

# CMMI High Maturity Handbook

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**High Maturity an Introduction**

CMMI High Maturity Level is one of the Prestigious Rating any IT/ITES Companies would be interested in getting. The Maturity Level 4 and 5 achievement is considered as High Maturity as the Organizations understand their own performance and Process performance. In addition they bring world class practices to improve the Process Performance to meet their Business Needs. CMMI Institute has kept very high standards in appraisals to ensure that stringent evaluations are done before announcing the rating. Similarly the practices given at Level 4 and Level 5 are having high integrity and complete alignment with each other to stimulate Business Performance. Hence it's become every Organizations interest to achieve High Maturity Levels and also when they see the competitor is already been appraised at that level, it becomes vital from marketing point of view to prove their own process Maturity. The ratings are given for the processes and not for product or services. Hence a High Maturity Organization means, that they are having better equipped processes to deliver results.

Why not every Organization go for Maturity Level 5 is a question which is there in our mind for quite some time. It becomes difficult because the understanding on High Maturity expectations are less in many organizations, advanced quality concepts, statistical usage expectations, longer cycles to see results, etc are some of the reasons which prevents organizations. In 2006 when I was an Appraisal Team Member looking at evidences for Maturity Level 5, myself and the Lead Appraiser has mapped the Scatter plot of Effort Variance vs Size for Process Performance Model. After 9 years when we look back, the Industry has moved on and does the CMMI Model V1.3. There is much better clarity on what do we expected to do CMMI High Maturity. Similarly in 2007 there was a huge demand for Statistics Professors in Organizations which goes for CMMI High Maturity and some organizations have recruited Six sigma Black belts to do CMMI High Maturity Implementation. There was huge stress on applying statistics in its best of form in organizations than the business results achievement. However with CMMI V.3 model release CMMI Institute (then "SEI") has ensured that it provides many clarifications materials, it grades the Lead Appraisers as High Maturity Lead Appraiser, conducts regular workshops by which many people in Industry has Benefitted with adequate details on what is expected as CMMI High Maturity Organization. However still there is concern that this knowledge has not reached many upcoming. Small and medium sector companies as intended. Also in bigger organizations when they achieve ML4 or ML5 only a limited set of people work on this and/or in a particular function of the implementation they work. These factors reduces the number of people who can actually interpret ML5 without any assistance. This also means very few organizations are within comfort zones of High Maturity.

The Purpose of this book is to give insight about High Maturity Implementation and how to interpret the practices in real life conditions of an organization. The Book is written from Implementation point of view and not from technical expectations point of view. The usage of CMMI word is trademark of CMMI Institute, similarly the contents of the CMMI model wherever we refer in this book is for Reference purpose only and its copyright material of CMMI. I would recommend you to refer "CMMI Implementation Guide" book along with this book for understanding up to CMMI ML3 practices and its implementation. This book deals only with CMMI Maturity Level 4 and 5 practices. I have tried covering CMMI Development model and Services model implementation in this book.

High Maturity Organizations has always been identified with their ability to understand the past quantitatively, manage the current performance quantitatively and predict the future quantitatively. High Maturity Organizations always maintains traceability with their business objectives with Process Objectives and manage the process. In addition they measure Business results and compare with their objectives and perform suitable improvements. However even a Maturity Level 3 organization can also maintain such traceability and measure their business results, which is the need of the hour in Industry. I am sure CMMI Institute will consider this need.

In addition there is a growing need of engagement level benchmarking which clients are interested. The client wants to know whether their projects have been handled with best of the process and what is the grading/rating can be given. The current Model of CMMI is more suitable for Organizational unit/Enterprise wide appraisals, however engagement level rating needs better design or new recommendation on how do the process areas are selected and used. In high maturity Organizations we can see the use of prediction model and few specific Process areas being used by many organization to demonstrate engagement level maturity. Many a times they miss out the Business objectives and client objectives traceability to Engagement Objectives and from there how they are achieved. There is a growing need for Engagement level Maturity assessment from users.

