

# AN APPROACH TO SIX SIGMA TECHNOLOGY

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*Abstract* : Six Sigma is associate loom that improves quality by analyzing data with information. In recent years there has been a significant enhance within the use and enlargement of the Six sigma methodology in industrialized. It's time to own appraise on the Six letter advance. This paper reviews some allied literature let's say methodology, implementation and future researches. This paper summaries four problems among the sub-category of the first Six sigma constructs: basic concept, DMAIC, DFSS and exploitation. Then, some sectors that help from the execution of Six sigma square measure listed out, and also the key factors influencing the triple-crown Six sigma project functioning square measure known. At last, some topics for future investigate square measure offered.

**Keywords-** Six Sigma; methodology; implementation; future research; quality management.

## 1. INTRODUCTION

Statistically, Six Sigma refers to a progression during which the series between the mean of a way excellence measuring and also the adjacent specification edge is a minimum of six fold the quality deviation of the method, shown as Fig. 1 and Fig. 2.

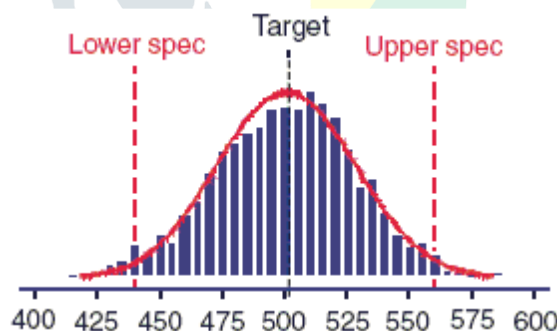


Figure 1. Graphic of centered 3 Sigma

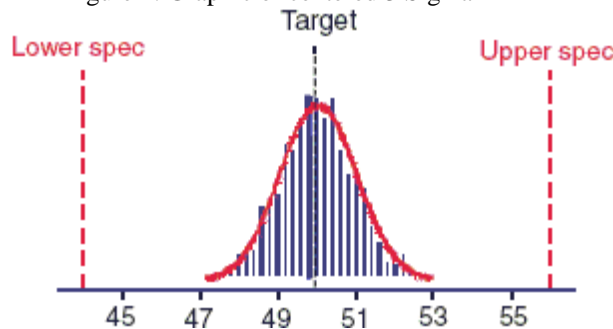


Figure 2. Graphic of Six Sigma process

The conventional quality management approaches, count applied math internal control (SQC), Zero Defects and Total Quality Management (TQM), are key players for several years, whereas Six Sigma is one in every of the additional topical quality perfection initiatives to grow esteem and approval in several industries obliquely the sphere. Six Sigma differs from alternative quality programs in its top-down constrain in its scrupulous methodology that trouble complete examination, fact-based choices,

and a rule preparation to certify fractional internal control of a method. Since its starting at Motorola within the Eighties, several corporations together with GE, Honeywell, Sony, Caterpillar, and Johnson Controls have adopted Six Sigma and obtained sizeable compensation. Six Sigma may be a long-standing dedication. It won't effort glowing while not full commitment from higher administration. Six Sigma changes the means a corporation thinks by instruction fact-based finding of fact creation to any or all levels.

In modern period, curiosity from the studious hamlet has increased radically. However, to appointment barely few papers are often recognized as a fiction valuate regarding Six Sigma specializing in the crucial perception, performance and prospect of Six Sigma [1-3]. Therefore, it's the time to own associate degree broad re-evaluate on the associated literatures. The current paper synthesizes four problems within Six Sigma basic ideas. It aims to acknowledge the key factors influencing the victorious functioning of Six Sigma come. Finally, the areas of future analysis are summary.

## 2. METHODOLOGY OF SIX SIGMA

Six Sigma has been distinct because the applied math item of measure, a Sigma that measures the potential of the strategy to achieve a defect liberated performance. Six Sigma has the bent to supply product and services with solely 3.4 defects per million, that could be a outstanding exploit. Six Sigma has additionally been delineated as a high routine info formidable approach in analyzing the core causes of dealing toil and resolution them.

