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Empirical Study of Philosophy and Approaches of "Six Sigma": Origin, Application & Future Trends

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Abstract

The most prominent yard stick of the quality in the world of industry is "Six Sigma". The origin of this concept though very recent but credit goes to Japan as a contributor from its oriental practices, from "Martial Arts", and from Buddhism. The world follows Japanese techniques as the best practices of improving quality. In fact, the reality is that, quality concepts and practice originated in India – evidences are Arthashastra, Nitishastra, Rajdanda etc. Japan learnt these concepts and techniques from India through Buddhism and Buddhist monks. Here it has been examined, the concept of "Six Sigma" which originates in India. This article goes in to the historical and the philosophical perspectives to provide an insight in to the origin of quality yard sticks in India in its oriental literature and it's the then contemporary practices. Indian scholars in the present time do have more interest in learning the management techniques from the foreign presentations rather going for a "Renaissance" of oriental Indian management systems, which are sounder and more appropriate for the world.

Key Words: ***Other Sigma's, Buddhist Martial Arts, Nine Sigma, Philosophy, Quality Management***

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1. EVOLUTIONARY PROCESS OF SIX SIGMA – THIS CENTURY

Phillip Crosby's zero defects and quality are free approach, Armand Feigenbaum's total quality management (TQM), Joseph Juran's triology, W. Edward Demming's 14 points, Japanese style TQM, quality circles, Taguchi methods, *kaizen*, ISO 9000, the Baldrige criteria and now Six Sigma, not to mention reengineering, *poka yoke* and lean manufacturing, it seems legitimate to ask what will come next. Cynics, of course, have already gleefully begun to ask whether it will be called Seven Sigma. Others hope it will all fade away. To hope quality management will go away is wishful thinking. It would be like reasoning that once you cleaned your house you never needed to do it again. Dealing with airlines and internet shopping provide daily reminders we still have a long way to go to achieve quality. Thus, if quality problems will require continued attention, what will come after Six Sigma? The short answer is labels may come and go, but a scientific approach to problem solving will remain. Indeed, history supports this assertion.

When we look back to the last 70 to 80 years, we observe a slow evolution of our understanding of how to effectively mobilize an organization's energy to solve quality problems. Evolution relies on two fundamental mechanisms: 1. Variation (Change), 2. The selection of the most favorable variant by the principle of survival of the fittest. This also applies to ideas, methods and approaches. Good ideas are promoted forward. By the process of the survival of the fittest, less useful ideas are left behind and become extinct. If we look at current Six Sigma approach, we see it incorporate wide variety ideas that originated from previous incarnations of quality management. Indeed, critiques frequently contend Six Sigma is just old wine in new bottles. This implication is that this is bad. On the contrary, we find it reassuring. If something remains fit, why should it not be allowed to survive? For the evolutionary optimization process to work, we need variation or change. In the quality management context, we need new ideas, methods and approaches. Through field testing, some of these will turn out to be useful. If so, they will be incorporated in to the next generation of quality management.

Other new approaches will, despite their enthusiastic promotion, fall short of expectations. After appropriate field testing, such ideas will go extinct and no longer be part of the program. The world keeps changing. Quality management will therefore always need to be improved and adapted to the changing circumstances. Thus, we constantly, need to experiment with new ideas. **ISO** – Six Sigma was a major step forward compared to previous quality management approaches. For example, ISO 9000 is likely now facing its evolutionary extinction. Proper documentation and institutionalization of procedures and responsibilities have proven valuable. These ideas are therefore retained under Six

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Sigma umbrella. However, we believe ISO 9000's top-down and bureaucratic ways of implementation will likely yield to Six Sigma's decentralized, results oriented approach. **TQM** – The TQM movement of the 1980s, including the approaches of Deming, Juran, Kaoru Ishikawa and Genichi Taguchi, was distinguished by a focus on quality improvement. This was a major change from the prevailing focus on inspection and quality control during the 1960s. TQM incorporated a set of excellent tools for problem solving as well as many useful innovations in management. However, we learned quality initiatives nevertheless frequently failed. A major reason was the management of the programmes – or more precisely its lack.

1.1**JURAN & SIX SIGMA**

The exception was, perhaps, Juran's approach as explained succinctly in *Juran on Leadership for Quality*. Thus, the main new contributions added to the body of knowledge and incorporated in to Six Sigma have been more focused and firm management of projects and the attention to change management theory and approaches. In fact, we think Juran was ahead of his time. The current version of Six Sigma has adopted many of Juran's approaches. For example, the two trilogy concepts of quality improvement and quality control are incorporated in Six Sigma's define, measure, analyze, improve and control (DMAIC), and his third trilogy concept of quality planning is similar to design for Six Sigma (DFSS). Juran's project management ideas, no doubt field tested and evolved by him and his associates over many years, are similar to what is currently used in successful implementation of Six Sigma. What is also new in Six Sigma is its focus on results, especially in monetary and strategic terms. TQM largely measured success in terms of activities. The tacit assumption was if a company trained enough people in problem solving, and enough improvement teams were active, profitability would automatically improve. Quality was frequently pursued as an end in itself. Six Sigma, on the other hand, measures success in terms of results, especially monetary outcomes. It incorporates the learned behaviour that it is vital to align quality improvement into profits. Changes in the environment also contribute to the evolutionary process. For example, the last decade's dramatic changes in computer technology and statistical software, which have resulted in the effortless access and transfer of data, communication via internet and even minor thing like the use of power point for teaching and team project reports, have been important forces for change that propelled TQM forward to morph in to Six Sigma. This computer and software revolution have contributed significantly to Six Sigma current incarnation.