In High Maturity Organizations we typically see a number of Process Performance Baselines, Process Performance Models, Causal analysis Reports, Innovation Boards and capable Process to deliver Results. In this book we will see about all these components and how they are created. The flow the book is designed in that way, where we go by the natural implementation steps ( in a way you can make your implementation schedule accordingly) and then end of the relevant chapters, we will indicate which process area and what are the specific practices are covered in it. However you may remember the goals have to be achieved and practices are expected components only. Similarly we will not be explaining the Generic Practices, as you may read the same in “CMMI Implementation Guide” book. Also there is a detailed book only on “Process performance Models - Statistical, Probabilistic and simulation” which details on various methods by which process performance models can be developed with detailed step. I would recommend to refer this book, if you want to do something more than regression based model given in this book. Also for the beginners and practitioners in quality, to refresh and learn different techniques in quality assurance field, you can choose to refer “Jumpstart to Software Quality Assurance” book.

Let's start our High Maturity Journey Now!

**Prerequisites for CMMI High Maturity**

CMMI High Maturity in an organization is not an automatic progress which they can attain by doing more or increasing coverage of processes; it's a paradigm shift in the way the organization works and project management practices. CMMI High maturity is an enabler and a sophisticated tool in your hand to predict your performance and improve your certainty. It's like using a GPS or Navigational system while driving, isn't great! Yes, however the GPS and Navigational system for you will not be procured, instead you need to develop. Once you develop and maintain it, it's sure that you will reach your target in predictable manner.

In order to implement CMMI High Maturity in any Organization, the Organizations should meet certain prerequisites, which can make their journey easier,

- \*Strong Measurement Culture and reporting System
- \*Detailed Work Break Down Structures and/or detailed tracking tool of services
- \*Good Project management tool
- \*Strong Project management Knowledge
- \*Regular Reviews by Senior management
- \*Good understanding on tailoring and usage
- \*Established Repositories for integrated project management tool
- \*Strong SEPG team with good analytical Skills
- \*Statistical and Quantitative understanding with project managers and SQA's (if needed, can be trained)
- \*Budget for Investing on Statistical and management tools and their deployment
- \*Good Auditing System and escalation resolution

What it's not:

- \*Not a diamond ornament to flash
- \*Not a competitors demand or client demand
- \*Not one of colorful certification in reception area
- \*Not an Hifi language to use
- \*Not a prestigious medal to wear
- \*Not a statistical belt to be proud

What it is:

- \*A performance enhancing tool for your organization to achieve results
- \*Makes you align your business Objectives with project objectives
- \*Statistical concepts add to certainty and better control and removes false interpretations
- \*It makes you competitive against your competitors
- \*A Maturity Level in which you maintain the maturity towards reacting to changes

If you believe that by spending twice or thrice the money of your CMMI ML3 implementation you can achieve High Maturity, then you may be making a big mistake! Not because it may never be possible, but you just lost the intent. Unfortunately today not many realize it, but they want to show their arm strength to the world by have CMMI MI5. However it's a real good model at L3 itself, which can do wonders for you. Why to fit a car which travel in countryside with autopilot equipment, do you need it, please choose.

High Maturity practices are the near classic improvements made in software process industry in a decade or so. At this moment this is the best you can get , if applied well! Not many models and standards have well thought about maturity and application of best practices, as given in CMMI ML5 Model. So if you really want to improve and be a world class organization by true sense, just close your eyes and travel this path, as its extremely pleasant in its own way!

