

# CMMI Implementation Guide

A Practitioner's Perspective



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This CMMI Implementation Guide is a reference book for anyone interested in implementing CMMI in their organization. The purpose of this book is, to provide insight in to CMMI Implementation phases and best practices to be followed in this journey. Most of us agree, that CMMI is more a De facto model that IT Industry follows and other industries also has shown lot of interest in adopting this model. The day to day popularity and its adoption rate is on the surge for CMMI. In this scenario, this book will help the new organizations and implementers, on how to approach CMMI Implementation practically in their organization. This book is not a replacement to the Model or to the resources which CMMI Institute Publishes. This is only an additional resource which user can benefit from.

CMMI Institute holds the complete authority and rights to CMMI model and all the components within the framework. This book is prepared based on the experience of a practitioner on implementing the model in various organizations. The Author has worked in multiple roles in CMMI Implementation and has global exposure in implementing the model. We reiterate that for all the model related details and updates, please visit CMMI Institute website and contact CMMI Institute team for any clarifications.

This book is intent to give you guidance on how to approach CMMI Implementation in your organization from initiation, planning, execution, appraisal and sustenance. This book gives various practical approaches followed by organizations as typical examples. Implementation of CMMI is not an activity for marketing and bidding, it's more than that, its strengthening of your product development & Service delivery models to achieve your business results. Considering this you would want CMMI Implementation to bring in the real cultural change and value to your business. This book provides you information which is useful for deciding, planning and implementing CMMI in Successful way.

Be clear, there are many ways to implement CMMI and its practices. Having a better consultant or Engaging a CMMI Institute Partner in your Journey is always helpful in removing the barriers at right time, however in this book we are giving the details, which one should be aware of in this journey to better utilize the resources and control the program.

This book is suggested for senior management people, process quality assurance people, delivery people and anyone interested to know about CMMI Implementation. Understanding on the topics given in this book will help them to strategize for successful CMMI Implementation.

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## Introduction to CMMI

CMMI (Capability Maturity Model Integration) is a Process Improvement Model, which has collection of Industry best practices to implement in Organizations to achieve process capability and maturity. CMMI is a proven approach to achieve better performance results. CMMI is more of a framework which contains the model, trainings and appraisal components which helps an organization to implement the model in successful way to get benefit out of it. CMMI over the years has shown lot of success considering organizations are getting dramatic improvements in effectiveness, efficiency and quality.

Software Engineering Institute in Carnegie Melon University has developed this model initially. The CMMI Model Evolution is given below,

Year	Model Development
1987	Initial Framework
1990	CMMv1.0
1993	CMMv1.1
1998	CMMv2.0
2000	CMMIv1.0

2002	CMMIv1.1
2006	CMMIv1.2
2010	CMMIv1.3

\*Source – CMMI Institute Site

In the year 2012 -2013 the CMMI Model and related components have been transitioned to the newly formed CMMI Institute for better management and results. For further details, please refer CMMI Institute site and/or contact Customer relations of CMMI Institute.

The current version of CMMI is Version 1.3 and it got released in year 2010 and related appraisal version SCAMPI v1.3 also available. The model can be downloaded for free in CMMI Institute site. CMMI has three different Constellations in its product suite. As definition “a constellation is subset of CMMI product suite relevant to improvement in a particular area of interest”. The constellations are CMMI for Development, CMMI for Services and CMMI for Acquisition.

CMMI for Development - Addresses guidance on product/System development/Engineering

CMMI for Services - Addresses guidance on delivering services to internal and external entities

CMMI for Acquisition – Addresses supply chain management, acquisition and outsourcing processes in government and in Industry.

These CMMI Constellations are having set of Process Areas designed to achieve results in that area. However there are 16 common process areas between all the three models. The other process areas are specific to that constellation. In this book, we are limiting ourselves with CMMI Dev (CMMI for Development) and CMMI SVC (CMMI for Services). In CMMI Dev we have 6 specific Process Areas and in CMMI SVC we have 7+1 Specific Process Areas. The CMMI Dev consists in total 22 Process Areas and CMMI Svc consists in total 23(+ Service System Development) Process Areas.