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2. PRODUCT AND PROCESS INNOVATION IN SIX SIGMA

What will follow after Six Sigma? Of Course, we don't have a crystal ball. Instead we prefer to discuss what we think ought to happen. First and foremost, quality professionals should broaden their scope and call what we do "systematic innovation". What we are doing under the Six Sigma umbrella is focused on more than just quality. During the past decade we have increasingly seen the application of Six Sigma to problems such as reducing cycle times, reducing the cost of issuing credit cards, optimizing performance of LCD screens, improving sales forecasting and reducing the time of hospital stays. These are what economists would call innovations. They are not directly related to defect reduction. Quality professionals recognize these types of projects ultimately are aimed at satisfying customers. But it seems contrived to call such efforts "quality". Defect reduction, or even the broader conception of quality as customer satisfaction or "fitness for use" is, after all, only a means to an end. What we are trying to do more broadly is to improve an organization's competitive position, better satisfy our customers and reduce costs. So why not use the more appropriate term – innovation? This broader economic perspective is more productive. It connotes something bigger and more important. Quality improvement as we know it is about process and product innovation. It is about improving any thing: product designs, process designs, radical changes, incremental changes or even new ways of managing. Process innovation usually aims at reducing costs of current production processes, or more generally, efficiency of entire supply chain. This is typically the objective of DMAIC type projects. Product innovation is about creating new product offerings or features that have more appeal to customers. This is typically the character of DFSS projects.

3. INTRODUCTION: SIX SIGMA - A CONCEPT & BEYOND

"We are what we repeatedly do. Excellence, then, is not an act, but a habit."

It was with this philosophy that Motorola originally developed a system of practices known as **"Six Sigma"** to minimize mistakes or defects and maximize value. Defects are defined as units that are not members of the intended population. Since it was originally developed, 6 σ has become an element of many **Total Quality Management** (TQM) initiatives.

4. ORIGIN

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Six Sigma process was pioneered by Bill Smith at Motorola in 1986. It is evident that Bill Smith did not really "invent" Six Sigma in the 1980s; rather he applied methodologies that had been available since the 1920s developed by luminaries like Shewhart, Deming, Juran, Ishikawa, Ohno, Shingo, Taguchi and Shainin. All tools used in Six Sigma programs are actually a subset of the Quality Engineering discipline and can be considered a part of the certified Quality Engineer body of knowledge. The goal of six sigma, then, is to use the old tools in concert, for a greater effect than a sum of parts approach.

5. CONCEPT

The concept 6 σ (Six Sigma) has many interpretations:

- **6 σ is a problem** – solving methodology. In fact, it's the most effective problem – solving methodology available for improving business and organizational performance.
- **6 σ performances** is the statistical term for a process that produces fewer than 3.4 defects (or errors) per million opportunities for defects.
- **A 6 σ improvement** is when the key outcomes of a business or work process are improved dramatically, often by 70% or more.
- **A 6 σ deployment** is the prescriptive rollout of the 6 methodology across an organization, with assigned practices, roles, and procedures according to generally accepted standards.
- **A 6 σ organization** uses 6 methods and tools to improve performance. Continuously lower costs, increase revenue, improve customer satisfaction, increase capacity and capability, reduce complexity, lower cycle time, and minimize defects and errors.

6. WHY SIX AND WHY SIGMA?

The σ scale is a universal measure of how well a critical characteristic performs compared to its requirements. The higher the Sigma, the more capable the characteristics. For example, if a critical characteristic is defective 31% of the time, one can say that this characteristic operates at 2 Sigma. But if it runs at 93.3% compliance, one can say that it operates at 3 Sigma. Table below shows the Sigma scale.

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A. THE SIGMA SCALE

Sigma	Percent Defective	Defects Per Million
1	69%	691,462
2	31%	308,538
3	6.7%	66,807
4	0.62%	6,210
5	0.023%	233
6	0.00034%	3.4
7	0.0000019%	0.019

If a characteristic operates at three Sigma, it means that, 6.7% of the time, the variation in its performance exceeds acceptable levels. Whatever the critical characteristic may be, if it is 3σ, it is defective 6.7% of the time, or 66,700 times out of a million.