## Planning High Maturity Implementation

### Scoping Implementation:

Do we need CMMI in every hook and corner of your Organization or the places where you feel you get better Return of Investment is possible, is your first Decision. As an user your organization can decide to implement CMMI practices on enterprise wide and may do appraisal within a particular scope (Organizational unit scope). At this moment Tata Consultancy Services has done enterprise wide appraisal, which is one of the largest Organizational unit with maximum number of people across multiple countries. But not every Organization need to follow that path and its free for the user organization to decide which parts of your enterprise may need CMMI with particular Maturity level. Within an Organization there can be two different Maturity Level the organization may want to achieve for certain reasons, are also possible. In such case the factors like Criticality of Business, Stability in Performance, Unit Size (smaller or Larger), Dependencies with Internal/external sources, Type of Business (Staffing/Owning service or Development), Cycle of delivery (Shorter/longer,etc), people Competency, Existing Lifecycles and Lenient Methods usage, Technology used etc can determine do you really need CMMI High Maturity Level 5. Sometimes it could be only the expectation of your client to show your process maturity, however you may confident that you are already performing at a maturity level 5 or in optimizing mode. So you may choose to implement/validate the CMMI practices for a particular scope using CMMI Material and CMMI Appraisal (SCAMPI A). What happens if you are a 25000 member organization, which decides to implement CMMI HM for a division which has only 1500 members is that fine? Can you perform an appraisal and say you are at ML 5? Yes, it is. CMMI Model is not developed for marketing purpose or for an enterprise wide appraisal purpose. It's developed to improve your delivery through Process improvements, hence if you decide to use it in a small part of organization, its up to you. The scope in which CMMI is Implemented is "Organizational Unit", which has its own definition of Type of work, Locations covered, people and functions involved, type of clients serviced, etc. This boundary definition is a must when it comes to appraisal scope, however the same definition when you use in implementation time will give greater focus to the Organization. The Organizational Unit can be of equivalent description of the Organization, if you choose the entire business units and functions within your Organization. However there are instances where the Organization claims its overall ML5 with smaller Organizational Unit (Less than Organization), which is not acceptable. The CMMI Institute has published appraisal results site, where the clients can see the Organizations' real scope of Appraisal (implementation scope could be larger than this) and verify whether the business centre and practices of supplier are part of this scope.

From an Organization which implements CMMI High Maturity Practices, we may need to consider the business objectives and its criticality, where systematic changes are possible and measurable, where clients wants us to consider improvements, which are the activities we can control and where we can influence, where we feel improvements are possible and currently we observe failures and/or wastages.

### Selection of HMLA and Consultants:

This is activity plays an important role in your CMMI ML5 Journey, after all there are many places in CMMI its subject to the interpretation of your HMLA and consultant. High Maturity Lead Appraiser (HMLA) are certified by CMMI Institute and only they can do an Appraisal and announce result of an Organization as Maturity Level 4 or 5. When you start your long journey which varies from 1.5 years to 3

years typically, your effort is going to be shaped most often by your HMLA and Consultant. Their presence with you should be beneficial in terms of improving your process there by achieving business results.

Hence when selecting your HMLA and Consultant, its important to check, how many organizations they have supported to successfully to achieve CMMI High Maturity in the last 2 years. Do they have experience in your type of business or they have earlier assisted/performed CMMI activities to a similar organization like yours. This will help you to get an idea on what you will be getting from them as guidance in future. Less experience is always a risk, as your team also might be needing some good guidance and review points to look. Check the geographic locations served by them and communication abilities in your native language also an important aspect, when your organizational presence is limited to a particular region and your people are not comfortable with foreign language. Also this will help in quick settling of consultant and HMLA to your culture.

There are HMLA's who has never done any High Maturity Appraisals in the past, but have cleared the eligibility criteria of CMMI Institute and been certified many years ago. They have also been able to renew their certificates based on their work on research, active participation on formal forums/seminars of CMMI Institute and been able to collect their renewal points. However their experience and comfort to perform a SCAMPI A appraisal for you can't be judged easily. This is a critical fact an organization has to consider. The same for a consultant who has worked in the past for many CMMI ML2 and ML3 consulting, but not in High Maturity Level (ML4 and ML5), its difficult to deliver many a times. Hence a special care to be given by your Organization in selecting your HMLA.