Process Area is a cluster of related practices to achieve certain results. Process Areas are organized in terms of Goals and each Goal consists of set of practices, which would help to achieve the goals. An Example: Configuration related practices to be performed in product development or in Service Delivery are collected and established under one process area called “Configuration Management”. Risk identification and handling practices are established under “Risk Management” process area.

CMMI consists of two representations, Staged Representation and Continuous Representation. Staged Representation is adopted by most of the organizations as its giving them guidance and benchmarking with other Organizations, Whereas continuous representation is adopted by

Organizations which are clear in their area of improvement and are comfortable with the practices in all other areas (or comfortable with the level of performance). In Staged Representation, Organization's Maturity level is provided with 5 different process maturities. In Continuous Representation, Each process Areas' capability levels are presented with 6 levels. A representation in CMMI is analogous to a view into a dataset provided by a database. Both representations provide ways of implementing process improvement to achieve business goals. Both representations provide the same technical content, but organized into different ways.

In this guide, we will concentrate on the Staged Representation based on Maturity Level. A Maturity Level is a well-defined evolutionary plateau on the path to becoming a mature organization. Each level provides foundation to the next Maturity level. Each Maturity level Consists of set of process areas to be implemented. There are five maturity levels in CMMI Staged representation.

Maturity Level	Definition	Characteristic
Level 1	Initial	Poor Control & Heroism
Level 2	Managed	Project Processes & Reactive
Level 3	Defined	Organization Process & Proactive
Level 4	Quantitatively Managed	Predictable and controlled Process
Level 5	Optimizing	Process Improvement & Innovation

\*source – CMMI Model

Each Process Area consists of Goals. Goals are further aligned with related practices and a goal indicates combined achievement of practices under it. There are two types of Goals,

- Specific Goals: Implementation Specific to that Area of Interest is the target
- Generic Goals: Institutionalization of the process area is the target

Each Goal consists of set of Practices to be performed. A Practice indicates the related tasks to be performed. There are two types of practices,

- Specific practices: Specific and unique itself. Information differs from level to level
- Generic practices: Common practices across all process areas with a similar grouping

In addition to this there are sub practices, notes and sample work products. They help us to understand the intent of the model components and implement it better.

Further details on architecture and understanding on Goals and practices, please refer to the CMMI model (The model is a registered copyrighted product of CMMI Institute).

Maturity Level	CMMI Dev Process Areas	CMMI Svc Process Areas
Level 2	Requirements Management	Requirements Management
	Project Planning	Work Planning
	Project Monitoring and Control	Work Monitoring and Control
	Supplier Agreement Management	Supplier Agreement Management
	Configuration Management	Configuration Management
	Measurement and Analysis	Measurement and Analysis
	Product and Process Quality Assurance	Product and Process Quality Assurance
	-----	Service Delivery
Level 3	Requirements Development	Strategic Service Management
	Technical Solution	Incident Resolution and Prevention
	Product Integration	Service Transition
	Verification	Service Continuity
	Validation	Capacity and Availability Management
	Integrated Project Management	Integrated Work Management
	Risk Management	Risk Management
	Decision Analysis and resolution	Decision Analysis and resolution
	Organizational Training	Organizational Training
	Organizational Process Definition	Organizational Process Definition
	Organizational Process Focus	Organizational Process Focus
	-----	Service System Development (Add)

Level 4	Quantitative Project Management	Quantitative Work Management
	Organizational Process Performance	Organizational Process Performance
Level 5	Organizational Performance Management	Organizational Performance Management
	Causal Analysis and Resolution	Causal Analysis and Resolution

\*Add – Additional Process Area: Applicability decided by Need of the Organization

CMMI – Known Benefits:

- Improvements in Project/Work performance Results
- Achievement of Business Objectives
- Delivery and Service Systems are streamlined
- Quality Improvement in service and product
- Lesser customer complaints
- Improved employee morale
- Standardized delivery approach in business
- Understand the Strength and Weakness in process and plan improvements
- Better process – product relationship achievement
- Predictability and continual improvements helps business growth
- Better Engineering and Service Processes
- Helps in Adopting Newer Technologies in Quick time
- Scaling up of process to new methodologies is comparatively easier
- Better Project Management and Control in the Organization.