### 2.1 Fundamental Concept

Six Sigma is measured to be a innovative proposal introduced by Motorola within the late Nineteen Eighties, therefore many papers from the first 1990's ponder on amplification the expansion of Six sigma victimization the Motorola case [4]. These authors discuss the new Motorola quality improvement program, particularly Six Sigma, that has result in enhancements in their quality presentation and after recommend Six alphabetic character as a innovative prospect for any association that has to advance quality. Different authors endeavor to look at Associate in nursing clarify the Six Sigma angle in an reminiscent manner while not experiential proof or any connected commerce. These papers area unit invaluable to researchers new Six Sigma in providing background so as, and giving confirmation of the budding significance of the methodology.

Two key intangible papers conjointly regard the for the most part theory, making an attempt to look at the event of Six Sigma and describe its algebraically foundation. Bothe presents a statistically based mostly motive for adding a 1.5 sigma move previous to estimating method wherewithal, proposing a replacement ability index, referred to as active Cpk [5]. He conjointly suggests outlook study on the blow and behavior of the alter in numerous scenario. General studies the strengths and also the weaknesses of Six alphabetic character in facet and associates Six alphabetic character to applied mathematics thinking [6]. He suggests that Six Sigma encompasses a durable applied mathematics foundation and after is prone to keep on being of consequence within the future. Table I summarizes Six Sigma trade ways, equipment, techniques, and ethics

**Table 1- strategies, equipment, techniques and ethics [1]**

Strategies and ethics	equipment and Techniques
Project management	Statistical process control
Data-based decision making	Process capability analysis
Knowledge discovery	Measurement system analysis
Process control planning	Design of experiments
Data collection tools and techniques	Robust design
Variability reduction	Quality function deployment
Belt system	Failure mode and effects analysis
DMAIC process	Regression analysis
Change management tools	Analysis of means and variances Hypothesis testing Root cause analysis Process mapping

### 2.2 DMAIC Process

DMAIC may be a closed-loop method that eliminates unproductive steps, typically focuses on new measurements, and applies technology for incessant sweetening. Some papers spotlight on illumination the DMAIC contents, with some authors discussing every stage of DMAIC thoroughly [7]. as an example, Rasis et al. present self-learning coaching material for DMAIC, employing a fabricated appliance [8]. This paper helps the readers to be told the way to jibe a small-scale Six Sigma of the alphabet project, investigating steering on the appliance of apparatus. It indicates a apparent would like for coaching material And suggests that an avenue for more analysis is to develop coaching material to hide a wider vary of applications and oversized scale comes.

Other papers specialize in precise aspects of DMAIC, akin to the project assortment method within the outline part or method management within the management half, explaining some key measures in Six Sigma, akin to project metrics and Roll outturn Yield (RTY). As an example, Snee emphasizes the importance of the project piece of music method within the outline part for the undefeated implementation whereas Mason suggests exploitation variable algebraically method management within the management part [9-10]. These papers lean to clarify the options of DMAIC instead of critically evaluative or enhancing it. Future analysis ought to investigate whether or not aspects of DMAIC got to be tailored to reinforce its scope, as an example for the overhaul zone or non-profit organizations. If so, analysis to develop the methodology could then be required. Table II presents the key steps of Six Sigma exploitation DMAIC method.

Table II- key steps of DMAIC process [1]

Steps	Key processes
Define	Define the requirements and expectations of the customer Define the project boundaries Define the process by mapping the business flow
Measure	Measure the process to satisfy customer’s needs Develop a data collection plan Collect and compare data to determine issues and shortfalls
Analyze	Analyze the causes of defects and sources of variation Determine the variations in the process Prioritize opportunities for future improvement
Improve	Improve the process to eliminate variations Develop creative alternatives and implement enhanced plan
Control	Control process variations to meet customer requirements Develop a strategy to monitor and control the improved process Implement the improvements of systems and structures

**2.3 DFSS Process Design for Six Sigma**

DFSS is a systematic methodology utilizing tools, training and measurements to permit the association to design products and processes that meet customer expectations and can be produced at Six Sigma quality levels [8].