Similarly the working style of HMLAs differ and that has to be checked specific to your organizations. Some of them looks at overall intention of the Goals and guide your team in interpreting it in a better way and then pushes your team to achieve the target. However some of them looks at practice level aspects in details and always questions your ability to interpret and implement the practice. Such style of working may not really motivate your Organization and your team. Considering this a long journey with your HMLA and Consultant, its important to understand their working style quickly and decide. Some Organizations pay for Spot Checks/Reviews and then see their way of working before entering into final agreement.

Similarly it's important to see how well your consultant (if you have one) and your HMLAs getting aligned. If they both work completely in isolation, that means there is more risk of final moment changes coming from HMLA. Its always recommended to have frequent checks by HMLA to get confirmation on the Process improvement path you have taken and its design. In the past we have seen Organizations do lot of rework simply because they failed to involve HMLA's in the intermediate checks and left only to consultants. Also check if your Consultants at least have CMMI Associate Certification. In future there is a possibility that CMMI Institute might announce certification as CMMI Professional or Specific to consultants.

**Scheduling CMMI HM Implementation:**

Many organizations wants to achieve CMMI ML5 in 1.5 of years and there are few who understands the natural cycle of it and ready for 2 to 3 years implementation. We shall remember the Maturity is a state where we have industrialized practices and able to demonstrate capabilities, hence you need time to see

whether your organization performs in this state for some time. In addition, most of the practices have interdependency with sequencing and not parallel activities. Above all, to achieve your Business Vision and Targets with Process Maturity needs time to understand and improve processes. Hence anyone implementing CMMI L4 and L5 in a period less than 1.5 year shall be studied for the best and worst.

The decision of timeline depends on factors like basic measurement structure, Process Culture, readiness for improvements/resistance for improvements, People and technical capabilities and frequency of visible outcomes and finally the time required to achieve Business Objectives (though it's not mandatory to demonstrate complete achievement). We would typically need a time period of 2 years to achieve the High Maturity.

The Key Factors to be considered in making a Schedule for CMMI HM are,

- \*Number of Business Units/Delivery Teams are Involved

- \*Number of functions involved and Interdependencies ( Metrics, SEPG, SQA, IT Support, Logistics, Training, Sr Management Teams, etc)

- \*Number of Business Objectives, QPPOs and Process Performance Models Required

- \*Possible Frequency of Process Performance Baselines(PPB) and Number of PPBs

- \*Current Level of Competency with Project Team, Quality Assurance and other vital teams and training Requirements

