

Six Sigma Methods and Its Application in Project Management

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Projects are temporary in nature ; have definite start and end dates; produce a unique product, service or a result; and are completed when their goals and objectives have been met and signed off by the stakeholders. Project Management is the seamless handling of multiple Projects. The Person who handles a project in Software Company or say any other company like a civil construction company is called a Project Manager and the considered individual ideally holds a PMP certification given by Project Management Institute (PMI) most of the companies where Project are handled have a PMO's office where all the planning is done. Project Management is carried out in Stages 1] Initiation 2] Planning 3] Execution 4] Monitor & Control 5] Project Closure the same applies in Six Sigma Methods because Six Sigma is carried out in phases also which are 1] Define (Similar to Initiation) 2] Measure 3] Analyze (Similar to Planning 4] Improve 5] Control (Similar to Project Closure). Lean Six Sigma is all about removing variations and defects in a product or process. Like Project Management the lean Six Sigma Practitioner needs to be certified by a governing body like IASSC, ASQ (American Society of Quality) or ISI(Indian Statistical Institute). The Certificates provided by them Lean Six Sigma Green Belt, Lean Six Sigma Black Belt & lean Six Sigma Master Black Belt. Bill Smith of Motorola Coined the term Six Sigma and is also called the father of Six Sigma; The Quality leader responsible for the term Total Quality Management is Feigen Baum; robustness in quality management was pioneered by Dr Taguchi; quality leader who did extensive work in Japanese industry is Dr Deming who paved the way for Quality Management Concept; Walter She wart is also one of the contributors in Six Sigma, he is sometimes referred to as father of Statistical Control.

The Table given below maps the phases of Six Sigma with that of Project Management Phases.

The Five Processes of PMP (Initiation, Planning, Execution, Monitor & Control, Closing Phase)

The relationship of the project stages to the life cycle phases

Stage	Outputs	Life Cycle Phases
Starting the Project(Define Phase of Six Sigma)	<ol style="list-style-type: none"> 1. Charter 2. Documentation of Need 3. Clear Goals 4. Quality Requirements 5. Scope 6. Initial Resource requirements 7. Cost benefit Analysis 8. Approval to proceed to next stage 	Initiating Process
Organizing and Preparing	<ol style="list-style-type: none"> 1. Communication Plan 2. Quality Plan 3. WBS 4. Resource Plan 5. Project plan 6. Risk management plan 7. Approval to proceed to next stage 	Planning Process
Carrying out the Work	<ol style="list-style-type: none"> 1. Project Results 2. Progress Reports 3. Communications 4. Develop tracking Systems 5. Team Management/Development 6. Approval to Proceed to next Stage 	Execution Process Controlling and Monitoring Process
Closing out the Work(Control Phase of Six Sigma)	<ol style="list-style-type: none"> 1. Demonstrating results 2. External and Internal Approval for the project results 3. Lessons learned 4. Transitioning team members to new assignments 5. Closing project Accounts 6. Post-mortem and lessons learned 7. Recognizing the team 8. Adjourning the team 	Closing process

Cost Benefit Analysis is done in Six Sigma as well as in the Initiation Phase of Project Management. Future value, Present Value and Net present Value formulas are also used in the Define Phase of Six Sigma as well as the Project initiation Phase of Project Management. Where the black belt or the Project Manager Should assess whether the project is worth doing.

Example Given Below:-

If \$100,000 were invested for 5 years and managed to earn a interest of 6 % per year compounded annually it will be worth \$133,822.60.

- PV from the Problem is = \$100,000
- $FV = PV (1 + i)^n$ - Where I is the rate of interest and n is the number of years.
- $FV = 100,000(1+0.06)^5$
- $FV=100,000(1.06*1.06*1.06*1.06*1.06)$
- $FV=133,822.60$
- The future value of the \$100,000 five years from now is \$133,822.60

In other words if a Project says it will be earning the organization \$160,000 per year in five years ,that's great but what is \$160,000 five years from now really worth today?

