

## PM.09

## A Capital Investment Review Process

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**F**or many owner companies, the process for managing and executing capital projects relies on a “phases and gates” approach. The move toward this type of capital process began more than 10 years ago, as companies faced increased competition to reduce cycle time and improve cost effectiveness in their capital programs. The sequence of activities to engineer, design, procure, and construct capital projects is divided into phases. By clearly specifying the project deliverables for each phase, and identifying clear review points or gates, the project process comes under closer scrutiny and better control. By using a phases and gates process, many companies have been able to better implement good project management practices, improve project cost effectiveness, reduce cycle time, and obtain better safety and operability goals.

The Eastman Kodak Company (Kodak) began to revamp its capital delivery process in the early 1990s. Upon benchmarking with other similar manufacturing companies, Kodak realized that it could improve its current project process by following a more structured project process that focused heavily on the early stages of the capital delivery process where the most effect and value could be realized. The company’s capital project delivery process uses the phases and gates approach; and documents the project implementation process from initial concept development through requirements definition and conceptual engineering, detail engineering and design, procurement and fabrication, construction and installation, and project commissioning. In developing the capital project delivery process, the company specifically concentrated on defining and improving the early portion of the overall process from concept development through conceptual engineering. This portion of the process is known as front end loading or FEL.

Adherence to the capital project delivery process has resulted in documented and statistically significant gains to the company. These gains include:

- improved cost effectiveness—saving approximately \$300 million over six years;
- improved cycle time to “best-in-class” levels;
- improved predictability in cost and schedule;
- reduced contingency allocations which frees up limited capital for more projects;
- improved operability performance for completed projects; and
- improved safety performance for completed projects.

## CAPITAL PROJECT DELIVERY PROCESS

The company’s capital project delivery process involves five (5) phases: strategic, requirements development, conceptual engineering, project execution, and commissioning. Interspersed within the project phases are seven gates. Gate 0 indicates the project launch of the strategic team, and the subsequent six gates (gate 1 through gate 6) involve specific points of project review and approval. The company’s capital delivery process is shown in Figure 1.

The following discusses the five phases of the company’s capital project delivery process with particular emphasis on the FEL phases.

**Strategic Phase**

The strategic phase, also known as Class S, is the period when various alternative schemes are considered as solutions to a need identified by one of the company’s business units. Both capital and non-capital solutions may be considered at this time, and strategic estimates and corresponding business case evaluations are prepared for the viable alternatives. Typically, the strategic project team is comprised of a very small group, which includes the client representative, one or two engineers, the project manager, and the estimator. From this analysis, a single alternative is selected based upon a combination of financial, technical, and strategic decisions. Class S activities include:

1. Characterize the need for the project, and quantifying the preliminary business case supporting the project.
2. Identify alternative solutions (including possible solutions that do not involve a capital project).
3. Prepare various Class S technical deliverables for each alternative (used to define the scope of each alternative).
4. Prepare Class S (Strategic) Estimates and corresponding business cases for the viable identified alternatives.
5. Select the best alternative.
6. Hold various technical reviews (engineering, health/safety, reliability) for the selected alternative.
7. Define the preliminary resource and contracting strategy.
8. Begin development of the front end loading (FEL) plan.
9. Prepare preliminary project funding request.