- \*Level of Resistance to change and time required for change Management

- \*Intermediate Reviews by High Maturity Lead Appraiser

- \*Process Up gradation Time to meet HM Requirements

- \*Time between SCAMPI B/ Pre Appraisal to SCAMPI A

- \*Internal Appraisals by Organization

- \*Organizational Initiatives Cycle

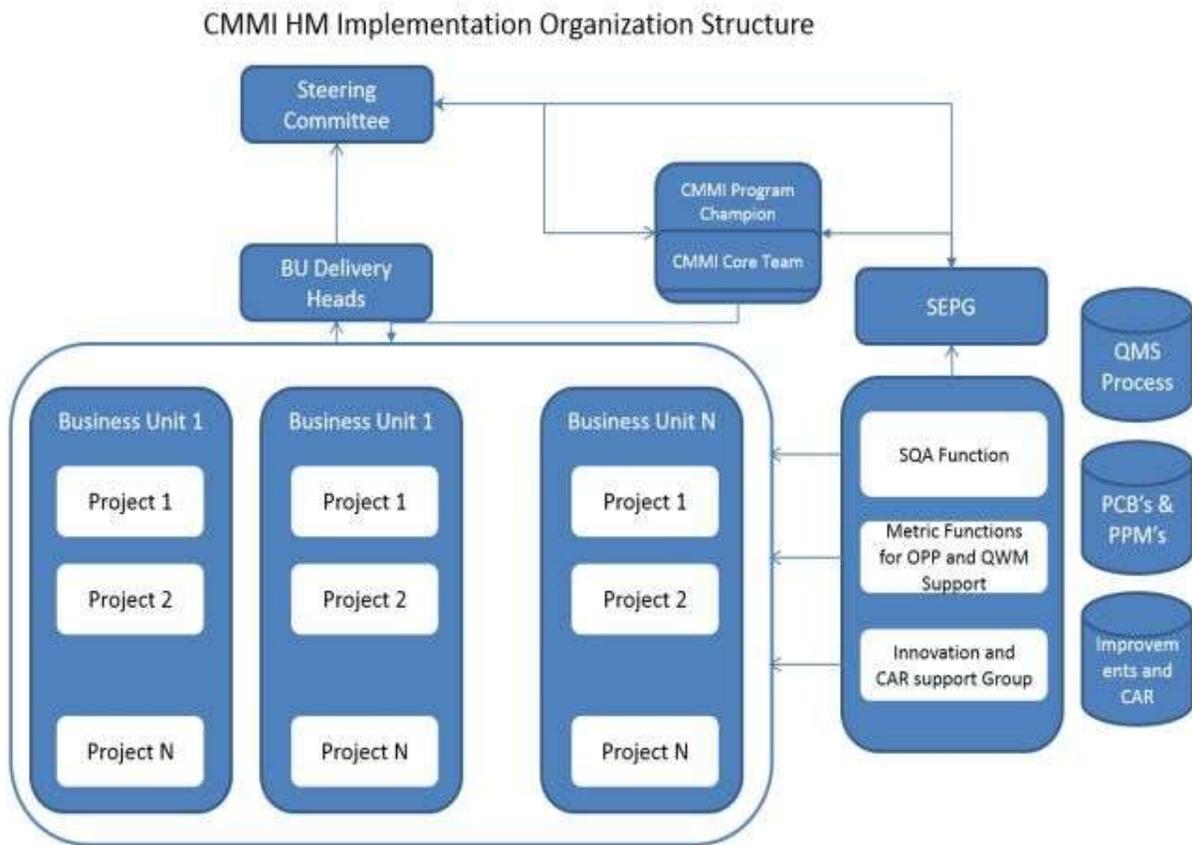
- \*Client and supplier Dependencies, if any

- \*Time Needed for a core Team who possess the understanding of Business with CMMI and Statistical Knowledge



However typically you need people with good quantitative and statistical understanding to drive the activities relevant to Objectives fixing, PPM and PCB preparation, etc. Also people with good understanding in engineering and Project management can be involved in causal analysis and in Organizational Innovation activities to support the Performance of Organization to achieve Business Objectives.

It's important to ensure that there is clarity with every team in terms of Roles and Responsibilities and their Interaction points. Also its important to ensure the project team has learnt High Maturity Practices and they are able to use it effectively without much handholding from Quality Assurance or any other teams.



### Steering Committee

The High Maturity Program needs a big change in legacy and culture many a times. To achieve this a committee with clear driving abilities and authority should be available in the Organization. Steering Committee drives the program of High Maturity achievement by removing impediments and providing necessary support. Typically Delivery Heads of Business Units, functions and Operations would be part of it along with the CMMI Program Team. The Identified CMMI Program Manager can provide information on various activities their status. The SEPG and Other Important functions will be represented to make action plan to progress further. The Sponsor of the Program will be the chairperson for the meetings. These meetings can happen on monthly/bimonthly basis.