Sigma	Defects per million opportunities	Yield
1	690,000	30.90%
2	308,000	69.20%
3	66,800	93.30%
4	6,210	99.40%
5	320	99.98%
6	3.4	99.9997%

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So, why six and why not five Sigma? Because for the complex products on which this method was originated, there were enough characteristics rolled together and enough long-term degradation that only six would do. Four or five Sigma just didn't provide enough relief from these two constraints.

For transactional and service companies now adopting 6 σ, their systems and environments are often less complex – they don't have as many critical characteristics coming together. So, they don't necessarily need to have each critical characteristic operating at 6 σ. In these cases, four or five may actually do.

But, the magnitude of the earlier success of 6 σ has made the name stick. And almost all companies, regardless of their size or complexity, recognize the benefits of aiming for a 6 σ goal. Even if the milestone of 6 σ is never reached, the act of working towards that goal drives breakthrough changes.

There are cases, where great companies are able to produce 6 σ qualities in their final products, services, and transactions especially when safety of human life is involved. For example, when we board an aero plane, we are about 2,000 times more likely to reach our destination than our luggage. There have been instances when the luggages were found missing. Also, no airline company can be reliable enough for their arrival and departure timings that's because, airline safety operates at a level higher than 6 σ, while baggage and time reliability operate at about four Sigma.

Let's have a comparative view of nearly good and very good through numerous examples in a tabular format.

b. HOW GOOD IS GOOD?

	99% Good (3.8 Sigma)		**99.99966% Good (6 σ)**
1.	20,000 lost articles of mail per hour	**1.**	7 articles of lost mail per hour.
2.	Unsafe drinking water for almost 15 minutes per day.	**2.**	One unsafe minute of drinking water every 7 months.
3.	5,000 incorrect surgical operations per week.	**3.**	1.7 incorrect surgical operations per week.

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4.	2 short or long landings at airports every day.	**4.**	I short or long landing at major airports every five years.
5.	20,000 incorrect drug prescriptions each year.	**5.**	68 incorrect drug prescription each year.
6.	No electricity for almost 7 hours each month.	**6.**	One hour without electricity every 34 years.
7.	11.8 million shares incorrectly traded on the NYSE every day.	**7.**	4,021 shares incorrectly traded on the NYSE every day.
8.	3 warranty claims for every new automobile.	**8.**	I warranty claim for every 980 new automobiles.
9.	48,000 to 96,000 deaths attributed to hospital errors each year.	**9.**	17 to 34 deaths attributed to hospital errors each year.

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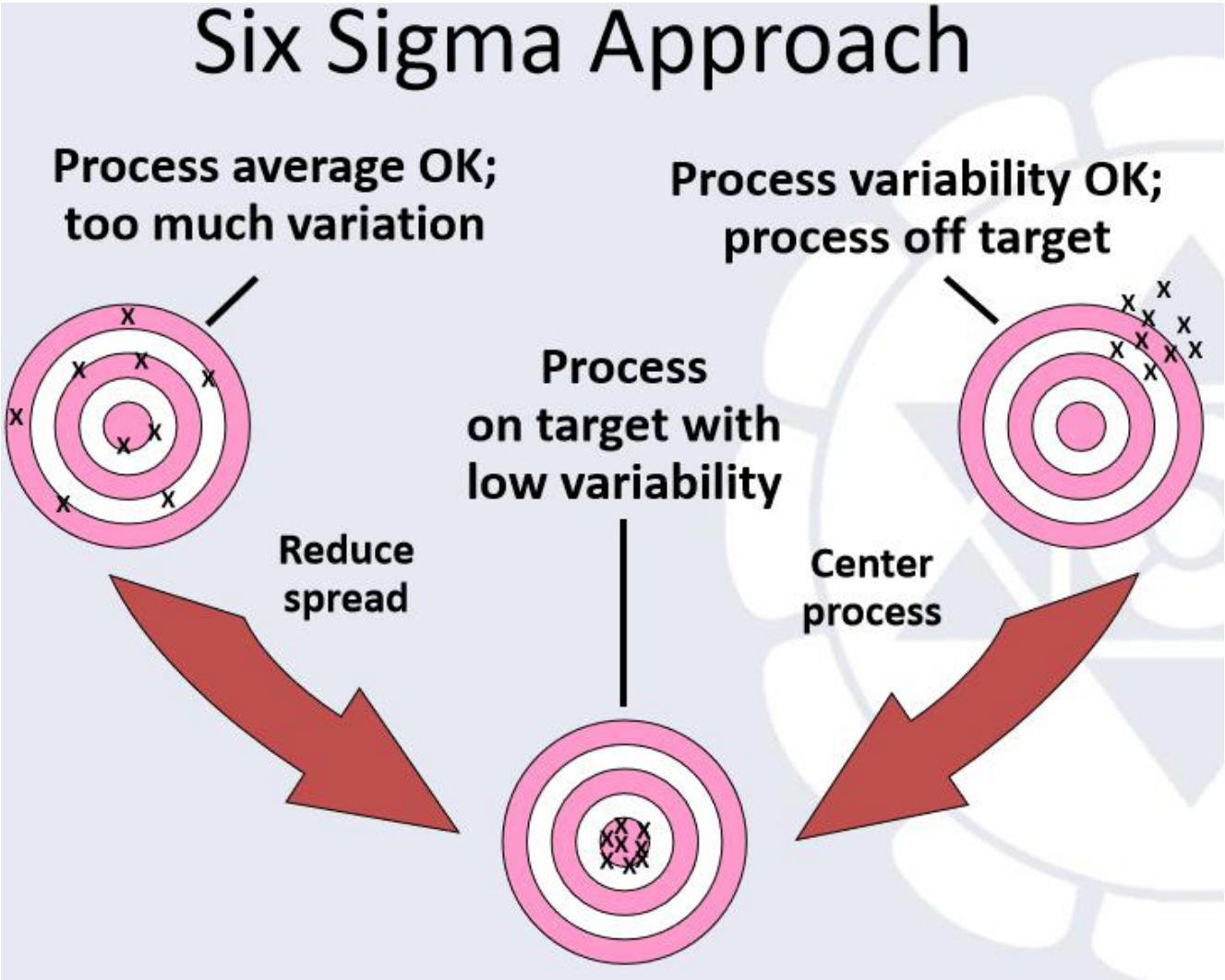

