

APM / INCOSE UK Systems Thinking Specific Interest Group

Fusion Point Guidance – Integrated Review Gates

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1. Who Is This Guidance For

This guide is aimed at Programme/ Project Managers (PM), Systems Engineers (SE) and Sponsors who will be defining and operating Gate Reviews associated with programmes and projects in their organisation.

This guide also provides information about the benefits of Integrated Gate Reviews and their successful use. It is intended to be useful to other PM, SE, senior business management staff and others who work in programme and projects to understand why gate review activities are carried out as they are and the impact different programme/ project approaches and structures have on them.

This guidance considers programme/ project level integrated review gates only.

Target Audience:

Primarily aimed at:

- Programme Managers.
- Project Managers.
- Systems Engineers.
- Programme/ Project Sponsors.

Also provides useful information to:

- Other Programme and Project Management professionals.
- Other Systems Engineering professionals.
- Business senior management.

2. What Are Integrated Review Gates?

A programme/ project Integrated Review Gate is a formal opportunity for programme/ project managers, systems engineers, sponsors and other business representatives to jointly assess the current status of a programme/ project and its proposed plan to the next gate. It is an open and objective evaluation of the status of the programme/ project overall undertaken between phases or tranches to make a GO/ NOGO decision about the remainder of the work [Ref a]. In addition, the successful completion of Gate Reviews should form top level milestones reported to senior management.

Review Gates therefore provide key fusion points between programme/ project management and systems engineering activities during programme/ project execution.

A Gate Review comprises:

- Assessing whether the progress required to have been made at this stage in the life-cycle has been achieved. This assessment is undertaken by:
 - Assessing whether the products associated with the Gate meet their requirements [Ref e, f].
 - Assessing whether the configuration of the product associated with the Gate is as defined in the configuration information associated with the Gate. [Ref e, g].
 - Confirming that the programme/ project 'Baseline' (Scope, Technical Solution Configuration, Cost, Time, and Commercial Contract T&Cs) is/ remains agreed by the stakeholders.
 - Confirming that the programme/ project Baseline to the next gate incorporates all agreed Changes.
- Assessing whether the progress to date and the activities planned to the next Review Gate will achieve the necessary progress to the next gate and can be undertaken with manageable risk.
- Confirming the continued viability of the programme/ project to achieve its Business Case.

A Gate Review comprises:

- Assessing whether the progress required at this life-cycle stage has been made.
- Confirming that work to the next Gate is appropriate and its risks managed.
- Confirming the programme/ project continues to meet its Business Case.
- Identifying Lessons that should be applied to this and other programmes/ projects.

This document represents the thoughts and conclusions of the Systems Thinking SIG and not necessarily the views of the APM or INCOSE UK. It is intended to assist Project, Programme and Portfolio Management and Systems Engineering practitioners wishing to explore concepts and ideas around Systems Thinking in P3M and to stimulate discussion on the subject. Feedback on the contents of this paper should be sent to the Systems Thinking SIG (SystemsThinkingSIG@apm.org.uk). It therefore does not constitute any formal position (or liability arising) on the part of the International Council for Systems Engineering (INCOSE), INCOSE UK Ltd. or the Association for Project Management (APM), nor should any formal endorsement by these bodies be inferred.

- Identifying Lessons Learned from the experience to date that can be applied to improve the future performance of both this and other programmes/ projects.

There are four potential outcomes from a Gate Review as given in Table 1.

Gate Status	Basis for Decision	Outcome
Pass (Green)	<ul style="list-style-type: none"> • All products are complete to the required quality and programme/ project progress confirmed. • The plan to the next gate is achievable and can be undertaken with manageable risk. 	<ul style="list-style-type: none"> • The programme/ project should proceed to the next gate.
Conditional Pass (Amber)	<ul style="list-style-type: none"> • Outstanding products and actions can be completed within a short (and defined) timescale and these are not critical to achievement of the programme/ project. • The plan to the next gate is achievable and can be undertaken with manageable risk. <p>Or</p> <ul style="list-style-type: none"> • Products critical to successful programme/ project delivery are incomplete or of insufficient quality such that the outcome of further work cannot be predicted or delivery is in doubt. 	<ul style="list-style-type: none"> • The programme/ project should proceed to the next gate, but remedial action must be completed within a defined (short) timescale. <p>Or</p> <ul style="list-style-type: none"> • Specific remedial action must be completed before proceeding and undertaking work associated with the next gate.
Fail (Red)	<ul style="list-style-type: none"> • Products critical to successful programme/ project delivery are incomplete or of insufficient quality to enable that further work to be undertaken with manageable risk. • The lack of completeness or insufficient quality of the products is such that regulatory/ safety processes are impacted. 	<ul style="list-style-type: none"> • Some, or all, of the work addressed by the gate must be repeated and the Review Gate re-run before proceeding and undertaking work associated with the next gate.
Stop	<ul style="list-style-type: none"> • Factors critical to programme/ project success cannot be resolved. • Outside actions and/ or changes to the environment within which the programme/ project operates mean that the programme/ project can no longer achieve its Business Case. 	<ul style="list-style-type: none"> • Recommend that the programme/ project as currently defined be closed. <p>Note: The formal closure decision will be made by the same (investment) body that authorised the programme/ project rather than the Gate Review Panel.</p>