Please visit CMMI Institute site for further details and for reports on Quantitative gains.

Beyond all this, we have to acknowledge the fact that CMMI from Information Technology Industry perspective is a De facto Model and it has ensured that more and more organizations has standard engineering process development practices, there by contributed to the industry and to

customers. In last 15 years, as the industry and new technology practices has grown, CMMIs contribution is vital to the Industry. We have to thank SEI and CMMI Institute for ensuring this model is up to date and paved way for us to standardize and improve our delivery practices. CMMI is instrumental in bringing Process Based Delivery Approach, Stable quality management system, bringing Process Quality Assurance practices more explicit, Clarity in software Engineering Concepts and establishing Strong Process Working Groups in the Industry. Having said that, CMMI is beyond software and Systems, however in this guide we limit only to the IT Industry.

Few Key Success Factors for its worldwide adoption:

- The users can contribute and raise change requests to customer relations
- Users of the model can ask clarifications and they are supported well by CMMI Institute
- The New changes are discussed and piloted in many cases
- New improvements are always welcome with CMMI Institute
- The Model and related sources are free and users can download
- Apart from Appraisal and official Training there is no mandated cost involved
- The Proven results made it as a model widely adopted across the globe
- CMMI Partners are available worldwide and getting services are easier
- User groups in Yahoo, LinkedIn and other social sites help in people to understand and clarify doubts
- Systematic working and bringing in changes to help users by the CMMI Institute and all its certified personnel is strength.
- The Quality of the results are monitored and relevant policy updates are given by CMMI Institute to ensure that Users get good experience in Implementing the model and performing appraisals
- The case studies, presentations, webinars on different topics performed by CMMI Institute to ensure that all kind of industries get relevant update.
- SEIR repository provides enormous amount of user contributed materials, which helps every organization and its employees to get better understanding and implementation of the model.



- CMMI Institute and associated members/partners work on different areas of interest and share updates on them to the community. Most of them are free articles. Example: Agile and CMMI, in this area lot of effort spent by community members and today we can say, we are no longer with many ambiguities in adopting CMMI and Agile together.
- Combined Constellation implementations and combined appraisals has also become reality and many of the organizations are interested considering their business model.
- CMMI Institute SEPG meetings which happens once in every 6 month, brings in lot new ideas and process approaches, which is critical for the evolving trends in the Industry. In short they work on maintaining the Model up to date.

## Initiating CMMI Implementation

Do I need CMMI?

The first step in CMMI Implementation is to understand what you want to achieve in your product development or service delivery. For that you have to be clear with your current business model and the role of processes in your business. There can be no business without any process in this world. However the balance between process, technology and people could vary from one to another. Hence it's important to understand what is the role of process in your business and by improving its maturity, what is the kind of result you expect with your business to be understood. This we can say, "Do I need CMMI?" CMMI may not be a solution for all the problems you have and just because someone has told, you may not start your implementation.

You are expected to have the clear understanding of current Business and related processes, in addition to that, now you are expected to set your objectives for CMMI Implementation. We can look at any similar organizations which has implemented the model and how the results have paid for them. With little more research on your own and with CMMI Institute site and relevant reports, you can have an idea about how CMMI Implementation can help in your business and in delivery.

When we say understand your business, it means

- What are the different products or services your organization offer
- How many divisions and units are there
- Do all of them produce same or similar products/services
- Are all of them produce same business benefit or which of them are key for me to succeed in business

- Are you already in the optimum level or there is scope for improvement
- Which part of the business to improve or Business process to improve
- What is the cycle time of my services or products
- Do you produce part of product/service or complete product/service
- Are you interacting with client directly or with your own resources (onsite teams)
- What is the current resource competency I have
- What is the level of Infrastructure you have
- Whether you are clients are expecting you to perform with certain maturity in some processes

The Understanding on these questions will help you to think more on what you are going to gain by implementing CMMI. Also it will tell, do you really inclined to implement CMMI or its just for Attracting clients or for bidding purpose, you want to get some maturity level. Because when we are not aware of our business model and where exactly we feel CMMI Implementation will benefit us in our business, then we have more chances of not getting the real benefits of CMMI.