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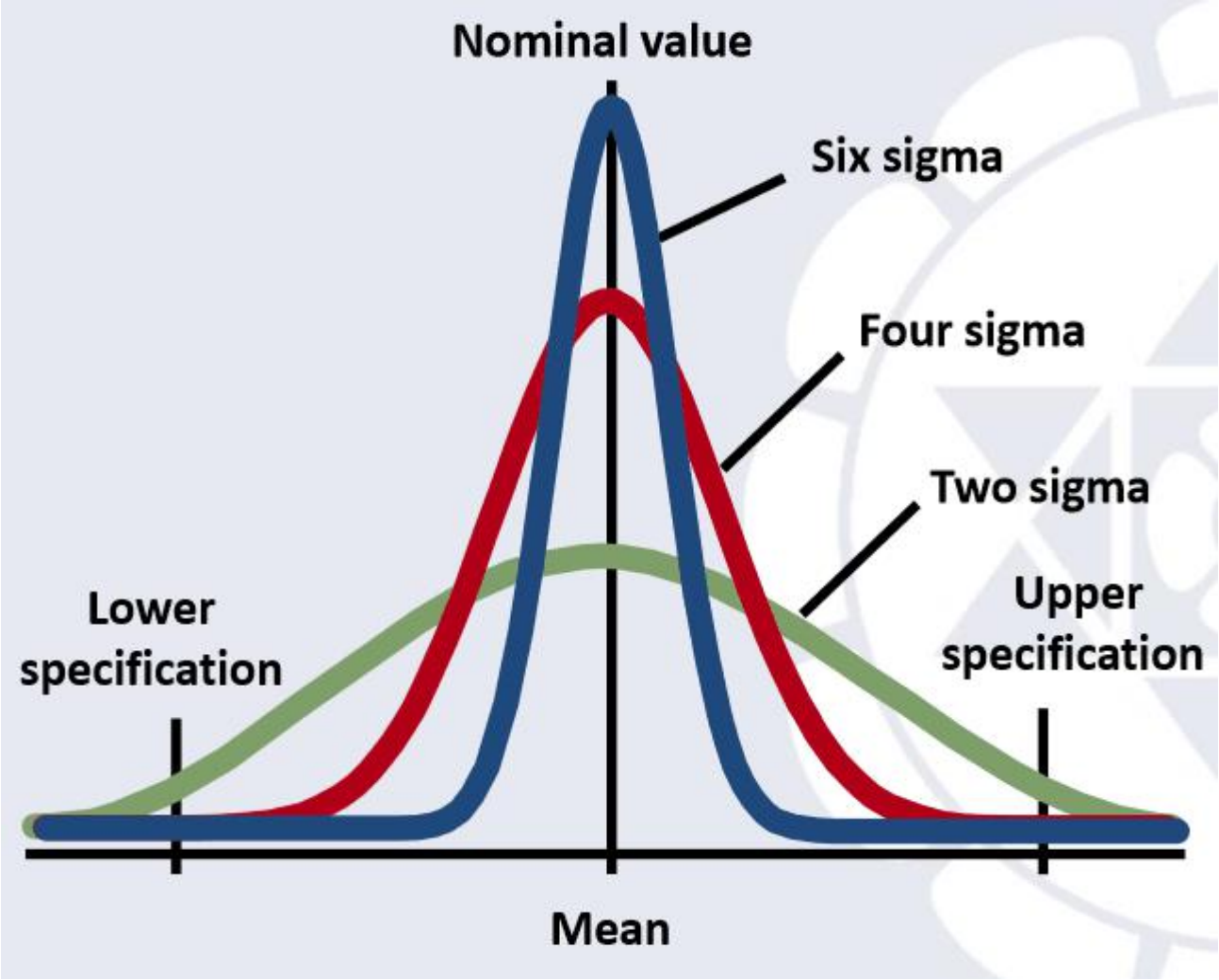

7. METHODOLOGY

Six Sigma has two key methodologies. They are DMAIC and DMADV. DMAIC is used to improve an existing business process. DMADV is used to create new product designs or process designs in such a way that it results in a more predictable, mature defect free performance.