Table 1: Gate Review Potential Outcomes

3. Why Are Review Gates Important?

Gate Reviews are important because they bring PM, SE and Business Management staff together to openly and objectively assess the status of the programme/ project and its plan to its next gate. More specifically, Gate Reviews:

- Align PM and SE activities at agreed pre-defined points in the life-cycle. The separate disciplines often focus primarily/ only on their local aspects and the use of Gate Reviews ensure they do not drift too far apart.
- Some organisational cultures do not encourage reporting of less than good news resulting in a 'Green Bias'. Problems are hidden and programmes/ projects fail late in their life-cycles and need expensive remedial action. The use of Gate Reviews, undertaken openly and objectively by an independent Review Panel, can be addressed before they become expensive to fix.
- Improve programme/ project performance by gaining

Gate Reviews provide the framework to:

- *Bring Project, Systems Engineering & Business Management together to assess project status & its proposed Next Steps.*
- *Improve project performance by gaining input from outside experts.*
- *Counter 'Green Bias' to identify issues early before they are expensive to fix.*
- *Communicate the project risks and their manageability.*
- *Gain Authority To Proceed to the next Review Gate.*
- *Provide a control mechanism for Senior Management to close the project if it is no longer viable.*

input from outside experts that the programme/ project is unlikely to be able to justify using full or part time and/ or cannot get full or part-time access to. The focussed use of this expertise at Gate Reviews gives the programme/ project efficient access to expertise that it otherwise would not have.

- Provide a forum to consider the risks associated with the programme/ project and their manageability. The broad organisational attendance at the Gate Review also enables these risks to be considered in a broader organisational context potentially improving both the identification and management of risks.
- Provide a formal opportunity for PM and SE managers working on the programme/ project to discuss their concerns and agree their resolution (e.g. Assumptions, access to Facilities, Resourcing) with peers and senior management.
- Provide a formal mechanism to gain buy-in and Authority To Proceed for the plan to the next gate.
- Provide a control mechanism for business Senior Management to better understand the status of the programme/ project and recommend its closure if it is no longer viable.

The specific Review Gates for a particular programme/ project, their points in the life-cycle and the acceptance criteria for each gate should be agreed at the start of the programme/ project and documented in the Programme Management Plan (PMP) and System Engineering Management Plan (SEMP). Ideally, this should be a single document, developed jointly by the PM and SE communities [Ref b].

4. What Makes Successful Review Gates?

The key aspects to successfully operate Review Gates are:

Review Gate Selection

Each gate assesses whether the activities that should have been completed during the stage to that gate have been. The life-cycle used impacts gate scope and scheduling.

The following considers the use of Review Gates for the life-cycle 'ends of the spectrum': Waterfall (where gates are explicit) and Agile (where gates are implicit). It is worth noting that the PRINCE2®¹ methodology [Ref d] defines a series of Gate Reviews (End-Stage Reviews). For Waterfall life-cycles, PRINCE2® Stages equate to the development phases and to Sprints for Agile life-cycles.

In practice, variations on these life-cycles will be used (e.g. incremental development, phased delivery, product upgrade) and PM and SE need to work together to tailor the use of gates. This tailoring is driven by not only the life-cycle used, but also specific programme/ project factors such as risks, participant organisations, operating environment and the desired programme/ project Outcomes

Review Gate Selection For Waterfall Life-Cycles

Waterfall [Ref b] based life-cycles have gates associated with the staged development of the solution. Generic Waterfall Gates and their acceptance criteria are given below and shown in Figure 1.

