SIX SIGMA

BLACK BELT
Body OF Knowlwdge
2019

IMPERIAL INSTITUTE OF
CERAMIC SCIENCE & TECHNOLOGY

PRANAMIKA
EDUCATION TRUST

ABOUT US

PET(Pranamika Education Trust, Vadodara, Gujarat, India) is a nonprofit making trust set up specifically for the skill set development of the people who are working in the industries and the students who are about to complete their study and willing to make their career in QA, QC, SCM, Operational Excellence, Manufacturing Excellence and Business Excellence in hospitality, service and manufacturing industries. There is a hard-core Team behind the success of the PET in form of Expert Experience Business Excellence and Engineering People who had served the industries for decades.

Who We Are?

PET's operational strategy consulting institution focusing mainly on Strategy, Innovation, Operational Excellence, Lean Six Sigma, Decision Sciences, Big data analytics and Change Management to individuals working in the industries to excel the industries where they serve .

We work with market leading organizations across multiple industry verticals solving high impact business problems in key horizontals such as Manufacturing, Marketing, Risk and Supply Chain. Organizations are challenged with scaling the use of analytics and making it an integral part of all business decisions. The dynamic nature of business requires Decision Sciences, an interdisciplinary approach of business, applied math, technology, design thinking and behavioral sciences, to solve constantly shifting and ill-defined business problems.

What We Do?

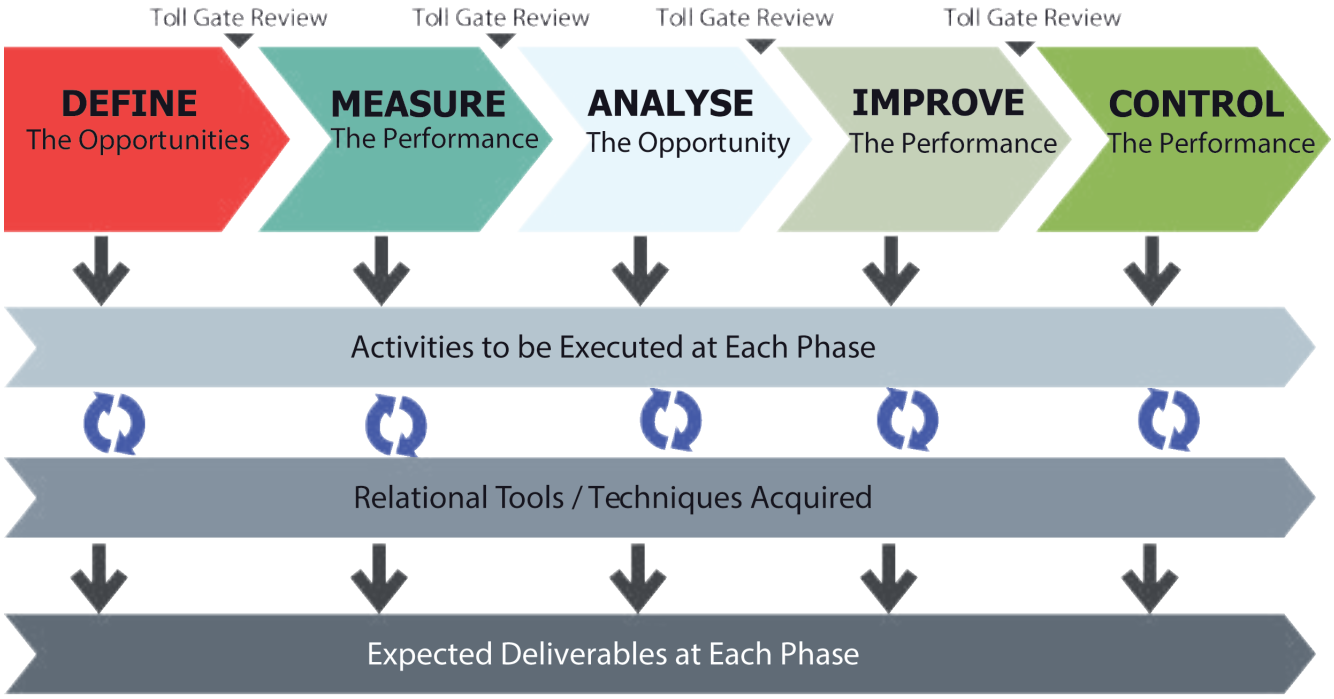
Organizations are challenged with scaling the use of analytics and other knowledge areas to make it an integral part of all business decisions. PET addresses this critical need and enables organizations to institutionalize analytics and Decision Sciences in a sustainable manner.

We work with organizations across multiple industry verticals solving high impact business problems in key horizontals such as Marketing, Process/ Product Improvement, Technology, Manufacturing, Risk Management and Supply Chain. Our expertise and experience cut across multiple and disparate verticals such as Retail, BFSI, Pharmaceutical, Healthcare, Technology, and many more. We believe that in a world of blurring value-chain boundaries and continuous transformation, organizations can profit from cross-industry / domain expertise. Over the years, we have leveraged this experience to enable innovation and convergence for our clients.