(i) DMAIC

Basic Methodology consists of the following five steps.

- **Define** the process improvement goals that are consistent with customer demands and enterprise strategy.
- **Measure** the current process and collect relevant data for future comparison.

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- **Analysis** to verify relationship and causality of factors. Determine what the relationship is, and attempt to ensure that all factors have been considered.
- **Improve** or optimize the process based upon the analysis using techniques like Design of Experiments.
- **Control** to ensure that any variances are corrected before they result in defects. Set up pilot runs to establish **process capability**, transition to production and there after continuously measure the process and institute control mechanism.

(i) DMADV

Basic methodology consists of the following five steps:

- **Define** the goals of the design activity that are consistent with customer demands and enterprise strategy.
- **Measure** and identify CTQs (Critical to Qualities), product capabilities, production process capability, and risk assessments.
- **Analysis** to develop and design alternatives, create high – level design and evaluate design capability to select the best design.
- **Design** details, optimize the design, and plan for design verification. This phase may require simulations.
- **Verify** the design, set up pilot runs, implement production process and handover to process owners.

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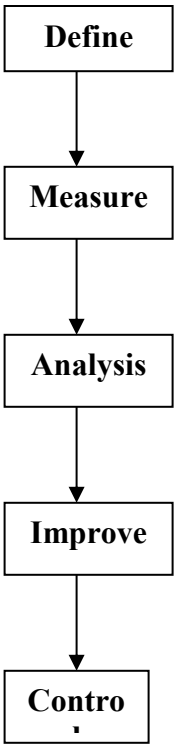
8. Flow Chart of DMAIC Improvement Methodology



Write the problem statement, the objective statement, prioritize, and lunch the project

Understand the process, validate the data accuracy, and determine process capability.

Determine the relationship of Y=f(x) + E and screen for the potential causes.

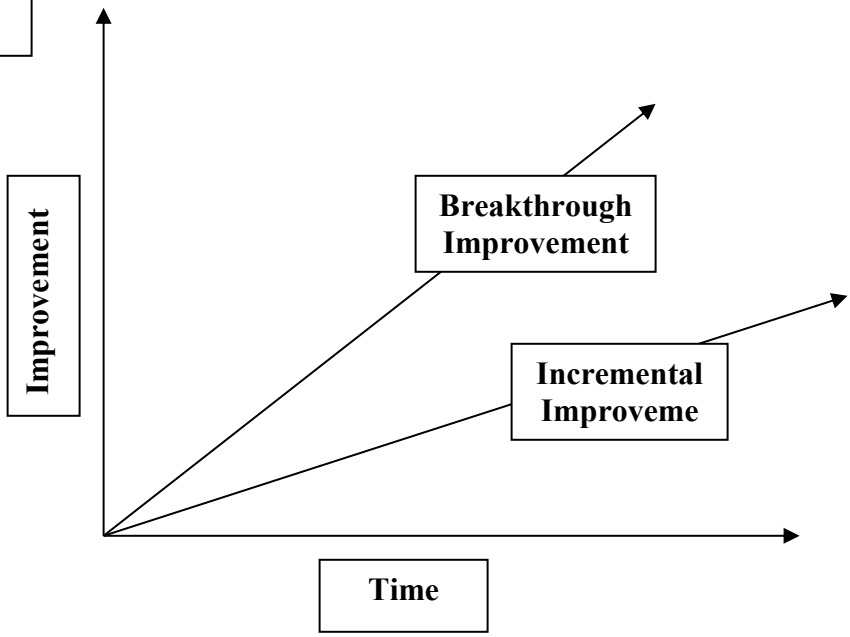
Determine, validate and implement solutions to achieve the objective statement

Implement process control methods and monitor performance to sustain results

Each phase of the methodology has been thoughtfully designed to create a logical progression of finding the practical solution of the problem for breakthrough rates of improvement.

A structural approach for breakthrough results

The 6 σ Breakthrough Strategy



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9. QUALITY TERMS

- **Control** – The state of stability, normal variation and predictability. Process of regulating and guiding operations and process using quantitative data.
- **CTQ** – Critical to Quality (Critical "Y") – Element of a process or practice which has a direct impact on its perceived quality.
- **Customer Needs, Expectations** – Needs, as defined by customers, which meet their basic requirements and standards.
- **Defects** – Sources of customer irritation. Defects are costly to both customers and to manufacturers or service providers. Eliminating defects provides cost benefits.
- **Variance** – A change in a process or business practice that may alter its expected outcome.

