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Project Management Maturity level for Large Complex Infrastructure Projects

Measuring an organization’s maturity level in the field of project management is a question that is raised often. By using existing frameworks (CMMI-DEV) and extending them to the field of Large Complex Projects, a meaningful project management maturity framework can be developed. This White Paper gives a summary of this approach and of the different maturity levels.

The CMMI -DEV framework

There are several frameworks available, a well-known reference is the CMMI® (Capability Maturity Model® Integration) framework. It has been developed historically in the field of software development and systems engineering, by the Software Engineering Institute. The CMMI-DEV document (the version of the CMMI® framework for development projects) is available for free on internet. The latest version is 1.3. Although it has been developed primarily for development projects in those fields, it provides an interesting generic structure to measuring the maturity of an organization.

The principle of the maturity measurement is a rating from 1 to 5, with the generic stages being as follows:

CMMI-DEV maturity rating	Summary description	Maturity description
1	Know-How based	Project Management is performed based on personnel know-how and heroism
2	Individual project processes	Basic project Management processes are in place for individual projects (plan and control)
3	Standard processes	Project Management processes are standardized across the organization, including a basic lessons learnt / continuous improvement loop
4	Effective timely quantitative control and piloting	Project Management processes are monitored effectively in terms of effectiveness which allows timely reactions; predictability for new projects is increased
5	Learning agile organization, optimizing	Project Management processes are continuously improved and transformed; the adaptation process is instantaneous effective, the organization is agile.

The full CMMI®-DEV framework details the requirements in 22 process areas to measure the overall maturity rating of the organization, based on the actual capability level of the organization for each of these process areas (refer to appendix 1). These generic areas are quite applicable to all types of project organizations; the weight of each area will depend of the circumstance, in particular if the organization is an Owner or a Contractor.

The detail of the criteria for rating for each level and each process area in CMMI®-DEV is useful although sometimes too specific to software issues. Hence it is quite useful to adapt this framework to the specifics of large, complex infrastructure projects.

A Project Management Maturity Framework for Large Complex Infrastructure Projects

PVD has developed a simple model which is based on the CMMI® generic maturity levels but uses a different list of processes using vocabulary and concepts that are possibly more common in the infrastructure industry. The model addresses both Contractor and Owners. In general, the Owners require more processes to be at the adequate level of capability – with a particular focus in terms of overall system engineering and management.

PVD’s Project Manangement Maturity framework is detailed in appendix 2.

Minimum maturity requirements

The maturity level is a very useful indicator for Executive Management of the suitability of the organization to the strategic ambition

Very simple and small projects can be tackled successfully with low maturity levels, as their success will mainly rely on the Project Manager’s

capabilities. For successfully tackling Large, Complex Projects, however, a minimum maturity level of 3 on all dimensions is required in this model. An organization with a maturity level of 2 only will not be able to effectively cope with size or complexity, leading to substantial project execution risks.

A maturity level of 4 will allow to effectively reinforce the predictability of project delivery and increase reliability and timeliness of decision-making by measuring in a continuous manner the performance of the organization. Such a maturity level is necessary in organizations that aim at being high-performing in managing large portfolios of varied large complex projects, or very large programs encompassing several large complex projects by themselves.

The quantification step founding the level 4 maturity is a necessary prerequisite to be able to reach level 5 which enables both flexibility and optimization.

The necessary maturity of Information Systems

The need to have performing Information Systems for all maturity levels above or equal to 3 arises specifically for Large Complex Projects. This is due to the mere volume of data to be controlled, handled and transmitted. Therefore, for the higher maturity levels, the consistency of the Information Setup with the maturity objectives will become a major parameter.

For successful tackling Large, Complex Projects however a minimum maturity level of 3 on all dimensions is required in this model.

Conclusion

Project management maturity models are useful for executive management to measure the current condition of its organization, or of part of its organization. They can also be used to compare the maturity of different organizations. The maturity level is a very useful indicator for Executive Management of the suitability of the organization to the strategic ambition of the organization in particular with respect to tackling Large Complex Projects.

Appendix 1: the 22 process areas of CMMI®-DEV

The process areas are segregated in 4 main categories: basic, advanced, quantitative performance management, performance optimization. The basic processes are the first ones that have to be developed to be standard processes, followed by the advanced processes, to increase the maturity level of the organization.