- Feasibility Gate: Is the requirement sufficiently understood for a programme/ project to be initiated?
- Requirements Gate: Are the overall requirements sufficiently mature, understood and documented for Level 1 (Conceptual) Design development to start?
- Level 1 Design Gate: Are the Level 1 Conceptual Design and requirements for the Level 2 (Functional) Design sufficiently mature and documented for Level 2 design development to start?
- Level 2 Design Gate: Are the Level 2 Functional Design and requirements for the Level 3 (Physical) Design sufficiently mature and documented for Level 3 design development to start?
- Critical Design Review (CDR) Gate: Are the Level 3 (Physical) component requirements sufficiently mature and documented for the development of these components to start (potentially including letting contracts to suppliers)?
- Test Readiness Gate: Are the components delivered sufficiently mature and Unit Tested for integration and test to commence (including Functional Acceptance, User and Business Acceptance Testing)?
- Operational Readiness Gate: Does the overall solution developed sufficiently meet its overall requirements to be put into operation?

Review Gate Selection For Agile Life-Cycles

¹ PRINCE2 is a Registered Trademark of Axelos Ltd. For further information see <https://www.axelos.com/best-practice-solutions/prince2>

Although the term 'Review Gate' is not used, gate reviews form the core of Agile approaches. Solutions are developed and deployed incrementally using time-boxed 'Sprints' with a review gate before and after each Sprint. The approach applies the steps described below and shown in Figure 2.

- Develop the 'Product Backlog'; a prioritised list of everything that might be needed in the solution for this solution to be appropriate, competitive and useful. The Product Backlog provides a single source of requirements is never complete and evolves as the solution and its environment evolve. This is similar to the Waterfall life-cycle Feasibility Gate.
- Run a 'Sprint Planning Gate' (using developers and users as one team) to define the Sprint Goal by selecting Product Backlog items to be implemented by the Sprint (the Sprint Backlog). Items to be implemented during the Sprint are recorded to make the work to realise the Sprint Goal visible to all.
- Undertake development work of the Sprint as defined by the Sprint Backlog, tracking progress and issues through daily, fixed duration, facilitated 'Scrums'.
- On completion of the Sprint, undertake a 'Sprint Review Gate' to:
 - Review the Solution produced to elicit user feedback. This is a form of Operational Readiness Review. The solution is deployed and the Product Backlog updated.
 - Undertake a 'Sprint Retrospective' to identify Lessons Learned for application to future Sprints.
 - Undertake the next 'Sprint Planning Gate' to decide which Backlog items will be in the next Sprint. As necessary, create an improvement plan to be enacted during the next Sprint.

Review Gate Planning

- Undertaking a Gate Review can be a significant undertaking and must be planned as part of the overall programme/ project schedule. For large programmes, a significant number of people (possibly 50-100) from multiple organisations may be required to attend (at least) some of the gate reviews.
- This planning is the joint responsibility of the Programme/ Project Management and Systems Engineering communities (typically the Programme Manager and Chief Engineer [Ref b]).

Review Gate Participation

Ensuring the right participation is vital to achieving the benefits of Gate Reviews and is particularly so for the Review Panel and Review Panel Chair. The following should participate in the gate review.

- Review Panel: The Review Panel is made up of independent, experienced and knowledgeable staff in the area the programme/ project is addressing, and is responsible for:
 - Preparing for the review by reading the material sent to them ahead of the review, including clarifying aspects as necessary with the programme/ project team ahead of the review.
 - Participating in the review to assess the completeness and quality of the work to date.
 - Recommending a Gate Review Outcome to the Review Panel Chair.
- Review Observers: other experienced staff who can contribute to the review. Observers can typically raise questions and comment during the review, but do not directly determine the review outcome.
- Review Panel Chair. The Review Panel Chair works with other panel members to define the review structure, the roles of the reviewers and, if necessary, what areas should be assessed in detail and/ or any specific topics and/ or questions that might be raised to determine the outcome of the review. The review should be chaired by a knowledgeable individual from elsewhere in the organisation or outside.
- Programme/ project PM and SE staff jointly present material to the Review Panel and address issues/ questions raised both ahead of the review and at the review. They do not determine the outcome of the review and are informed of the outcome by the Review Panel Chair on completion of the review.

Review Gate Support

The logistics of running a Review Gate is likely to require specific support to:

- Collate and distribute the material for review to Review Panel members in advance of the review (typically 2-4 weeks). All material considered by the review should be formally approved and issued (i.e. draft documents should not be submitted for Gate Review consideration).
- Collate any clarification questions and/ or comments raised by reviewers ahead of the review. These should be discussed with the Review Chair and raised at the review itself if appropriate.
- Document the Review Gate, including the questions and/ or comments raised and their replies.
- Collate and distribute the review outcome, recommendations and lessons learned.