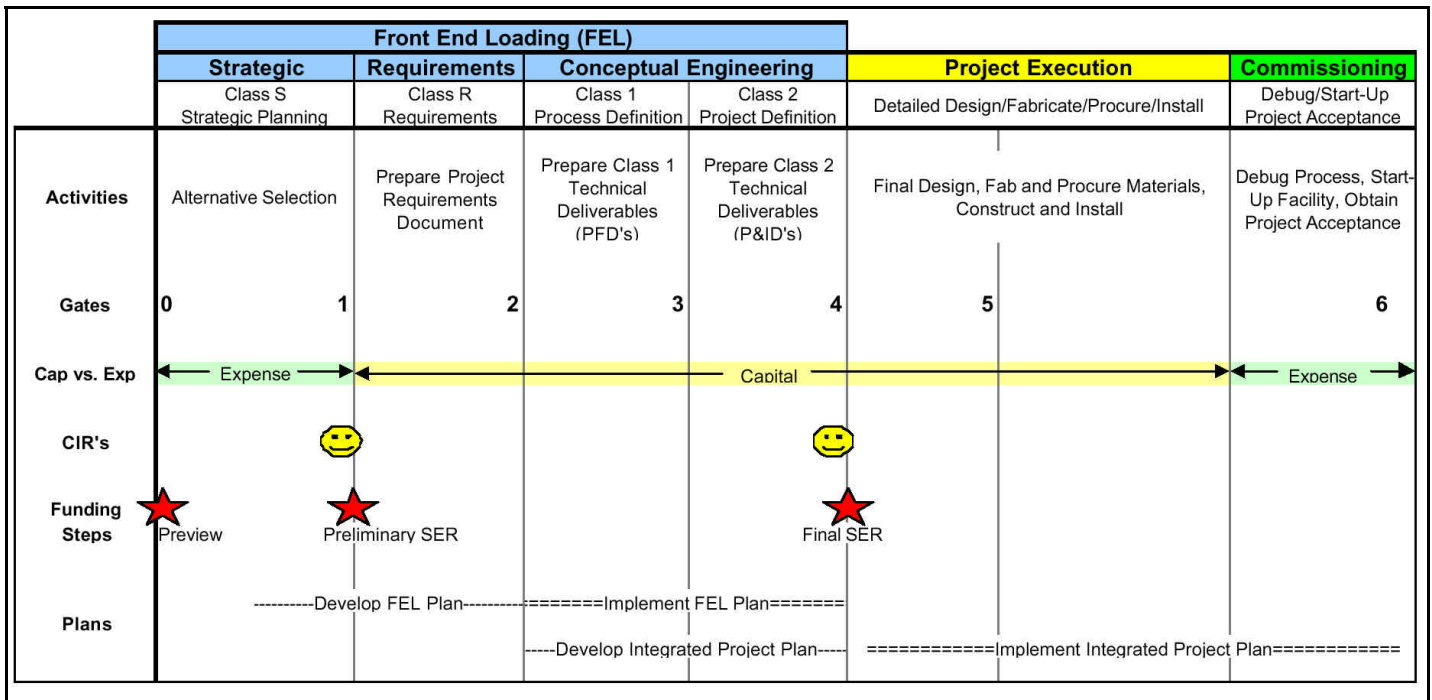


Figure 1. Kodak's Capital Delivery Process

The strategic phase is kicked off by gate 0, which involves the formation of the strategic project team; and approval of the project preview that authorizes the expense funding to cover Class S activities. The strategic phase ends with gate 1, which reviews the technical and project deliverables developed during this phase, and approves the selected alternative. If the project passes the gate 1 review, a capital investment review (CIR) is scheduled.

Whereas the gate reviews typically involve the project team and client representative, the CIR involves various levels of management within the capital organization. The CIR is intended to review that the capital project delivery process has been followed. The CIR reviews will be covered in more detail later in this article.

If the project passes the CIR, the preliminary project funding request (Preliminary SER) is submitted for corporate management approval. The preliminary project funding request provides the Class S estimated total cost of the project, and specifically requests the funds to cover the requirements development and conceptual engineering phase of the project, and occasionally the purchase of long-lead items that may need to be ordered in order to meet the project schedule. The preliminary project funding request is expected to request less than 10 percent of the estimated total project costs. Approval of the preliminary project funding request does not indicate approval for the project—only approval to continue with the conceptual engineering required to better describe the technical scope of the project, and provide a reliable estimate to support a final funding request.

**Requirements Development Phase**

Upon approval of the preliminary project funding request, detailed requirements for the selected alternative are developed during this phase, also known as Class R. The project team may be expanded to include the additional technical resources needed to complete the requirements document. The project's requirements document fully describes the business unit need that the

project is to address, and details the functionality and operational goals for the project. Class R activities include the following.