We have indicated in blue, those are specifically most relevant to Owners or Contractors Integrators.

1. **Basic (required for maturity level 2)**
 1. Configuration Management (CM)
 2. Measurement and Analysis (MA)
 3. Project Monitoring and Control (PMC)
 4. Project Planning (PP)
 5. Process and Product Quality Assurance (PPQA)
 6. Requirements Management (REQM)
 7. Supplier Agreement Management (SAM)
2. **Advanced (required for maturity level 3)**
 8. Decision Analysis and Resolution (DAR)
 9. Integrated Project Management (IPM)
 10. Organizational Process Definition (OPD)
 11. Organizational Process Focus (OPF)
 12. Organizational Training (OT)
 13. [Product Integration \(PI\)](#)
 14. [Requirements Development \(RD\)](#)
 15. Risk Management (RSKM)
 16. Technical Solution (TS)
 17. [Validation \(VAL\)](#)
 18. Verification (VER)
3. **Quantitative Performance Management (required for maturity level 4)**
 19. Organizational Process Performance (OPP)
 20. Quantitative Project Management (QPM)
4. **Performance Optimization (required for maturity level 5)**
 21. Causal Analysis and Resolution (CAR)
 22. Organizational Performance Management (OPM)

Appendix 2 (next page): Project Value Delivery's Project Management Maturity Framework for Large Complex Infrastructure Projects



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Project Value Delivery Project Management Maturity Model for Large Complex Infrastructure Projects

Maturity Level		2	3	4	5
Owner and Contractor	Integrated Project Management	Project-specific	Standard project execution model	Developed project execution governance tools	Ability to adapt project execution and governance to specifics based on measurable criteria
	Project Governance	Ad-hoc	Standard approach Basic portfolio management	Data-based decision-making, optimized governance, advanced portfolio optimisation	
	Configuration & document management	Project-specific, semi-manual	Company-wide process and automated system	Organization wide management of configuration and document assets	Configuration and document management inclusion in wider system engineering
	Project Planning	Project-specific format and approach	Standard plans and templates. Shared scheduling database	Schedule performance measurement for decision-making	Development of creative project execution and risk management approaches backed-up by data availability and analysis
	Project Monitoring & Control	Project-specific, semi-manual	Standard reporting templates. Proper forecasting capability.	Shared project control database, automated reporting, proven forecasting process	
	Risk Management	Performed at project level	Portfolio-level aggregation and lessons learnt	Inclusion in integrated enterprise risk management	
	Quantitative project & process performance	Semi-manual reporting, non-standard performance reports	Standard performance reports	Integrated performance reporting system	Predictive performance reporting system
	Quality Assurance	Project-specific format and approach	Standard plans and templates.	Quantified and optimized QA approaches	Development of new approaches based on data, Total Quality programs
	Verification process	Basic Quality Control	Standard quality control process	Strategic integrated quality control	
	Engineering	Project-specific process and tools.	Standard engineering process and standards; Standard tools.	Integration engineering to construction driving engineering process, shared tools and databases	Development of creative integrated project execution solutions and strategies, backed-up by data availability
	Supply Chain Management	Project-specific process	Standard approach and tools	Active supplier management and development	
	Contract Management	Project-specific	Standard Terms & Conditions and Red Lines	Contractual approach effectiveness measurement	
	Construction & commissioning (Product integration)	Ad-hoc construction & commissioning process	Standard construction & commissioning process	Optimized strategic construction & commissioning process	
	Organizational process focus	Basic processes / procedures, incomplete management system	Understanding of process vs organization. Complete management system	Interactive Integrated Management System	Process map optimization
	Organizational training	Reactive project-specific trainings only	Organization-wide training coordination	Strategic competency development schemes	Long term skill enhancement and high potential management
Advanced analysis and optimization processes		Manual management dashboards. Basic portfolio-level dashboard.	Automated management dashboards and set targets Advanced portfolio-level dashboard.	Creative approaches development and evaluation based on data	
Owner-specific	Requirements management	Project-specific	Standard process	Optimized requirements management / lean	Integrated requirements management
	Requirements & product definition	Ad-hoc definition process	Standard gate-based FEL approach established	Standard maturity development criteria for product definition	Integrated iterative product definition process
	Requirements validation process	Project-specific validation process	Standard validation process	Optimized integrated validation process	Optimization of validation process through integration in other processes



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