# 10 Keys to Maximizing Capital Effectiveness

*Practices to mitigate common project failure modes*

Celerant

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## Practices to mitigate common project failure modes

### Key goals for capital projects

- Design the project to ensure all safety, environmental responsibility, reliability, maintainability, constructability, process efficiency and quality excellence are managed during execution and operational life
- Build the most effective and efficient process and management system controls to meet the business goals and complete the project on time & on budget
- All experience from similar projects is used to ensure the best design, execution and operation as possible
- Cost and schedule are managed through robust control systems, with clear communication of any changes from plan in a timely fashion so that alternatives to over runs are evaluated
- At project startup, maintenance & reliability programs are installed, and critical spares are available on site
- All required data, materials and people are available for each stage of the project

### Typical issues

There are many instances of failures to meet one or more of these goals. Typical and well documented failures include over budgeted efforts and late project deliveries. Less obvious project failure modes include incomplete scope and discipline designs from stakeholders early in the project, setting unrealistic expectations of cost-based designs on incomplete scopes, and drawn out facility start-ups as well as operational issues that endure for the life of the asset.

**Key practices:**

- ✓ A best practice gated capital process
- ✓ Know the scope before the cost
- ✓ A multidiscipline integrated team
- ✓ Leveraging all available expertise
- ✓ Support function excellence
- ✓ A communication plan
- ✓ An MOC process
- ✓ A complete fit-for-purpose design
- ✓ A thorough commissioning plan
- ✓ Control your destiny: keep control of the project

## Top 10 recommendations to keep your capital projects on track

1. Have and follow a best practice gated capital process that emphasizes high levels of pre-planning and design prior to capital funding (FID) to eliminate changes late in design or in the field.
    a. The business goals should be well defined, documented and vetted with the capital team as the initiation of the process.
    b. Develop alternatives to meet the business need, with risks and order of magnitude costs identified for each and develop the best solution further.
    c. Ensure Process Hazard Analysis (PHA) results, maintenance & reliability issues (criticality, critical spares, tools) and mechanical integrity plans are defined in the initial design prior to funding.
    d. Identify risks and mitigation steps for the project during each stage of the lifecycle, to minimize delays and capital overages.
    e. Communicate the right contingency for the stage of the development completed. The goal is to have no changes in design or scope once the capital funding is requested.
    f. Use accepted practices and tools (e.g. IPA using Front End Loading (FEL), and CII using the Project Definition Rating Index (PDRI) ) to ensure sufficient and repeatable preplanning and design.
2. Ensure all impacted groups are included at the earliest phase of the project scoping and build a functionally integrated project team.
    a. Identify and have available the support expertise for the integrated project team – EHS, mechanical integrity, reliability, maintenance, R&D, process engineering, procurement, production/ operations, sales, marketing, and management.
    b. Complete a roles and responsibility document for each phase of the project. A key to this is getting agreement and commitment from all the stakeholders prior to the project initiation.
3. Support functions must exist and be operating at high performance levels.
    a. Process safety management, personnel safety and environmental protection policies and procedures need to be developed and in compliance with Federal and local laws. EHS Personnel must be knowledgeable to provide design guidance and to lead Process Hazard Analysis in scope development ensuring full compliance and funding.
    b. Maintenance processes including work identification, planning, scheduling, execution and documentation providing care and history for the assets must be operating efficiently with good measures of effectiveness.
    c. Reliability processes including criticality ranking (equipment and spare parts), FMEA analysis, asset care development and mechanical integrity programs are defined and are integrated to ensure longevity and availability per the design.
4. Leverage your experienced resources to mentor, audit and support projects from ideation to operation.
    a. Implement a live company searchable resource guide for documenting personnel skills and experience.

   b. Identify all resources that could bring valuable information to each phase of the project and include them in the appropriate teams during specific phases of the project.
5. Complete the scoping and risk analysis with all available information and the team before floating an order of magnitude estimate and be specific regarding the contingency.
   a. Incomplete scoping even at the earliest order of magnitude estimating stage can lead to impractical projects being pursued at costs of millions through further design stages.
   b. Consider lifecycle costs during development of alternatives and throughout the design phase.
   c. Define funding requirements for the expense aspects of a project, including demolition, temporary facilities, rentals, write-offs and accelerated depreciation.
   d. Design to capacity and complete value engineering and constructability workshops at multiple stages of the project with at least one event prior to the capital funding request.
6. Have a robust well-defined communication plan for the project that includes project controls (financial, scope, design and schedule,) risk identification and mitigation.
   a. Actual, committed and forecast versus budget spending needs to be updated at least monthly or when major bids are let, or when changes are implemented, and continually posted for the team.
   b. Carefully document the use of the contingency throughout the project and post the reporting for all stake holders.
   c. Detailed schedules for each project phase should also be posted and updated weekly.
7. Define and follow a Management of Change (MOC) process for all aspects of the project – the goal is to have no changes. When there are changes, they need to be well documented, justified and approved at the appropriate organizational level.
   a. The approval process for use of contingency needs to be defined very clearly and followed.
   b. Design changes should have the most complete reviews with all project disciplines represented, as small changes can have trickle down impacts that are not easily forecast from a single view.
   c. Cost forecasting should be done as each bid is returned and compared to the project estimated amounts to allow opportunities to address issues prior to committing the funds.
8. Ensure all engineering designs are complete and fit-for-purpose though team interaction (e.g. design reviews) and routine follow up.
   a. Use best practice standards and specifications that have been vetted by all stake holders in the design and bidding process.
   b. Ensure designs are completed and approved by all stakeholders (maintenance, EHS, reliability, process engineering, R&D, etc.)
   c. Use an equipment criticality system for determining scope of critical spares: installed spare vs spare equipment in stock vs spare parts on-site vs order as needed.

d. Conduct value engineering studies and constructability reviews prior to the scope being forwarded for final design.
e. Ensure the existence and understanding of the process being used by the design teams to guarantee no systems are trying to occupy the same space, and to ensure visibility to other teams' special requirements.

9. Develop the commissioning plan and requirements early in the project and monitor progress.
    a. The commissioning plan needs to include an *operational readiness schedule* for acquiring new labor, building of training and training execution, development of any new policies and Standard Operating Procedures (SOPs) and acquisition of new tools, spare parts and equipment. Additional labor may include support functions such as maintenance and quality departments.
    b. Other documentation and system development plans for the capital project should include building the required elements in a CMMS and/or ERP system. This will include development of an equipment hierarchy and entering of equipment data, spare parts, preventive and predictive maintenance plans, and asset information. Training on the newly built CMMS/ERP additions will also be needed.
10. Control your destiny – keep control of the project.
    a. Design-build contracts are filled with risks unless the project is a duplicate of an existing system and all aspects of the project are fully specified.
    b. Keep control of the project by spending the time upfront defining the appropriate project controls and using all the assets available to develop the plan, design and budget. Employ confidence in using the controls with the support of the reporting and review processes and identify and manage risks early.

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