



How Six Sigma can effectively integrated into the Government agencies?

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Introduction

There is great pressure to improve the nature, standard and cost of public services in the developed and developing countries. In the early 80's it was estimated that whilst manufacturing wasted 20-25% of its sales value, service organizations wasted 40-45% of their sales value or income for the public sector.

Six Sigma concept is new to public sector, but the tools and techniques it utilizes are not. The key to a smooth transition to the Six Sigma concept is found in integrating this new concept into those already existing tools and techniques. This approach minimizes any negative impact on operations tempo and training while still providing an effective process improvement system.

The Background of Six Sigma

The father of Six Sigma was the late Bill Smith, a senior engineer and scientist. It was Bill who crafted the original statistics and formulas that were the beginning of the Six Sigma culture. He took his idea and passion for it to Bob Galvin, the CEO of Motorola at the time. Bon urged Bill to go forth and do whatever was needed to make Six Sigma the number one component in Motorola's culture. Not long afterwards, Senior Vice President Jack Germaine was named as quality director and charged with implementing Six Sigma throughout the corporation. So he turned to Motorola University to spread the Six Sigma word throughout the company and around the world. The result was a culture of quality that permeated Motorola and led to a period of unprecedented growth and sales. The crowning achievement was being recognized with the Malcolm Baldrige National Quality Award (1988)

What is Six Sigma?

Business world often describes Six Sigma as a highly technical method used by engineers and statisticians to fine-tune products and services. Another school defines Six Sigma as pursuing a goal near-perfection in meeting customer requirements by achieving 3.4 defects per million opportunities (DPMO). Culture change is also a valid way to describe Six Sigma. Motorola puts a



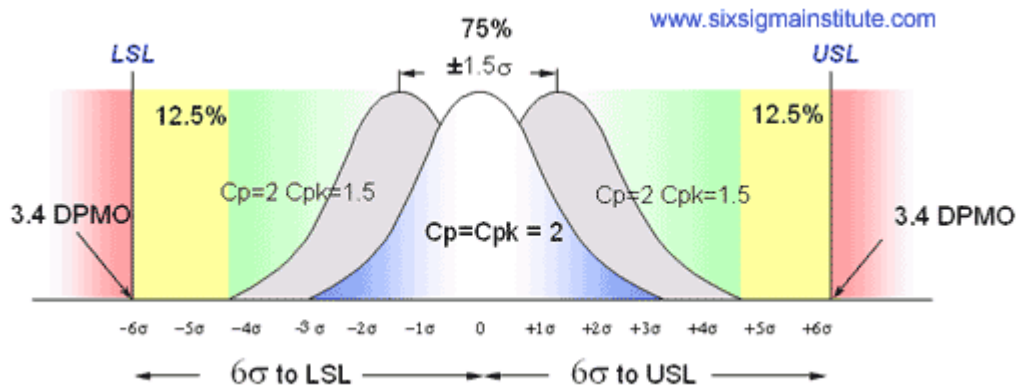
lot of emphasis on cultural change such as breaking down the white space between departments, employee empowerment, etc.

Sigma Level	Examples
2 σ	IRS phone tax advice
3 σ	Restaurant bills, medical prescriptions, airline baggage handling
4 σ	Payroll processing
6 σ	Domestic (US) air crash fatalities

Six Sigma Definition

■ A Management driven, scientific methodology for product and process improvement which creates breakthroughs in financial performance and Customer satisfaction.

Source: Motorola



Meanwhile, in the decade between Six Sigma's beginning in 1987 and 1997, Motorola's achievements have included the followings:

- Five-fold growth in sales, with profits climbing nearly 20 percent per year.
- Cumulative savings based on Six Sigma efforts pegged at USD 14 billion.
- Motorola stock price gains compounded to annual rate of 21.3 percent.

Six Sigma improvement is also achieving significant results in the Public Sector.



- Over USD 3 million of savings in The City of Fort Wayne, Indiana in Year 2003.
- Indiana Family & Social Service Administration's Six Sigma has achieved savings in excess of three million dollars in first year and it is projecting savings of over six million for the second year.
- Idaho National Engineering and Environment Laboratory, USA saved USD 40 millions in 18 months
- In Singapore public sector, for first 20 Six Sigma pilot projects each yielded estimated cost savings ranging from \$10,000 to \$1.5 million.

Six Sigma improvement model typically has five phases: Define, Measure, Analyze, Improve and Control. Many of the components of this DMAIC model are not new things, such as Statistical Process Control (SPC), Failure Modes and Effects Analysis (FMEA), Measurement Systems Analysis (MSA), 8D, Lean Manufacturing and Business Operating Systems (BOS).

D => Define Opportunity – What is important?

M => Measure baseline Performance – How are we doing?

A => Analyze Opportunity – What is wrong?

I => Improve Performance – What needs to be done?

C => Control Performance – How do we guarantee performance?