Typically the following aspects at High Maturity can be discussed,

- \*Planned Milestone dates and current achievement details
- \*Involvement Need of stakeholders
- \*Competency Needs of Project teams and functions
- \*Selection of High Maturity Lead Appraiser and Managing Activities
- \*Resource Needs to Drive the Program
- \*Technology and Lifecycle updates Required in context
- \*QMS Update and Purpose
- \*Approval for Improvements/Innovations to pilot and to deploy
- \*Scoping Implementation
- \*Interaction points with Other Units/Functions and Support Needed
- \*Challenges and Issues in Implementation
- \*Appraisal Planning
- \*Support Needed Area in Implementing CMMI High Maturity

## SMART Business Objectives and Aligned Processes

The Ultimate aim of any Business Organization is to earn profit and achieve its business results and CMMI model is aligned to help you achieve the Business results. It provides you the strategic practices which helps you to plan, monitor and manage your business results achievement using Process Improvements. Process here refers to inclusion of people and technology, which means any initiative running to improve people competency or Technological advancement is also considered part of Process Improvement Journey. CMMI sets the expectation clear by asking for measurable business objectives, which includes variation and targeted time. This is achieved by having SMART Business objectives. SMART refers to Specific, Measurable, Attainable, Relevant and Time bound. Which means the objectives to have specific definition, to have clear measure, possible to achieve target, relevant to your business context and it has definite time period.

Before we move into explaining it with samples, how do these business objective originate is basically from your vision. Every Business Organization has its vision to achieve and its typically in a few years' time period. The Vision can only be achieved if your immediate business targets are aligned to it and you keep progress towards them year on year. Hence typically the Business objectives have clear traceability with Vision and it's of a year or two time period. Vision can get changed when there is a major change in business and market conditions, etc. in such scenario the Business Objectives have to be aligned with it. However it may be uncommon.

Sample SMART Business Objectives:

\*Customer Satisfaction Rating to be improve from current performance of mean 3.5 to new performance mean 4.0 by maintaining Standard Deviation at 0.25 by End of 2016

\*Operations Effectiveness Ratio to improve from Current performance of mean 70% to new performance mean 80% by maintaining Standard Deviation 6 by End of 2016

Quality and Process Performance Objectives known as QPPO in CMMI High Maturity is the connecting factor between Processes and Business Objectives of the Organization. They are the objectives which are quality and process targets which are measurable in the lifecycle of Operations/project, which when achieved will lead to business objective achievement. Typically the Business objectives may not be directly measurable from projects or measurable at intermediate stages, which leads to difficulty in controlling them. However QPPOs are intermediate or one of the few important component which influences the final achievement of Business objectives. For example, Customer satisfaction results may be collected in periodic intervals and at the end of project, however what may influence the customer satisfaction is Defect rate in product/service, SLA met, etc. If we keep these quality and process targets in a limit, you may most probably get better customer satisfaction. This is how QPPO works to achieve Business Objectives. The word Quality is stressed to think in terms of Quality Targets in your projects and not only process and cost related targets.

Sample Vision-Business Objectives and QPPOs,

Vision	Business Objectives	QPPOs
Market Leadership	Reduction in Cost	<ul style="list-style-type: none"> <li>• Development Productivity</li> <li>• Effort Variance</li> <li>• Maintenance Productivity (Ticket/PTE)</li> <li>• Meeting Timelines</li> </ul>
Competitiveness	Meeting Timeline	<ul style="list-style-type: none"> <li>• Average TAT</li> <li>• Schedule Variance</li> <li>• Backlog Index</li> <li>• SLA Compliance</li> </ul>
Quality Focus	Improve Quality	<ul style="list-style-type: none"> <li>• Defect Density</li> <li>• Defect Containment Effectiveness</li> <li>• Defect Arrival Rate</li> <li>• Cost of poor quality</li> </ul>
Capital Optimization	Achieving Capacity & Utilization	<ul style="list-style-type: none"> <li>• Incident Arrival Rate</li> <li>• Capacity availability Ratio</li> <li>• Resource Utilization rate</li> </ul>
Customer Centricity	Customer Satisfaction	<ul style="list-style-type: none"> <li>• Customer Satisfaction Index</li> <li>• Compliance Index</li> </ul>