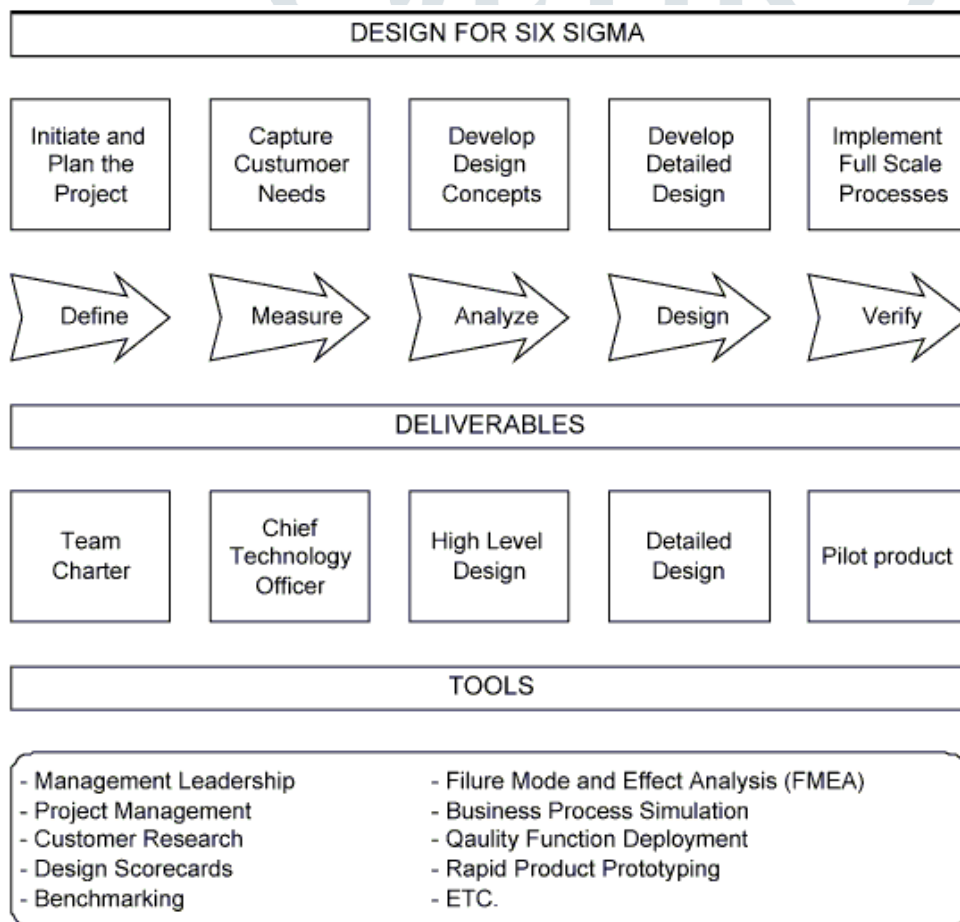


Figure 3-graphic of design for six sigma process [1]

**3. Manufacturing business**

Cases of productive corporations that have adopted Six Sigma available in several papers. The authors illustrate however the relevant companies’ execute Six Sigma, giving insights into problems with professed best practices. Motorola was the primary organization to use the term Six Sigma within the Eighties as a part of its quality performance activity and sweetening program. Six Sigma has been fruitfully purposeful in different producing organizations such as Boeing, DuPont, Ford Motor, Seagate, Texas Instruments, GE, etc. All of those papers area unit categorized as redolent papers, giving details of business cases, however while not an explicit case study loom.