(i) Roles required for implementation - Six Sigma identifies five key roles for its successful implementation.

1. **Executive Leadership** includes CEO and other top management team members. They are responsible for setting up a vision for 6 σ implementation. They also empower the other role holders with the freedom and resources to explore new ideas for breakthrough improvements.

2. **Champions** are responsible for the Six Sigma implementation across the organization in an integrated manner. The Executive Leadership draws them from the upper management. Champions also act as mentors to Black Belts. At GE this level of certification is now called "Quality Leader".
3. **Master Black Belts** identified by Champions, act as in – how expert coaches for the organization on Six Sigma. They devote 100% of their time to Six Sigma. They assist champions and guide Black Belts and Green Belts. Apart from the usual rigor of statistics, their time is spent on ensuring the integrated deployment of 6 σ across various functions and departments.
4. **Exports:** This level of skill is used primarily within aerospace and Defense Business Sectors. Exports work across company boundaries, improving services, processes and products for their

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supplies, their entire campuses, and for their customers. Raytheon Incorporated was one of the first companies to introduce experts to their organizations.

5. **Black Belts:** They operate under Master Black Belts to apply Six Sigma methodology to specific projects. They devote 100% of their time to 6 σ. They primarily focus on 6 σ project execution, whereas champions and Master Black Belts focus on identifying projects / functions for 6 σ.
6. **Green Belts:** They are the employees who take up 6 σ implementation along with their other job responsibilities. They operate under the guidance of Black Belts and support them in achieving the overall results.

List of Six Sigma Companies

- ***Motorola***
- ***General Electric***
- ***3M***
- ***Bank of America***
- ***Advanced Micro Devices***
- ***Caterpillar Inc.***
- ***Honeywell International***
- ***The Boeing Company***
- ***Amazon Com. Inc.***
- ***Littlewoods Shop Direct Group***
- ***Ford***
- ***Starwood Hotels & Resorts.***
- ***U.S. Army***
- ***Mumbai Dabbawalas***

10. SYSTEMATIC INNOVATION & SIX SIGMA

Innovation broadly defined as economic concept includes the development of new:

- Products and services.

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- Methods of production or provision.
- Methods of transportation or service delivery.
- Business models.
- Markets.
- Forms of organization.

But innovation is typically considered the product of genius. Many associates it with the stereotypical image of someone having a flash insight. It need not be so. Innovation can be a systematically planned and organized activity with a high degree of predictability of purpose and end results. Tools and roadmaps can be applied to schedule and manage the innovation process. As Juran says, "A project is problem scheduled for solution". Thus, the appropriate term for our efforts is "systematic innovation". Incidentally, innovation is not the same as invention. To convert an invention to an innovation requires the innovator to work hard to develop and commercialize the invention to the point at which the product is reliable and of high of enough quality a customer is willing to pay for it. To systematize the process of innovation and reduce the precarious dependence on genius, tools can be used to systematically analyze customer needs and expectations, investigate and diagnose the problem of meeting these expectations, develop a solution to the problem of meeting these expectations, develop a solution to the problem and accompany the solution with appropriate controls to ensure it will continue to work. In other words, systematic innovation involves carrying out a carefully managed sequence of steps akin to DMAIC or Six Sigma's define, measure, analyze, design and verify strategy and using appropriate tools-statistical and other-and roadmaps. DMAIC and use of quality tools, especially the data driven ones, embody a scientific approach, which has been the foundation for the quality profession since Shewart's days. What quality profession brings to the table in regard to innovation is what is embodied in the adjective "systematic". The Six Sigma body of knowledge can, with minor adjustments to the scope and terminology, be applied to systematize the innovation process. If w do so, we would assume a much more important role: guiding upper management to see our work is of strategic importance for the survival of the organization where we work. With this wider, more visionary scope, it is hoped we will receive more and better recognition what we do.

11. SIX SIGMA FUTURE PROFESSIONALS

Organizations should employ effective and well-trained systematic innovators, with quality improvement initiatives no longer executed by a designated quality department. Instead, such

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initiatives are delegated to agents – Black Belts, Green Belts – throughout the organization. This resonates with the observations of economists that suggest improvement projects and innovations must involve people that have intimate contextual knowledge. Thus, innovation should be seen as an integral part of everyone's task rather than the responsibility of a separate department and a few specialists. Besides, training many of its professionals in systematic innovation skills (be it under the lable of Six Sigma or its successor), the organizational structure should be designed to cultivate an experimental and risk taking attitude. This is necessary for innovation. Risk aversion and other organizational impediments should be minimized. When carefully built over time, the cultivation of these competencies in an organization can lead to important sources of competitive advantage. General Electric's carefully built Six Sigma culture exemplifies this. This cultivation of competencies has an important consequence for training and education. It is no longer sufficient to be an expert manager, marketing professional or engineer. The competitors in low-cost countries increasingly also have experts. Most are inexpensive. In addition to be an expert, a 21st century professional must be well trained and experienced in Six Sigma type systematic innovation skills. A scientific systematic approach to problem solving is a core competency. If our profession seizes the opportunity and adopts as its mission the idea of being the systematic innovators, we might well find ourselves the leading profession of the future knowledge economy.