Review Gate Governance

- The Gate Review session(s) needs a formal agenda to enable the content to be presented by the programme/ project team as clearly as possible. In addition, depending on the gate, scope of the programme/ project and/ or the number of organisations involved, the Review Gate may be run over multiple sessions. The Review Chair should work with the programme/ project team and the Review Panel to establish this agenda. The Review Chair must also ensure that the review sticks to the agenda.
- Gate reviews can be, and sometimes are, operated as a bureaucratic 'box ticking' exercise. If this is the case, the benefits from using review gates will not be realised. The Review Chair should ensure the review is an open and independent assessment and that any recommendations made are enacted.
- Where a programme/ project runs late, a decision must be made to either reschedule the Review Gate to allow unfinished work to be completed or run it as scheduled. The default is to reschedule as sufficient progress is unlikely to have been made. However, the SE, PM and Business Management and the Review Chair may jointly decide to run the Review Gate as scheduled after consideration of the completed and incomplete work and the risks associated with the work to the next Review Gate.

Continued Viability of the Business Case

- The review may identify internal or external issues that mean the programme/ project cannot achieve its Business Case. Should this be the case, the review should recommend that the business stop or (significantly) change the programme/ project. The formal decision to stop or change the programme/ project will be made by the same (investment) body that authorised the programme/ project.

Review Gate Follow-Up

- Where the review outcome is a Conditional Pass, completion of the required actions must be confirmed. These actions should be included in the programme/ project schedule and tracked as part of its on-going work. Confirmation that all actions from the previous review have been satisfactorily completed is an entry condition (and an agenda item) for the next Gate Review.

5. How can a Fusion between SE & PM Help?

The use of programme/ project level Review Gates as top-level milestones fuses SE and PM activities to the overall schedule at the start of the programme/ project. This fusion is maintained as each Review Gate considers the technical progress has been made together with the plan to the next Review Gate.

In summary, the fusion between programme/ project management and system engineering activities that Gate Reviews provide helps realise the following benefits:

- Better fused programme/ project management and systems engineering at the start of the programme/ project through the joint definition of the gate reviews to be held, their content and success criteria.
- Improved visibility of programme/ project status, planning and risks, including countering organisational 'Green Bias' so that issues are identified and addressed before they become expensive to resolve.
- Provision of a forum for identification and capture of programme/ project lessons learned and communication of these across the organisation from a forum supported by senior management.
- Increased understanding of the context of the programme/ project within the organisation by improving communication between programme / project PM/ SE staff and organisation senior management.
- Maintain better fused PM and SE through-out the programme/project by requiring PM and SE staff to jointly present progress to date and gain buy-in for the plan to the next gate.

6. References

[a] APM BOK, 6th Edition, 2012.

[b] SEPM Joint Working Group Roles & Responsibilities document, v1.0, June 2016.

[c] SEPM Joint Working Group Guide to Life Cycles and Life Cycle Models, v1.0, November 2016.

[d] PRINCE2 Manual 2009 (Managing Successful Project With PRINCE2), AXELOS, 2009, ISBN 9780113310583).

[e] ISO/IEC/IEEE 15288:2015 Systems and Software Engineering - System Life Cycle Processes.

[f] ISO/IEC/IEEE 29148:2011 Systems and Software Engineering: Life cycle processes - Requirements Engineering.

[g] ISO 10007:2003 Quality Management Systems: Guidelines for Configuration Management.