PET defining Decision Sciences, Big Data analytics and Lean Six Sigma services helps enterprises institutionalize data-driven decision making. Our unique interdisciplinary approach and cross-industry learning drive innovation in solving high impact business problems across marketing, risk management and supply chain.

TOPICS

LEAN SIX-SIGMA : DMAIC



WHY?

If you're a budding project manager, or interested in becoming one, you should learn Six Sigma and Lean at one point. Preferably now. They're two different but highly complementary approaches to streamlining business processes and eliminating waste. Initially, Six Sigma was used in manufacturing to improve quality and efficiency while bettering business practices.

Lean's focus is to streamline unnecessary steps in the development of a product, so the steps taken to make it only add value. Lean is entirely based on whether the customer would buy the product or not.

Six Sigma believes that the root cause of waste is variance, focusing instead on quality control versus value-add. But both systems have the same eventual goal: to create the most efficient system and the best product possible.

PHASES

DEFINE : Identify Improvement Opportunities

- Voice of the Customer (VOC) and Voice of the Business (VOB) Requirements Flow Down
- Project Definition, Problem Statements, Scope Statements, and Project Charters
- Process Maps/SIPOC/Swim Lane/Value Stream Mapping

MEASURE : Measure the Current State

- Categorical versus Numerical Data
- Descriptive Statistics
- Yield, PPM Defective, Defects per Million Opportunity (DPMO), Rolled Yield
- Process Time Decomposition (Process Time, Wait Time, Lead Time/Total Time in System) Process Capability Indices and Analysis
- Process Capability Analysis – Normal/Non-Normal Distributions
- Basic Graphical Tools (Run Chart, Histogram, Box Plot, Scatter Plot, Interval Plot)
- Overview of Basic Statistical Concepts – Sampling Methods, Estimation, Central Limit Theorem, Hypothesis Testing, Error, p-values, Statistical vs. Practical Significance Assessing Process
- Stability – Variable Control Charts (X-Bar/Range, I/MR)
- Assessing Process Stability – Attribute Charts (p-chart, u-chart)
- Measurement Systems Analysis: Sources of Measurement Error (Accuracy, Repeatability, Reproducibility, Stability, Linearity)
- Gage Accuracy Studies, Repeated Measurement Studies, and Gage R&R
- Studies Attribute Agreement Analysis (Advanced) Data Collection Plans

ANALYZE : Analyze Existing Process

- Process Map (Flow Chart, SIPOC, Swim Lane, Value Stream Mapping)
- Current State ("As-Is") vs. Future State Maps
- Structured Brainstorming, Cause and Effect Diagram, 5 Whys, and P-Diagram
- Two Group Hypothesis Tests (F-tests, t-tests, 2 Proportion)
- One-Factor ANOVA
- Power and Sample Size Planning
- Nonparametric Hypothesis Tests (e.g., Levene, Mann-Whitney, Kruskal-Wallis) (Advanced)

  Simple Linear Regression/ Correlation/R-squared/Fitted Line Plot
- Multiple Regression/Stepwise Regression/Best Subset/General Regression

  General Linear Model (GLM) (Advanced) Binary Logistic Regression (Advanced)
- Principles of Design of Experiments (DOE)
- DOE – 2k and 3k Factorial Experiments
- DOE – Fractional Factorial Designs
- DOE – 2k w/Center Points and Mixed Level Experiments (Advanced)
- Multi-Vari Analysis (Multi-Vari Charts and Multiple Box Plots)
- Categorical Data Analysis – Cross Tabulation and Chi-Square Tests for Independence
- Categorical Measures of Associations (Advanced) Reliability Analysis (Advanced)

IMPROVE : Countermeasures and Short Term Verification

- Error Proofing
- Redesign Process Flow, Load Leveling
- Standardized Work
- Before versus After Improvements (Using above tools)
- Pilot Studies

CONTROL : Develop Control Plans and Long Term Verification

- ⇨ Quality at the Source/Source Inspection (Error Proofing)
- ⇨ Visual Controls and Daily Visual Management
- ⇨ Process Monitoring (including Leading vs. Lagging Indicators)
- ⇨ Failure Mode and Effects (FMEA) and Improving Methods of Control/Detection
- ⇨ Total Productive Maintenance (TPM) (Advanced-Optional)
- ⇨ Tolerance Analysis

Additional Lean-Six Sigma Topics :

- ➔ Conducting a Kaizen Event
- ➔ System Productivity Analysis (Takt, Throughput, Nominal/Effective Time, Total Lead Time)
- ➔ Capacity Planning/Analysis and Utilization (Nominal vs. Effective)
- ➔ Load Leveling Analysis (Operator Bar Charts)
- ➔ Standard Work Analysis (Time observation, capacity planning sheets, detail job instructions)
- ➔ Implementing Pull Systems (Kanban, FIFO, CONWIP)
- ➔ Flow Improvements (One-Piece Flow, Little's Law, Improving Facility Layout)

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