Establish Internal Commitment:

Discuss within management about what CMMI is, and what kind of benefits you are expecting from implementing the model in your organization. Be specific on the results and be clear that questions may come on the following, Why CMMI model and why not others, what benefit it will give, how can we apply in our business, etc. The reality is almost 90% of the organizations might have the same questions; however they have implemented the model and getting benefits today. It's pretty normal that everyone thinks that their business is unique, their project is unique and they are unique. However most of them can be categorized in countable number of groups and many of them has similar characteristics, so CMMI is no difference to it. Set clear expectations with people on what level of involvement you expect and where the changes are likely to come. Many times, fear of change and modification of system will make people resist the Implementation. Hence clarity on what is expected, what might change, what benefit it will bring, motivating them to be part of change and making them own the changes will help to great extent. Involve the Heads of all the functions in your discussion, so that everyone feels part of the initiative.

Give time to people to think and come back on the CMMI Initiative. Let the questions come on the initiative and anything on the model, it's better to answer it through an Executive Session on CMMI. The Session could be typically for a day, so that better clarity and understanding all the

senior management people achieve. This could help you in removing the anxiety from the stakeholders.

Initial discussion with Subject Matter Expert:

Once all the stakeholders are in alignment you can go ahead and have discussion with the CMMI Subject Matter Expert (SME). You may find one internally in your organization or you may contact any CMMI Partners in your region, who are providing the Consulting and Appraisal services. You can check the list of CMMI Partners and their services through CMMI Institute site. A discussion with Subject Matter Expert should be on the following,

- Current Version and Status of CMMI Model
- What are the different steps involved in Implementation
- What phases and approach they generally suggest to the organization
- Data/Experience related to Similar Cases of Implementation
- Check the ROI that Other Organizations have achieved
- What the different Objectives that Organization like yours can aim to achieve
- What are the different requirements on Human, Infrastructure, training requirements
- What is the right Constellation according to the SME for your business
- Have them describe the overall expectation from the Organization
- Collect the Contact points and relevant references for them (for external Service Providers)
- It may be too early, however you can check with them the timeline typically it takes to implement CMMI Model on an Organization like yours and the maturity level you should target.

CMMI Institute always keeps their database up to date on their Partners; hence selecting a Service Provider from there is not a difficult choice. At the same time, there are many other renowned organizations also providing CMMI Consulting services. You have the option of selecting among many, but for Appraisal and formal training services from CMMI Institute, it shall be done through CMMI Partners only with the CMMI Certified Individuals. However for consulting or SME services there is no such restriction.

Choosing the right Constellation for you:

As we already discussed that you have worked on the basics of your business and what you expect from CMMI Implementation. However when it comes to selection of CMMI Constellations for your business, you may end up with question, which one to choose. It can be decided on few factors,

- Business Model in the Organization
- Typical Cycle Time to deliver your Product or Services
- Volume of work in Service Delivery and Product Delivery
- Business Income ratio between Service Delivery and Product Delivery
- Complexity involved in Product Development
- Areas where you need Improvement
- Type of Activities Performed

There could be other factors which also can influence. However when you find they are smaller cycle times in which you have to deliver your product or services and less intensive engineering needs, then its recommended to go for CMMI Services. However if you are involved equally on development of product and in Services (Maintenance/migration/testing/etc) then you can go for combined CMMI Dev and CMMI Svc Constellations to have the best from both. In case if you have lot of medium (3 to 9 month) and Longer Projects (> 9 months) and need good Engineering Practices to strengthen your product, you can select CMMI Dev model.

Be clear CMMI Svc doesn't mean there are no engineering practices; it has Service System Development process area to support your needs. However you have to decide based on what level of complexity, your products have.

Fix your Goal on the Program:

The following aspects you have to be clear before engaging in to the planning part of CMMI Implementation in your organization.

