrastructure associated with a project or package, including site costs, professional fees, all service and planning charges, applicable taxes, risk allowances and provision for price adjustment for inflation." Packages are identified typically during Stage 2 (strategic resourcing).

The SIPDM requires that:

- the initiation report developed in Stage 0 (project initiation) provides an estimated cost and proposed schedule for the project;
- the prefeasibility report developed during Stage 3 (prefeasibility) provides preliminary capital estimates and a proposed schedule;
- the strategic brief developed during Stage 3 (preparation and briefing) includes a control budget and a schedule for the package;
- the concept report developed during Stage 4 (concept and viability) establishes the feasibility of satisfying the strategic brief for a package within the control budget established during Stage 3, and if not, motivates a revised control budget; and
- the design development report developed during Stage 5 (design development) contains a schedule for the package, and confirmation that the package can be completed within the control budget, or proposes a revision to the control budget.

The price for the work required to satisfy the developed and documented design for a package and the schedule for the delivery of the works is known at the time that Stage 7 (works) commences. Payment certificates reflect the amount of work certified in terms of the contract for payment at the completion of Stage 7. The final amount due in terms of the contract is established at the completion of Stage 9 (close-out). Accordingly, data associated with costs and schedule is known throughout the project life cycle for the delivery of infrastructure projects. It is therefore possible to track shifts in costs and schedules, as well as changes in scope and performance of the works during most of the stages of the project life cycle.

The SIPDM requires that budget submissions for budget approvals to advance a project within a financial year be broken down into the stages of the control framework. This standard also requires that an implementation plan be developed for new infrastructure or for the rehabilitation, refurbishment or alteration of existing infrastructure. Such a plan is required to include the scope, budget and schedule for each project or package, a time management plan for each project (baseline against which progress can be measured) and projected budget and cash flow which enable planned and actual expenditure to be measured. The SIPDM also requires that an annual report be prepared which reflects the performance for each portfolio of projects. Such a report is required to reflect performance against the following implementation metrics:

- expenditure incurred in infrastructure delivery for the financial year against the budget available to cover such expenditure;

- the average variance between planned and achieved completion of all stages and packages;
- the average time taken to complete Stage 8 (handover); and
- the average difference between the totals of the prices in the payment certificate issued following completion of Stage 7 (works) and that contained in the final account during Stage 9 (close-out).

The baseline data for the quantification of these metrics is contained in the infrastructure plans. The above-mentioned metrics measure the efficiency of those responsible for managing projects and programmes within a portfolio of infrastructure projects.

The SIPDM also requires that the annual report contains an overview of all packages where Stage 7 (works) was completed within a financial year, and where the total of the prices and the envisaged time for completion exceed 20%, together with a brief explanation as to why such increases occurred.

It should be noted that copies of the annual reports need to be sent to the relevant treasuries.

ALLOCATION OF RESPONSIBILITIES FOR APPROVING AND ACCEPTING DELIVERABLES AT EACH GATE

The SIPDM requires that an organ of state's SCM policy for infrastructure procurement and delivery management assign responsibilities for approving or accepting deliverables associated with a gate in the control framework indicated in Figure 2. Decisions to proceed to the next stage need to be based on the acceptability (receive as adequate, valid or suitable, or give an affirmative answer to a proposal) or approval (officially agree to) of the end-of-stage deliverable. They may also be based on certifications made in terms of a contract or order issued in terms of a framework agreement, as indicated in Table 3.

The implementation of infrastructure projects needs to be carefully managed. The gates shown in the control framework presented in Figure 2 provide to all those involved in all levels of management access to information to perform their work, and to those involved in the governance system to take decisions regarding their readiness to bear the risk (effect of uncertainty on objectives) after risk treatment in order to achieve objectives.