In this Book, We are going to use two sample cases of Business Objectives and QPPO's throughout, as applicable. One Business Objective from Application Development and another from Application maintenance Scenario. So for the Business Objective sample which we saw in last section, the following could be the QPPOs,

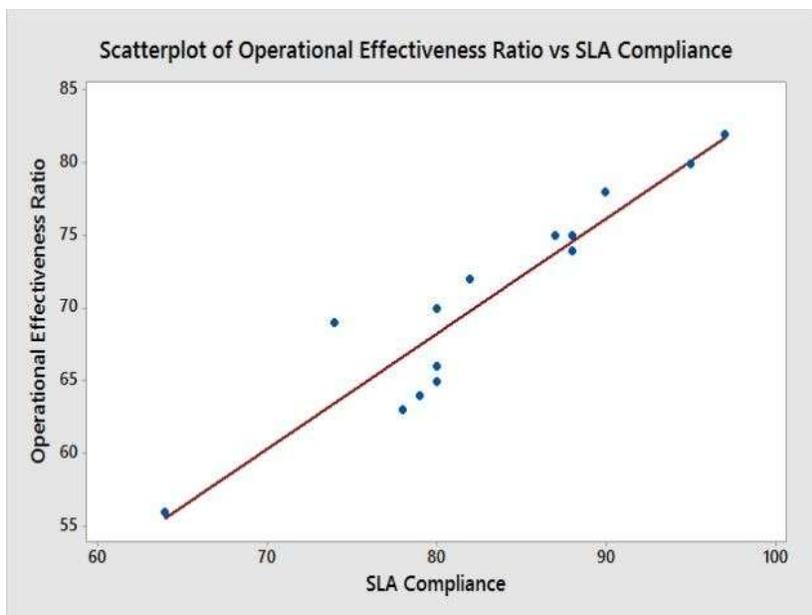
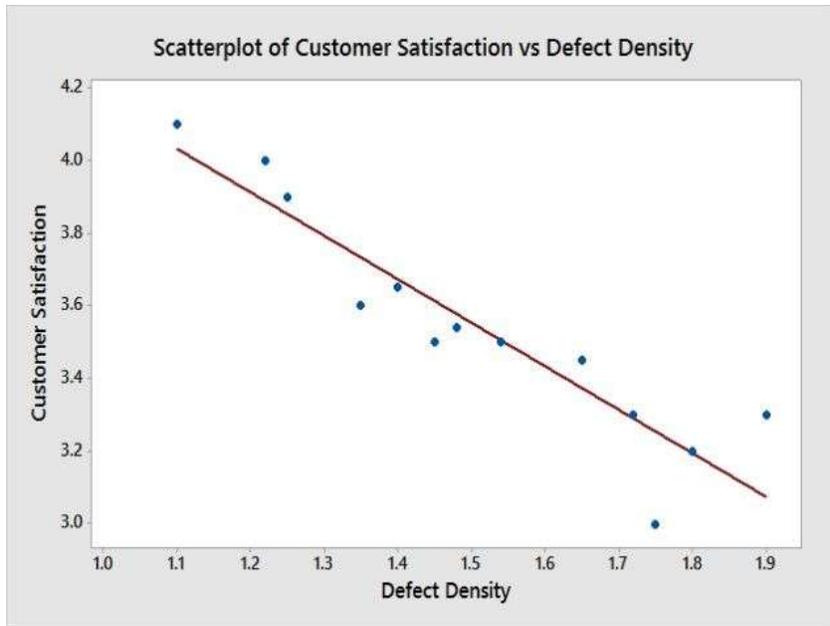
Vision	BO	Org QPPO
To achieve great customer satisfaction by providing world class quality and cost effective products/Services on time.	Customer Satisfaction Rating to be improve from current performance of mean 3.5 to 4.0 with S.D 0.25 by End of 2016	To Reduce Defect Density from current Performance of mean 1.5 to 1 with maintenance of S.D 0.3 by End of 2016
		To Reduce Effort Variance from current performance mean 9.5% with S.D 12% to mean 9.5% with S.D 5 by End of 2016
	Operations Effectiveness Ratio to improve from Current performance of mean 70% to 80% with S.D 6 by End of 2016	To Increase the SLA compliance of mean 84% to 95% with S.D of 5 by End of 2016