12. UNDERSTANDING THE PHILOSOPHY OF THE CONCEPT

Finest Japanese concept, tuned and twisted to the Samurai methods has its origin in the Indian subcontinent. – ***A Logical controversy***

Six Sigma the most acclaimed concept for the world of Industry has its origin form Japan. This drive is well admired in the Industry and firms are identified as distinct with the certification of Six Sigma. Fundamentally Six Sigma is understood as ***"One Error in A Million Transactions"***. In other words, ***"3.4. Mistakes In A Million Time Operation"*** is accepted as Six Sigma. Quality is the big cry of the industry to improve in volume, value and image. Certification of higher quality standards are the bench mark of the brand and product. **Six Sigma** in the current scenario is the highest quality standard certification. This Japanese concept is well adopted by many manufacturing companies. Even many service organizations have also received Six Sigma certifications.

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Apart from the industry, unorganized sector in services are proud receivers of the Six Sigma. To talk about the lunch suppliers, (Dabbawala) organization, i.e., unorganized sector has already received Six Sigma in its error free service network. These ***Dabbawalas in Mumbai*** supply the home cooked lunches of the job employees from their home door steps to their offices and place of works which has less than one error in a million of lunch supplies. In this context the transport mode and carrier is the Mumbai local trains. If the train routes are disrupted then the supply channel will have more errors to disqualify the Six Sigma certification. In the similar fashion may unorganized sectors are in the fray for six sigma certifications in India.

13. THE ORIGIN & HISTORY OF SIX SIGMA- *THE CONTROVERSY*

In its origin and historical process to examine, Six Sigma as per samurai concept stands as one error accepted in a million-time operation. One million is represented as six zeros to the right of the numeric one i.e., 1. Zero is an end less movement by Buddhist Philosophy. Zero represents a circle, any movement clock wise or anti – clock wise on a circle path is end less, similarly the quality circle is an endless process, every movement tries for improvement in the quality. Zero as a numeric concept originated in India that any mathematician and historian will strongly adheres to. Indian concept and contribution in the form of creating a **"Zero"** and application of "Zero" in numeric computation and calculation to the world is the biggest donation. To compute the error level in the **"Six sigma"** (1) error is acceptable in a million Transactions (000,000) i.e., (1) 000,000, the form of six represents the six zeros to the right of digit 1 as Six Sigma. The logical representations made in the oriental "Samurai Texts" as inspiring Philosophy for the Buddhist monks to practice to move towards perfect. At the same time oriental samurai Literature strongly advocates that no human work is perfect. And no human being can be perfect. Practicing to be perfect is the process for quality improvement in life. Life leads to salvation ***"Nirvan"*** at the end. To attain the holy goal, the human being needs to practice throughout the life endlessly. In Buddhist Philosophy Practice is the method to attain the goal. The topmost achievement can be computed with the least and lowest number of errors and mistakes. This method of Practice and practice till the end is justified with one error as accepted level to be Perfect in a million of acts of the perfect human being. This human concept of practice, error and mistakes are borrowed to the operation of an organization i.e., combination of man and machines in delivering quality.

14. BUDDHISM vs HINDUISM - *THE SIX SIGMA CONTRIBUTORS*

At the same time the Vedantic methods as per the oriental literatures in India **"Zero"** has its origin form the chants of "**OM"** in Vedas. The non-script literate man represents **"OM"** as a Zero to remember the three numeric as Brahma, Visnu & Maheswar in a scripting representation of three "000" zeros. Indian Philosophic representation of **"Zero"** is many but ultimate end is its application in the right is multiplication through digit addition which is ten times, i.e., improvement of a minimum standard for calculation. Zero in the right and in the right place is the process of highest improvement to scale. The scientific temper of Indian Vedantic texts are logical, the logic defines "practice makes a man perfect" and ***"perfect is not absolute".*** Absolute achievement is the end in itself. These concepts of Vedantic literature and logic are borrowed by Buddhist literature to a great, extent. Reasons are obvious; Buddhism originates in the India and the philosophy and theosophy is influenced by Indian Philosophy, logic and reasoning. Buddhist texts preachers were trained in India through Indian scholastic thinking and logic. India's scholars influence on Buddhist literature is highly evident. Organization is a must by Buddhist Philosophy to survive and improve. The concept of ***"Sangh"*** justifies in Buddhism to organize in an organization.