The Six Sigma methodology, using a modified step-by-step model, has also found a home in development of new products and services. Typically this model also consists of five phases: Define, Measure, Analyze, Design, and Verify (DMADV).



Why Six Sigma is important for service quality?

Currently, industry is running at approximately three (3) to four (4) sigma without shift in average, which equates to 99.73% and 99.9937% defect free processes respectively. With 1.5 σ shift, it falls to 93.32% and 99.38%. This percent point sounds pretty good, but think about the result of a four sigma process:

- Unsafe drinking water almost 9 minutes per day.
- No electricity for almost 4.5 hours per month.
- No telephone service for 62.6 minutes each week
- RM 191 million is unaccountable for from Malaysia Year 2004 budget. (Note: RM 30766 million)

For cases in USA,

- 13,500 lost article of domestic mail per hour (Note: 190 billion pieces in Y2002)
- 8539 incorrect surgical operations per week. (Note: 71.5 million surgeries in Y2002)
- 1,58 millions wrong drug prescriptions each month. (Note: 3.05 billion prescriptions in Y2002)

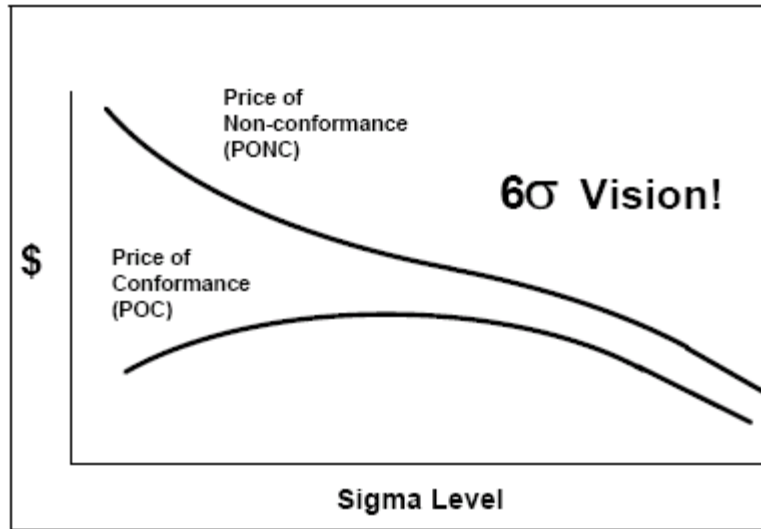
Therefore, being just 99.38 % accurate can sometimes spell disaster. The new research indicates the cancer risk from 0.6 percent to 3.2 percent varies depending on the frequency of X-rays and CT scans in 15 countries surveyed. The new 0.9 percent estimate in US translates into 5,695 death cases each year due to cancer induced by X-Ray and CT over exposure.

If Six Sigma level is achieved

- Unsafe drinking water almost 1.8 minutes per year.
- No electricity/telephone service for almost 17.6 minutes in a decade.
- 7.4 lost article of mail per hour (USA)
- 4.7 incorrect surgical operations per week.
- 864 wrong drug prescriptions each month.
- Only RM104604 are unaccountable for from Malaysia Year 2004 budget

The difference between 4 σ and 6 σ performance means producing 1826 times fewer defects and increasing profit by at least 10%. The gap between four and six sigma at GE was costing GE between USD 8 to 12 billion a year.

This below figure shows a cost comparison of conformance (POC) with non-conformance (PONC) as sigma increases. Conformance identifies a unit of production which has no defects requiring rework. A non-conforming unit of production has defects, requiring additional time and money to repair.



According to Taguchi's concept of quality, any defective or poor service from the public sector is a loss to the society. For example, long waiting time to get a business permit is loss because a businessman cannot provide their value added service to their customers. Time, a non-renewable resource is wasted besides other hidden costs like rental, electricity bills, salary to staff, etc have to be burdened by the businessman or ultimately by the consumers and society.

Government or Public Agency as a Service Organization

Public agencies interact with customers and deliver service whether it is accompanied by hardware or not.

A world-class service organization must meet these criteria or principles, (Excerpted from CSMS:2003 Customer Service Management System)

- ◆ Operating philosophy encourage employee sensitivity towards customers
- ◆ Customers interact with the performance of processes at "touch points"
- ◆ Competitive customer measurements observe variation over time
- ◆ Service level agreement guarantees are based on objective metrics
- ◆ Customer requirements are received regularly to assure competitiveness
- ◆ All management levels are actively engaged in customer support



- ◆ The target for performance achievement is zero customer defections
- ◆ A closed loop customer complaint system is tied to performance rewards
- ◆ Employee incentives are tied to customer engagement measurements
- ◆ Service improvement strategy is linked to capital resources allocation, and
- ◆ Annual improvement projects deliver performance gains to the bottom line without loss of customer satisfaction and other measures of external customer perception.

What roles Six Sigma can play in the Public Sectors or Agencies

Six Sigma methodology can be applied in the public sector at macro and micro levels.