- Clear description on your business needs on CMMI Implementation
- Performance Goals target for your business
- Tools and Technology Improvements or positioning
- Prioritization of process based delivery and Services
- Competency level of Employees and target improvements

- Possible Effort and Availability requirements of Management Team
- Possible effort needs from SME and Process Quality Assurance people
- Return on Investment expected from the program (direct and in-direct)

Once you have made up your mind on the above given points then it's time for you to engage Service Provider.

Engaging CMMI Institute Partner or Service Provider:

As explained earlier, you would definitely need a CMMI Institute Partner for performing a) CMMI Official Trainings b) Appraisal Services. For CMMI Consulting Activities, you can engage any Subject Matter Expert from your own organization or from other service provider or through a CMMI Institute Partner. If Appraisal is in your plan and you want to achieve a Maturity Level rating, then it's important that you understand that you need a CMMI Institute certified Lead Appraiser for performing your appraisal. A Lead Appraiser services can be availed through the CMMI Institute Partner. Engaging Lead Appraiser early in your implementation helps you to be in alignment with his expectations and to ensure his availability for your program.

The following points you need to consider before engaging any of them:

- a) Consider the overall experience of the Lead Appraiser and relevant experience in the area of working
- b) Interact with them to see how they are able to pick up your business model and services
- c) Check their credibility in the market
- d) Cost of the Appraisal services (include Logistics cost)
- e) Past experiences and similar organization appraisals performed by them
- f) Collect References for their work
- g) Get their view on your CMMI Implementation program
- h) Understand their schedule and how busy they are. ( There is a cap of 12 appraisal per year/ per LA, hence check whether they are available for you)
- i) Sponsor of CMMI Program has to interact with the Lead Appraiser, before engaging them

- j) Check your comfort level with Lead Appraiser. Sometimes few are comfortable with aggressive type of Individual and some are comfortable with soft spoken, friendly Lead Appraiser.
- k) Check what are all the different product modules (Trainings, Appraisals) he is certified for, that can reduce your interaction with multiple Certified Individuals.
- l) Check on the best possible review schedule and Appraisal schedule they suggest to you.

Be clear a Lead Appraiser who is going to perform your appraisal, can't be a consultant for you. Similarly if you have your own Lead Appraiser, then he/she can't be from the same Organizational Unit (the Organizational unit which is within the scope of Appraisal).

Most of the points given here holds true for selecting a Consultant, however for that you don't need a CMMI Institute Partner. CMMI Institute doesn't mandate consulting activities under any case and Implementation of the model, can be completely done by in house or with any known service provider. The fact is CMMI Institute monitors the conflict of Interest that same registered organization shall not consult and perform appraisals. Under any case, CMMI Institute collects declarations from Partners and from Individuals in different times.

Common Reasons for Ineffective CMMI Implementation:

Before you start the complete planning of your CMMI Implementation program, be aware of the Common reasons which could make your CMMI Implementation in-effective.

- Lack of business alignment
- Lack of management participation
- CMMI Implementation Program for "*customer demand*"
- Lack of project management competency
- Not considering as "*Organizational Program*"
- Resistance to change
- Lack of belief in process improvement
- Interpretation challenges
- Lack of clarity in ROI
- Lack of resources
- Separation of Finance metric from Process metric

- Failure to understand the significance of “*Product and Process relationship*”

## Planning CMMI Implementation

The first step recommended is to understand your current product and/or service delivery practices and its gap with CMMI Constellations which you are targeting. This would help you to plan your activities, timelines, estimation on resources, establishing/modifying working functions and strategize for effective implementation of CMMI. Hence a Gap Analysis is the recommended first step in Planning. Gap Analysis can be performed by internal Subject Matter Expert (SME) or with external one. Basically you do this exercise to understand the gaps in your defined processes (if you have one) and with Practices followed in Service/product delivery. Also a good understanding on the Organizational dynamics and gaps identified there would be values add for you.

### Gap Analysis:

Planning a Gap Analysis, involves the service/delivery centers in different places, type of delivery models, type of business, duration of projects/programs, etc Based on these factors identify set of projects/program/applications which you want to take as sample for your Gap Analysis. Performing Gap Analysis involves a) Artifact Study and b) Interview/Discussion with practitioners. A detailed Gap Study will reduce lot of ambiguities and estimation errors in the subsequent stages of the program. Fix time with your practitioners and perform gap analysis with CMMI constellation that has been chosen. Check the relevant artifacts given by them to understand the delivery model and the current maturity.