1. Develop and complete the requirements document for the selected alternative.
2. Update the business case for the alternative.
3. Complete the FEL plan (detailing the activities to be undertaken during the conceptual engineering phase).
4. Update the resource and contracting plans.

The requirements phase concludes with gate 2, which reviews the project requirements document, updated business case, and updated plans as described above, as well as any follow-up activities identified at gate 1. If the project passes the gate 2 review, conceptual engineering activities will begin.

**Conceptual Engineering Phase**

Passing gate 2 kicks off the conceptual engineering phase. Conceptual engineering involves two sub-phases: Class 1 (process definition), and Class 2 (project definition). The project team is expanded to include all required resources (engineering, designers, material management, etc.). Class 1 technical deliverables are prepared, which include completed site and layout drawings, preliminary equipment lists, preliminary one-line electrical drawings, and completed process flow diagrams (PFD's). A check estimate may be prepared at this time but is not required unless the project involves new technology, or the design has changed substantially from that identified during Class S.

Next, Class 2 activities begin that include completing all of the FEL technical deliverables, culminated by the completion of the process and utility piping and instrumentation drawings (P&ID's). At the end of Class 2 (or conceptual engineering), total engineering/design progress should be in the 25 percent to 40 percent range. The technical deliverables should be sufficient to kick-off detailed design.

During conceptual engineering, the integrated project plan is developed that is comprised of the complete engineering/design plans, the project controls plan, the material management plan, the commissioning plan, and the integrated project schedule.

Conceptual engineering activities include the following.

1. Develop Class 1 technical deliverables—
  - completed process and utility flow diagrams;
  - general equipment layout drawings;
  - site layout drawings;
  - preliminary equipment lists;
  - one-line electrical drawings;
  - preliminary process control design description; and
  - preliminary software design document.
2. Develop Class 2 technical deliverables—
  - completed process and utility P&ID's;
  - final equipment list and pricing;
  - preliminary lighting and power distribution drawings;
  - preliminary structural and foundation drawings;
  - completed process control design document;
  - refined software design document; and
  - preliminary control panel layouts.
3. prepare integrated project plan;
4. finalize project work breakdown structure;
5. update project schedule;
6. prepare Class 2 estimate;
7. update business case; and
8. prepare final project funding request.

The conceptual engineering phase includes gate 3 that occurs at the end of Class 1 (process definition), and gate 4 at the end of Class 2 (project definition). gate 3 is primarily an intermediate review of the Class 1 technical deliverables. Gate 4 reviews Class 2 technical deliverables, the Class 2 estimate and schedule, and all updated plans as described above. If the project passes the gate 4 review, a second capital investment review (CIR) is scheduled.

If the project passes this CIR, the final project funding request (final SER) is submitted. The final project funding request requests all remaining funds required to complete the project, and if approved authorizes the project team to complete the project.

### Project Execution Phase

After management approval of the final project funding request, detailed design begins. The balance of the equipment and other major purchases is ordered, and any required fabrications are started. At the end of detailed design, the final design review for the project occurs at gate 5. After gate 5, construction and installation takes place (site preparation may be started before the gate 5 review if the schedule requires it). The execution phase concludes at mechanical completion.

### Commissioning Phase

The commissioning phase includes project start-up, debug, and customer acceptance. This phase includes gate 6, the final approval of the project. To pass gate 6, the "process" must be certified to be in compliance with the project targets and goals iden-

tified in the project requirements document. At this point, the project assets are turned over from The company's capital organization to the business unit. Final "product" accreditation may not have been achieved, but will be continued under the business unit's direction and funding.

### Fit For Use

The company's capital project delivery process is meant to be a fit-for-use process. Small projects, repeat projects, and projects without significant complexity may combine some phases and gates. For these projects, gate 1 and gate 2 will often be combined, as will gates 3 and 4. The process is not meant to be burdensome, but to provide a structured methodology to maximize cost effectiveness, reduce cycle time, and meet or exceed operational, reliability, and safety goals for all projects.