The indicative impact of a number of key factors over the life cycle of a project is illustrated in Figure 6, while the linkage between the four "E's" associated with value for money to the stages in the project life cycle for the delivery of infrastructure is indicated in Figure 7. The decisions made at an early stage in the project set the value-for-money proposition and have the greatest impact on project outcomes. Accordingly ap-

Table 3: Responsibilities for approving or accepting end-of-stage deliverables in the control framework for the planning, design and execution of infrastructure projects

Stage			Person assigned the responsibility for approving or accepting end-of-stage deliverables
No	Name		
0	Project initiation		Designated person accepts the initiation report.
1	Infrastructure planning		Designated person approves the infrastructure plan.
2	Strategic resourcing		Designated person approves the delivery and/or procurement strategy.
3	Prefeasibility		Designated person accepts the prefeasibility report.
	Preparation and briefing		Designated person accepts the strategic brief.
4	Feasibility		Designated person accepts the feasibility report.
	Concept and viability		Designated person accepts the concept report.
5	Design development		Designated person accepts the design development report.
6	Design documentation	6A Production information	Designated person accepts the parts of the production information which are identified when the design development report is accepted as requiring acceptance.
		6B Manufacture, fabrication and construction information	The contract manager accepts the manufacture, fabrication and construction information.
7	Works		The contract manager certifies completion of the works or the delivery of goods and associated services.
8	Handover		The owner or end user accepts liability for the works.
9	Package completion		The contract manager or supervising agent certifies the defects certificate in accordance with the provisions of the contract. The contract manager certifies final completion in accordance with the provisions of the contract. Designated person accepts the close-out report.

provals typically take place at a senior management or portfolio level, whilst acceptances can be made at a programme or project management level where the project parameters are better defined and understood. Approvals and acceptances can be granted by individuals or committees. Where an organ of state implements a project on behalf of an organ of state, acceptance or approval of end-of-stage deliverables may have to be granted in consultation with such an organisation, who remains the client. Alternatively the decision-making at a gate may be assigned by a party to an agency agreement between a client and an implementer.

As a general rule, the person designated to approve or accept a deliverable at a gate should be the person best able to make an appropriate decision based on the information presented, and who has insights of the potential impact of the decision on the business case, programme or project objectives, as relevant.

NOTE

Further insights and information can be obtained from:

Construction Industry Development Board. IDM Toolkit. Delivery Management Guidelines: Delivery Process 1 – Portfolio Management. Available at: www.cidb.org.za/_layouts/toolkit/index.html.

SANS 9000:2015 ISO 9000:2015. Quality management systems – fundamentals and vocabulary. South African Bureau of Standards.

Watermeyer, R B 2015. Design and adoption of innovative procurement systems in infrastructure delivery. West Africa Built Environment Research Conference, Accra, Ghana, August.