As a results of Six Sigma being initiated within the USA, all the on top of success stones describe America corporations. Only a few papers are found relating to self-made implementation methods for whole businesses in different elements of the globe. Therefore, academic analysis outside USA may be a decent space of future study to see any comparative variations in implementation problems, like those caused by cultural problems.

### 3.1. Non-manufacturing business

#### 1) Healthcare services

Healthcare services are one amongst the key active nonmanufacturing contexts during which Six Sigma has been adopted, with the bulk of papers studying implementation problems in USA. Six Sigma principles and therefore the care sector are fine matched due to the care nature of intolerance for mistakes and potential for reducing medical errors. Some papers justify however Six Sigma improves care service quality by reducing medical errors and increasing patient safety.

#### 2) Financial services sector

In recent years, finance and credit department are pressured to scale back money assortment cycle time and variation in assortment performance to stay spirited. Typical Six Sigma comes in money establishments embrace up accuracy of allocation of money to scale back bank charges, automatic payments, up accuracy of coverage, reducing documentary credits defects, reducing check assortment defects, and dipping variation in collector performance [19]. Bank of America is one in every of the pioneers in adopting and implementing Six Sigma ideas to contour operations, attract and retain customers, and build fight over glory unions. it's many Six Sigma comes in areas of cross commercialism, deposits, and drawback resolution. Bank of America reportable a 10.4% increase in client satisfaction and 24% decrease in client issues once implementing Six Sigma [10].

#### 3) Other Sectors

Still, there are different sectors in Six Sigma implementation, including Civil Engineering and Construction, analysis and Development, Supply Chain Management, Human Resource Management and Train and safety.

#### C. Success factors in Six Sigma functioning

Some papers present the key ingredients for the effective introduction and 6-Sigma implementation in production and services organizations because the following [9-10].

- 1) Management commitment and involvement.
- 2) Understanding of Six Sigma methodology, tools, and Techniques.
- 3) Linking Six Sigma to business strategy.
- 4) Linking Six Sigma to clients.
- 5) Project choice, reviews and chase.
- 6) Organizational infrastructure.
- 7) Cultural modification.
- 8) Project management skills.
- 9) Linking Six Sigma to suppliers.
- 10) Coaching.

### 4. FUTURE RESEARCH OF SIX SIGMA AND CONCLUSION

Given that Six Sigma methodology has been just about in business for over a decade, it currently looks unimportant to see whether or not Six Sigma is best than different approaches. it's a lot of vital to find out a way to enhance the Six Sigma methodology and improve implementation problems for the growing range of corporations that are selecting to adopt it as a way of method improvement. The first focus ought to get on rising overall management performance, not simply pinpointing and enumeration defects. Researchers and practitioners try to integrate Six Sigma with different existing innovative management practices that are around to create Six Sigma methodology even a lot of enticing to completely different organizations that may haven't started or totally enforced the Six Sigma methodology. One space of future analysis is however these Six Sigma practices are adopted in numerous structure contexts is required, since completely different organizations have dissimilar maturity levels of QM implementation and therefore the strengths and weakness of their alive QM systems vary. An additional space advised for future examine is that the examination of however Six Sigma works with different improvement ways equivalent to slant production. Successful implementation and nascent social control connotation in six Sigma methodology are detonation within the previous couple of years. However, there's still the necessity for a lot of ascertained analysis into the Six Sigma development, victimization thorough analysis ways to corroborate the numerous unsubstantiated Six Sigma claims and to check new theories or models that are planned to fortify the tactic. Yet, the analysis territory to this point has been solely found inside the North America region with solely a number of studies in Europe and Asia. Given the economic process of the many corporations, as well as those victimization Six Sigma, study in different components of the globe is required to realize insights into cultural problems that will have an effect on the speculation and apply of Six Sigma. Valuable Six Sigma principles and practices are a lot of probably to succeed by processing the chief culture incessantly.

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