## CAPITAL INVESTMENT REVIEWS

The capital investment review (CIR) is charged with performing a readiness review for projects at the completion of gate 1 and/or gate 4 in accordance with the capital project delivery process, and prior to submittal of the preliminary or final project funding request. All projects with a total estimated project cost (capital and expense) greater than \$100,000 must undergo a CIR. The CIR is intended to accomplish the following objectives.

- Ensure global adherence to the FEL process.
- Provide a mechanism to coach project teams for the purpose of eliminating variability in the application of front end loading (FEL).
- Perform a risk assessment on the project from a capital execution perspective.
- Ensure that project teams meet or exceed the requirements of the capital steering team (the upper management body that approves capital funding requests).
- Ensure compliance with new breaking initiatives in the project process.
- Provide a forum for the collective experience of CIR members to add value to projects.
- Allow organizational leadership to become familiar with the projects on which their direct reports are working.

The capital investment review involves a presentation by key members of the project team to the current CIR committee. The presentation typically takes approximately 30 minutes, and addresses the following topics.

- If FEL project and technical deliverables are complete.
- If the estimate prepared for the project meets expectations for the specific level of funding being requested.
- Business case justification, and cost/benefit calculations are documented and consistent with corporate standards.
- Benefit streams are proportional to the project scope, and not overstated.
- Resource plans were prepared and reviewed with required supervision.
- Purchasing strategy was prepared.

- Standard design use is maximized.
- Reliability has been planned into the project.
- Projects maximize return on investments, minimize cycle time, and meet or exceed project goals.

The CIR committee is comprised of the director of the worldwide engineering division, the director of the worldwide flows (project management) division, and representatives from global equipment reliability excellence, skilled resources (fabrication shops and construction), worldwide procurement, and the capital manager for the applicable business unit. Key members of the project team required to attend the CIR includes the project manager, the engineering manager, and the project estimator. Other members of the project team may attend if their expertise of knowledge may add value at the review.

The project team's presentation at the CIR will typically include a brief review of the technical scope of the project, a review of the business case, a description of the assumptions made in preparing both the business case and the project estimate, and a review of the CIR deliverables (described below). The review is intended to primarily focus on the analysis of project risks and concerns to the project.

The following deliverables are expected to be included in the submittal package prepared for each CIR.

- CIR summary preparation table;
- Copy of the completed funding request (preliminary or final);
- Cost summary at appropriate level of detail;
- Resource plan for FEL activities (for preliminary funding) or for detailed engineering, fabrication, and construction (for final funding);
- Reliability impact checklist;
- Construction/fabrication checklist (for final funding);
- Material management plan (for final funding); and
- Standard design plan (for final funding).

These deliverables will typically comprise approximately 15 pages and templates exist for use by the project teams. Any supporting technical deliverables or engineering drawings will also be brought to the CIR for use if necessary. Specific details about the information presented during the CIR will be discussed at the presentation.

**K**odak's capital project delivery process is a well-developed and well-established, but continually evolving process. Both internal company experience and external benchmarking has proven that this type of process is required for robust and reliable capital project delivery. Significant advantages have been realized through use of this process, and its emphasis on front end planning. Capital investment reviews ensure that the following things happen.

- The project delivery process is adhered to in a consistent manner by all project teams.
- The project delivery process is adapted on a fit-for-use basis by project teams.
- Project teams maximize the collective experience available within the capital organization.
- Funding requests submitted for management approval meet all required guidelines.

### RECOMMENDED READING

1. Eastman Kodak Company, **The Asset Lifecycle Process.**
2. Eastman Kodak Company, **The Capital Project Process Manual.**
3. Eastman Kodak Company, **Capital Investment Review Preparation Guidelines.**
4. Eastman Kodak Company, **Global Manufacturing Capital Project Delivery Process.**

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