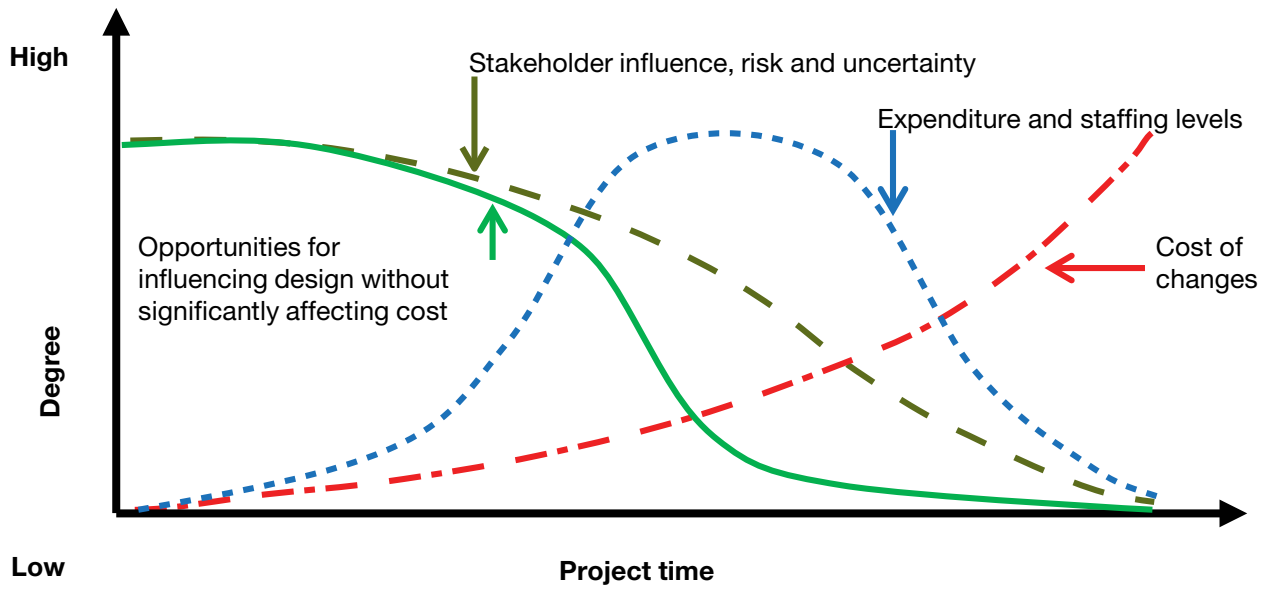

Figure 6: Indicative impact of key variables on the delivery of infrastructure over time

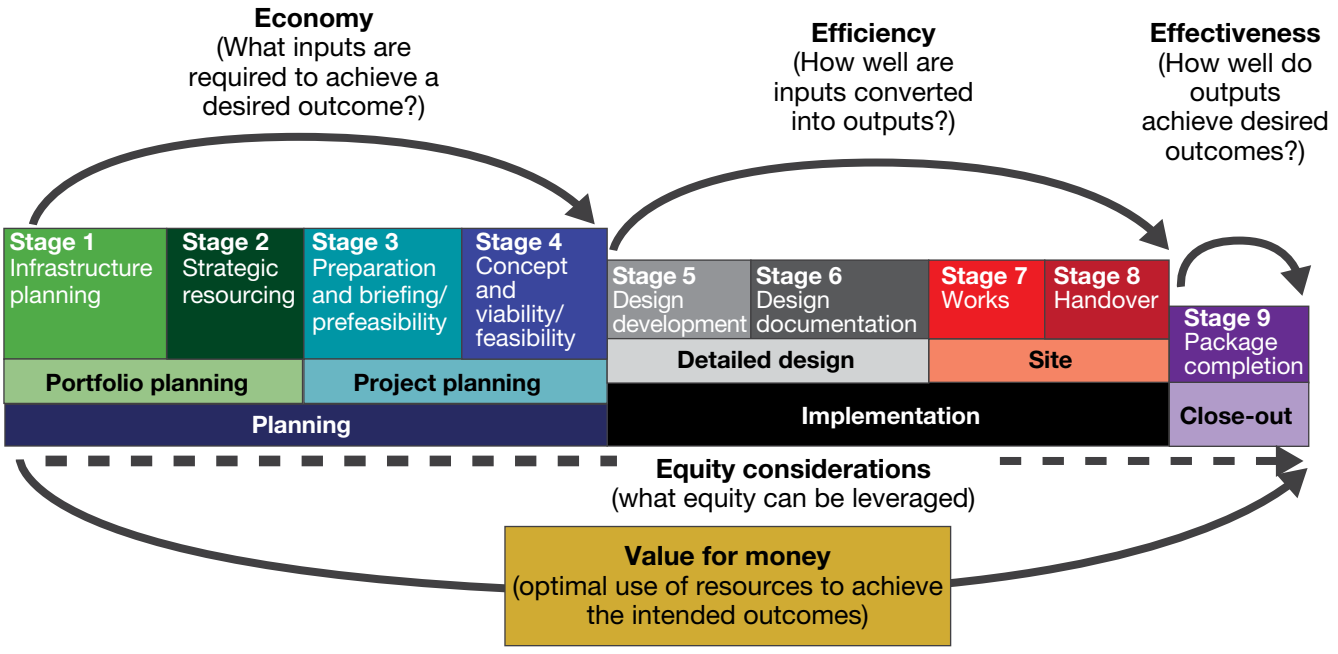

Figure 7: Value for money in the context of the life cycle for the delivery of infrastructure