### BO-QPPO Relationship

The relationship has to be logically identified with group of relevant people. Then they can be weighted across multiple QPPOs. The QPPO which is possible to collect and contribute to one or more Business Objective and critical in nature is prioritized and selected. There can be many possible QPPO's contributing to given Business objectives, however the Organization has to do trade off to find the best possible ones , so that cost of measuring and Predicting these QPPOs has good Return on Investments(ROI).

Though we may start with simple logical relationship, we need to establish a quantitative/statistical relationship of QPPO with BO to find it an effective tool to achieve the Business Objective. So if the data available already then these relationships to be established early.

In the above sample given here, if we collected the data from various projects and the metrics are available with us, we may plot them to understand the relationship to substantiate their logical relationship.



When it's not possible to get this level of detail at the beginning of your journey for all Business objectives and QPPOs, you are expected to collect data and to build it. The relationship need not be always linear in nature and also it can be mathematical relationship in some cases.

Once we understand the possible QPPO's we need to evaluate them on selecting for future usage. Though some of them could good measures for BO, they may not be easy and periodical to capture and analyse. Some of them has influence of similar other QPPO's and so on. Hence it's expected to evaluate the Business Benefit in selecting the QPPO along with their relationship with BOs.

A sample QPPO table is given below,

B.O vs QPPO								
Business Objectives	Business Priority	To achieve mean contribution margin greater than 50% with 90% Confidence Level	Reduce Cycle Time mean by 8% and maintain Standard deviation less than mean with 90% Confidence Level	Reduce Mean of Defect Density by 10% and maintain Standard Deviation with Current reduced level with 90% Confidence Level	Effort Variance mean to be reduced by 10% and Standard deviation 10% (applicable where S.D => Mean) with 90% Confidence Level	Reduction in Rework by 10%	B.O Contribution	Rank
Improve Contribution Margin of 75% projects from Current performance of more than 46.7% to 50%	1	1	1	3	1	3	9	1
Reduce Cycle Time mean by 8% in more than 80% of Projects	1	3	1	5	1	5	15	3
80% of Projects to Reduce Defect Density by 10% from current Performance	3	3	3	1	5	1	39	4
To Reduce Effort variance mean by 10% and Standard deviation 10% (applicable where S.D => Mean) in 80% of Projects	1	3	3	3	1	3	13	2
<b>Total</b>		10	8	12	8	12		
<b>QPPO Contribution</b>		3	1	4	2	4		
<b>Status</b>		Selected	Selected	Selected	Selected	Discard		
<b>Remarks</b>						Defect Density and Effort Variance Together addresses the Rework to an extent, hence management decided to		

### Business Priority

1 -High, 3-Medium, 5-Low

### QPPO Correlation with B.O

1-High, 3 - Medium, 5- Low

QPPO Contribution field is ranked based on their contribution, and lower the value then more chance of getting selected. However you may reject few QPPOs based on business and practical reasons, however it should be a well thought out decision. Also the ranking of QPPO helps in sub optimization and which one to give high importance.

### Process Flow and Process/Sub Process Selection:

Once the QPPO's are selected the next important step is to understand how the process system helps us to achieve these QPPO's and which Process and Sub Processes are critical and what factors to consider and what measures to consider. Hence its important for us to have Process System Map with us, before getting in to this step.

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