Prepare a draft report in terms of Process Definition gaps and Process Implementation gaps for each of the Process Area. With certain number allocation for compliance with practices, you can also give an indicative value for Compliance with the model. Though it's inaccurate, it definitely helps organizations to visualize the compliance and to understand how much gap they have. A Gap Analysis report is the basis for planning and to work on removing the weaknesses, hence a detailed report is required. The Draft report has to be discussed with the management and final report to be prepared. Consensus with your management team ensures accuracy is established in the report. A good Gap Analysis report will also have significant weaknesses identified and provides key recommendations for next level planning. The Gap Analysis should also consider the relevant tools available and used in your organization. Any existing standards compliance by your organization to be considered in the gap analysis, as this would help in evaluating the process understanding and Management system maturity.

### Strategize and Plan your CMMI Program:

We call it as a program here, considering that your entire organization is involved in it and it brings cultural change in the organization and beyond that you may need to run lot of smaller projects within this CMMI Implementation program to make it effective and bring desired results for you. Having said that, it also depends on how big is your organizational Unit, for which you are targeting the CMMI Implementation. Now based on the Gap Analysis, Understand the following,

- a) Process Definition Gaps to be filled
- b) Delivery and Service practices where improvement is needed
- c) Roles and responsibilities update required
- d) Quality Management System Establishment ( set of process, technology and role which is set up to achieve desired results in delivery)
- e) Type of Projects/Works targeted under CMMI Implementation
- f) Organization structure update
- g) Training Needs in your organization
- h) Where maximum benefit can be realized with CMMI Implementation
- i) Compliance Program and Metrics culture status update

Based on these factors and understanding your organization's dynamics and change management ease, derive your Goals on the following,

- CMMI Constellation to be Implemented
- Representation to be used
- Target Maturity Level
- Timeline Target for achieving the desired Maturity Level
- Performance Goals for the Program
- Business Performance Expected after CMMI Implementation
- Coverage of Business Units/Delivery Centers within scope of Implementation

Be clear your timeline has to be little aggressive than what you can achieve. Relaxed timelines and Very Aggressive timelines both can affect quality of implementation. Maturity Level consideration wise, you can select anything between Level 2 to level 5 as your target. However you can't skip any Maturity Level, it means you need to implement all the Process Areas



belonging to the Lower Maturity Level, along with the one which you are targeting. Also understand it's more of a good practice, that before you target Higher Maturity levels like ML4 and ML5, its better that you achieve ML3. A Maturity Level is not a rank, but it's the actual process maturity status in organization. Unless you perform at certain level consistently, it would be difficult for you to understand what makes your organization perform at that maturity, and after knowing that and securing your strengths, you can move to the next Maturity Level. Else you might be working with unstable system and trying to simulate Maturity only on certain accounts, which could result in negative results and poor employee morale.

Discuss with your SME/CMMI Institute Partner:

Discuss the timelines, scope of implementation, Maturity Level targeting with your CMMI SME (Subject Matter Expert)/ CMMI Institute Partner and ensure that all of you are in alignment and see the possibilities of making the program success. Understand the additional points which you need to take care in this implementation program. You can't have very different plans from your service provider that will not help to achieve your results. Be open and seek support as required. Do not consider CMMI Implementation as Process definition and Audit, such thinking will definitely cost your organization badly.

Planning the Elements in Implementation:

Organization Structure:

If you don't have any existing process standard or model implementation in your organization, than you may need few new functions in your organization. Typically for CMMI Implementation you may need,

Steering Committee:

Steering Committee is formed to ensure that program runs smoothly and any barrier is removed without delay. The Steering committee consists of senior management, head of all relevant functions and CMMI program manager. If sponsor participates in the steering committee, then it will be very effective.

- They decide on business needs and process needs
- They Communicates to Organization
- They decide on CMMI program and its implementation
- Reviews progress periodically
- They remove the barriers
- They monitor the overall progress of the program

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