7. When can a Fusion between SE & PM help

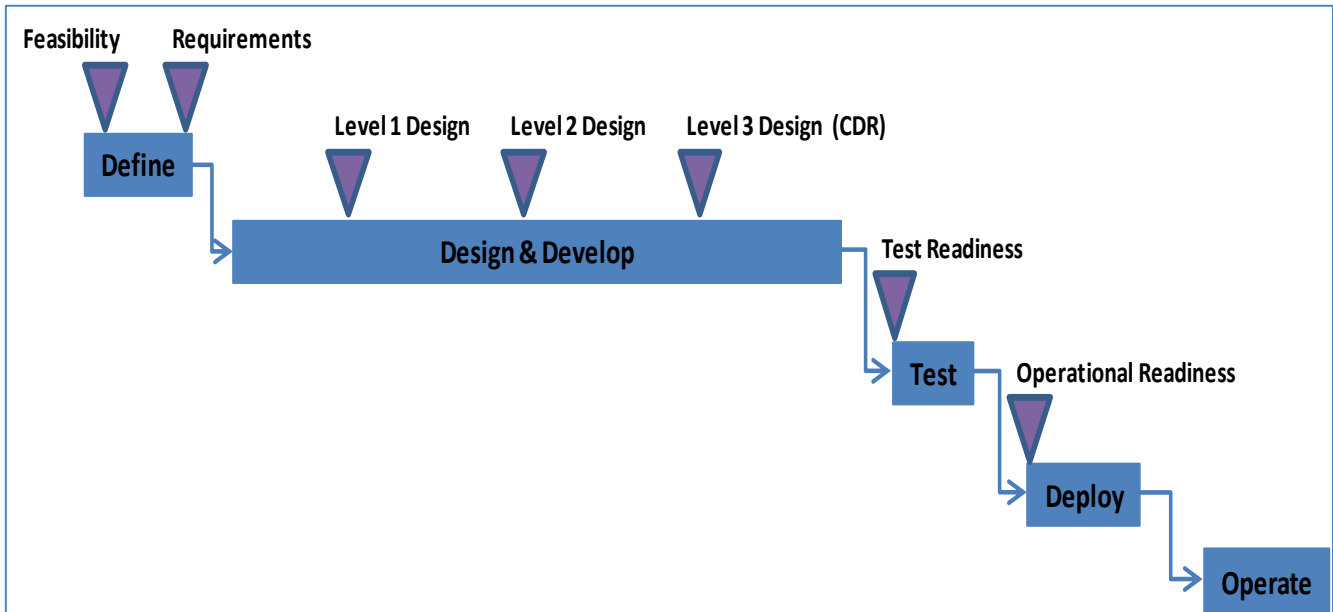


Figure 1: Generic Waterfall Life-Cycle Gates

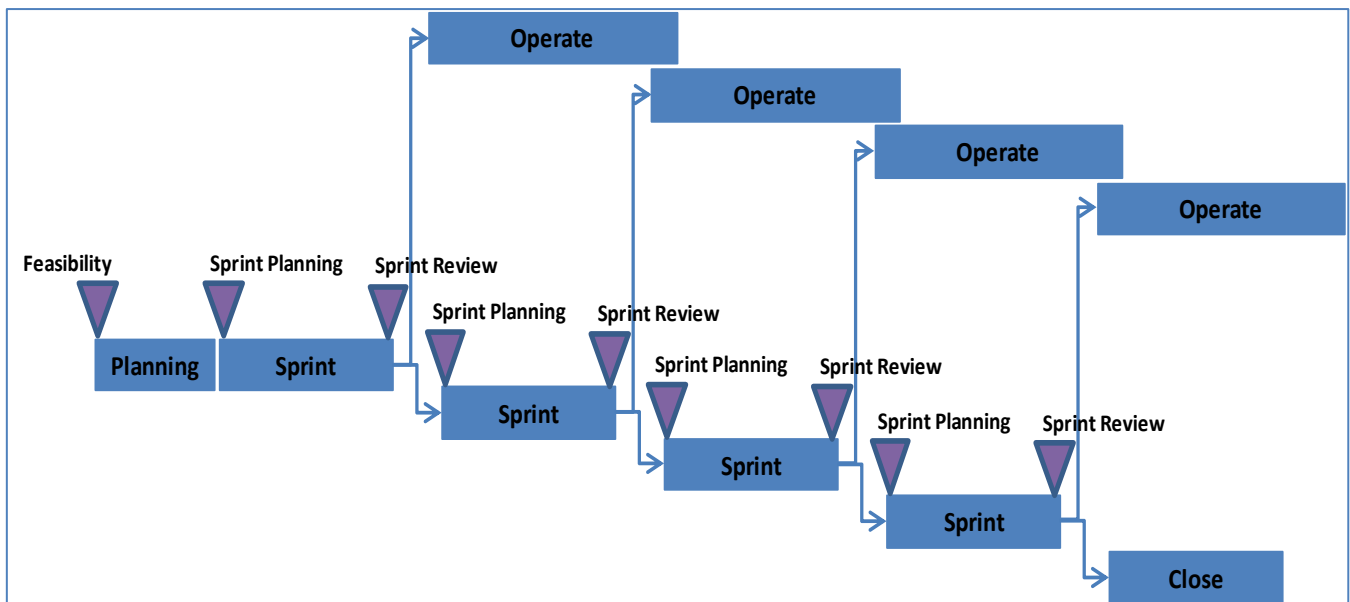


Figure 2: Agile Life-Cycle Gates