In this context organization in Indian Philosophy is evident for the public welfare not for the religion. Hinduism is a religion having no preachers and teachers, it has originated from the nature and worship of nature is its practice. Preachers were in Jainism before Buddhism. Buddhism concept of ***"Buddha" "Sangha"*** and ***"Dhama"*** had highlighted themes to be accepted by common people. The concept organization greatly contributed for the spreading and acceptance of Buddhism in different parts of the world. With the practice of the organization theories Buddhism and organizational discipline in Buddhism proliferated the religion to spread in different land masses like China, Cambodia, Japan, Korea etc. in the Asia region? Training is the biggest contribution of this religion and was implemented with strict norms which helped the Buddhism to sustain in very odd situations in history and time.

15. SIX SIGMA & MARTIAL ARTS

The culture of martial arts of Buddhism has sustained and grown to heights through training. The world is crazy for several Buddhist martial arts of different Buddhist temples. Martial arts have trainers who certify the pupil with belts. Black belt is the right belt for a learner to impart the training further and to succeed as a trainer of the temple in the martial art. Practice and adoption of improvements are

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the procedure of qualifying from one belt to another. Quality is a continuous process of improvements. Six Sigma do in the same way has borrowed the concept of belt and "Black Belt" is last on the tag. Processes of quality improvements through training practice and tests of ***Six Sigma*** are indebted to Buddhist temples ***"Marital Arts"*** training, practice, and examination system. The silk route through the passes in Himalaya was the route of the Buddhist monks to spread Buddhism in an organized way in China and other land masses of the Asia Pacific region. Trade routes through warm currents on the sea ways was another route of Buddhist monk to preach Buddhism in Thailand Cambodia, Bali and Sumatra etc. Buddhist preachers and monks were the highest section of knowledgeable people of the society in India. Basically, they were the scholars of that time. Buddhist monks were carrying the Indian knowledge and logic along with them apart from the knowledge of medicine (Ayurveda) Mathematics, Astronomy, Economics, Science, Philosophy etc. from Indian Vedantic teachings. Time to time Buddhism gained and received royal patronage from Indian rulers and emperors. Asoka the great was one of the greatest protagonists of Buddhism. His initiative in support of Buddhism is well evident in Srilanka today. Buddhism in fact has exported Indian knowledge bank to the other Asian regions.

16. BEYOND THE SIX SIGMA – NINE, FIFTEEN & THIRTY-THREE SIGMA

In the industry part, at present Six Sigma is considered as the highest quality certification. To examine the similar quality certification in the similar light and context few examples can be cited as beyond "Six Sigma". For the purpose the astonishing works of the calendar devised millenniums before through astronomy are performing flawlessly for the mankind. In this context of examination of error level, it can be claimed that Gregorian calendar – (English calendar), Saka calendar – (Indian calendar), Hegira calendar - (Islamic calendar) have an error level which can be claimed as ***"One Error in A Billion Transaction"*** – which is nothing but – ***"Nine Sigma".*** All these calendars have more than millennium years of application and error level is nearest to nil. On application of the similar methods experts do claim the ***"Nine Sigma"*** norm is justified in case of these three great calendars of the world - Hindu, English and Islamic calendars.

More than two thousand three hundred years the works of the most pragmatic philosopher and scholar Chanakya has not been countered as obsolete or dead in his verses in *"**Arthshastra**" & "**Nitishastra**"*. Not in a single stance, any concept of Chanakya has not been proved wrong till date in its applications and practice. Simply the concepts and rules of Chanakya are absolute

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without any flaw and time tested for more than two thousand and three hundred years. Scholars who have tested ***"Chanakyaniti"*** on human and human societies irrespective of time have found as absolute. The wonderful works of Chanakya logically have every claim for the certification of ***"Fifteen Sigma"*** i.e., less than ***"One Error in A Tetrallion Applications".***

Not only nine and fifteen Sigma for some master pieces, machines do have absolute performance with absolute error free. Such is the mathematics wonder machine for counting i.e., ***"Chinese Abacus".*** Abacus has performed for more than thousands of years without a single error to its credit. Even a single error has not yet found in its trillions of usages. Undoubtedly this can be claimed as **"Thirty-Three Sigma"** on its function and counting. Nothing is more accurate in counting than that of an abacus. World, leader in computing **IBM** has well recognized the flawless performance of this tiny wonder.

17. INDIAN CONCEPT - SIX SIGMA

Six Sigma is not an end process for any industry. The continuity of improvements is the process. Japanese concept presentation of **"Six Sigma"** to the world of Industry is well admired and recognized. The concept and its application which originated in India have no global recognition. What the oriental India practiced is least recognized by the modern India in the present day. Nothing to surprise, we welcome many such applications and different sciences as alien. Our scholastic research works are so neglected even India lacks in recognizing its knowledge treasure. Six Sigma is one such great Indian treasure presented by the Japanese to the world with a crazy quality drive.

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