- Let us use the formula assuming interest rate is still 6%-
- $PV=FV/(1+i)^n$ - Where FV is future Value , i rate of interest and n the number of years
- $PV=160,000(1.06*1.06*1.06*1.06*1.06)$
- $PV=\$119,561$ so \$160,000 is really worth \$119,561 today if we had four different projects of varying time to completion, cost and project cash inflows at completion we calculate the present value and choose the project with the best present value as it is likely the best investment for the organization

Project Planning

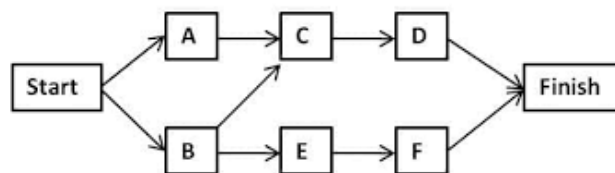
The planning process group has more processes than any other process group as a result a lot of time and effort goes into the planning process group of any company on some projects you might almost spend as much time planning with that of executing in a way it is a good sign as the project is properly planned. The define activities process is the further breakdown of the work package elements of the WBS

Tools and techniques for defining activities

- Decomposition
- Rolling wave planning
- Templates
- Expert judgement.

Precedence Diagramming Method (PDM)

The PDM Method is what most project management software programs use to sequence activities. Precedence diagrams use boxes or rectangles to represent the activities called nodes the nodes are connected with arrows showing the dependencies this method is called AON activity on node. Diagram is given below.



Precedence Diagram Method (PDM)

The four dependencies are as follows

Finish to Start (FS) The finish to start relationship is the most frequently used relationship the relationship says that the predecessor or from activity must finish before the successor or to activity can start in PDM diagrams this is the most often used logical relationship.

Start to Finish (SF) The Start to finish relationship says that the predecessor activity must start before the successor activity can finish this logical relationship is seldom used.

Finish to Finish (FF) the finish to finish relationship says that the predecessor activity must finish before the successor activity finishes.

Start to Start (SS) the start to start relationship says that the predecessor activity depends on before the successive activity can start.

Critical Path Method (CPM) is a schedule network analysis technique it determines the amount of float or schedule flexibility for each network paths by calculating the earliest start date, earliest finish date , latest start date and latest finish date for each activity. The Critical path is generally the longest full path on the project any project activity with a float time of zero is considered a critical path task.

Calculating Expected Value : Say for example for a particular project you are given 38 days of optimistic time, 57 days for the pessimistic and 45 days for the most likely so the formula for calculating expected value is (Optimistic + pessimistic +(4* most likely))/6

The expected value for the sample project activity is as given below:-

$$(38 + 57 + (4*45))/6 = 45.83$$

The formula for standard deviation which helps to determine the confidence level is (pessimistic – optimistic)/6

The standard deviation for your activity is as follows $(57-38)/6 = 3.17$

So we subtract $3.17 - 45.83 = 42.66$ and we conclude that there is 68.26 % chance that the project will be completed in 42.66 to 49 days.

Project Oversight and Management (Forecasting, Measurements & Monitoring):-

Every Project requires some measure of progress and in many cases, multiple forms of measurement must be used to gauge the overall health of the project, project measures might be used to answer basic questions like:

- Is the project on track to finish on time?
- Is the project expending funds within budget?

Let us consider some of the common forms of measures used on most projects at the task(work package) level

- Planned value (PV). This is the approved budget for work scheduled for completion by a specific date. It is also known as budgeted cost of work scheduled(BCWS)
- Earned Value (EV). This is the approved budget for the work actually completed by a specific date. It is also known as Budgeted Cost of work Performed (BCWP).
- Actual Value (AV). This is the actual cost incurred for work completed by a specific date. It is also known as actual cost of work performed.
- Scheduled Variance (SV). The Schedule variance is the difference between the amounts budgeted for work performed and the planned cost. It is calculated as $SV=EV-PV$.

If SV is positive, the project is ahead of schedule, if the SV is zero the project is on schedule and if SV is negative, the project is behind schedule a corrective action must be taken.

- Cost Performance index(CPI) : This is a dimensionless index used to measure the project's cost efficiency it is calculated as

$$CPI = EV/AC = BCWP/ACWP.$$

If the CPI is greater than 1 the project is under budget. If the CPI is equal to 1 , the project is on Budget and if the CPI is less than 1 , the project is over budget and corrective action must be taken.

- Schedule Performance Index (SPI). This is a dimensionless index used to measure the projects schedule efficiency

$$SPI=EV/PV = BCWP/BCWS$$

If SPI is greater than 1, the project is ahead of schedule, if the SPI is equal to 1 the project is on schedule and if the SPI is less than 1 the project is behind schedule and corrective action should be taken. We can conclude that the phases used in Six Sigma (DMAIC) & Project Management has nearly Similar activities in the respective phases which we have proved by mapping the two(Six Sigma & Project Management).

REFERENCES

- [1]. The Certified Master Black Belt Book By T. M Kubiak.
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