Macro level :

This is the role of the government as stimulator or catalyst for achieving economic viability as a nation such as setting up investment, fiscal, trade, etc policies. Six Sigma method can be used to establish a measurable, data-driven and closed loop national policy.

Examples:

- CIA used Six Sigma to improve measures (e.g. data mining process) against terrorism (USA)

Micro level :

The application of Six Sigma initiatives to improve the way government is managed. The goal is to make public agencies more effective, efficient and economic to support national policies.

Examples:

- Six Sigma Water Permit Project by Minnesota Pollution Control Agency (USA)
- Alexandra Hospital used Six Sigma to measure the time taken to turn-around patients at the Specialist Outpatient Clinic. (Singapore)



The Six Sigma key ingredients for the public agencies?

In some very basic ways, the Six Sigma program is **no different** than many private-sector implementations although there are some little differences. Among them are lacking free competition in the public sector because public agencies monopolize many services rendered to the public and also no full accountability for the result especially under a non-democratic government.

These below factors are crucial for Six Sigma initiatives to be integrated into the government agencies.

☀ **Free and democratic society**

A full accountability only can be instilled and achieved under a free transparent election mechanism and all electorates (or tax payers) have the power to remove those poor performed managers from the public agencies.

☀ **Strong leadership and top management commitment**

TQM in the past failed mainly due to weak support to drive quality ideas. (Pande et al., 2000). Good support from departmental head is imperative in the restructuring of the organization and achieving the cultural change and motivation of public servants towards quality and the Six Sigma strategy to the business.

☀ **Linking Six Sigma goals to strategy planning and vision**

Unfortunately, in most cases, strategic planning is a square-filling activity which is accomplished once a year before shelving it and repeating the same planning process year after year. Six Sigma goals need to be linked closely with the strategic plan of an organization to create high impact improvements.

☀ **Linking Six Sigma to customers**

A genuine focus on the customer, backed by an attitude that puts the customers' needs first, as well as by systems and strategies that serve to tie in the business to the "Voice of the Customer." Six Sigma should begin and end with the customers.

The process of linking Six Sigma to the customers can be divided into two main steps:

- a. Identifying the core processes, defining the key outputs, and defining the key customers that they serve.
- b. Defining the customer requirements.



☀ **Organizational infrastructure**

A formal Six Sigma infrastructure in an organization is crucial to support the Six Sigma undertaking. Belt system is a common system used nowadays.

- Sponsors or champions are senior management staff that guide the project improvement team and negotiate resources for the team.
- Process owner are individuals responsible for a particular process and identifying the opportunities for process improvement.
- Master Black Belts (MBBs) are fully trained quality leaders responsible for Six Sigma strategy, training, mentoring, deployment and results.
- Black Belts (BBs) are fully trained experts leading improvement teams across the business.
- Green Belts (GBs) are individuals trained in Six Sigma supporting Six Sigma projects.
- Team members are individual supporting specific projects in their areas.

☀ **Cultural Change**

According to Mayor of The City of Fort Wayne, Mr. Richard, “The first success was about the culture and the attitude” (e-Zsigma July 2003 Newsletter). The lack of positive attitude like “can do”, “taking ownership for the problem”, etc is common problem in old-fashioned and hierarchical public agencies.

The successful implementation of Six Sigma requires adjustment to the culture of the organization and a change in the mindset of its staff. Several strategies need to be carried out to overcome resistance to change issue in public agencies arising from technical, political, individual and organizational factors.

☀ **Training and Retraining**

Training and retraining is another crucial factor in the successful implementation and deployment of Six Sigma initiatives. It is important to communicate both the why and how of Six Sigma as early as possible and provide the opportunity to people to improve their comfort level through training classes. The management needs to ensure that the training to be structured such that it is relevant to employees' everyday jobs.

The staff shall have good understanding on Six Sigma methodology DMAIC, statistical tools and metrics through systemic training conducted by qualified trainers.



☀ **Project Prioritization and Selection**

For public agencies as service organization, the manner of interaction with customer, processing turnaround time and service quality shall be used as yardstick to choose Six Sigma projects. The high impact and manageable projects shall be selected in the pilot implementation stage to avoid overstressed and frustration to many people in organizations.

☀ **Linking Six Sigma to Performance or Remuneration reward**

Some studies show that above 60% of the top performing companies practicing Six Sigma link their rewards to their business strategies and Six Sigma projects. For instance, 30% of annual salary review of employees in GE is tied to his/her Six Sigma project performance.

☀ **IT infrastructure**

Six Sigma is about closed loop monitoring and feedback for top management to take timely and correct actions. Hence any effective Six Sigma implementation requires an IT system to receive, organize and help translate input and feedback into effective decisions for the organization. For such a system to be active and functional, it requires an underlying IT infrastructure.

☀ **Cross functional Team**

Many people are part of a process especially within service and public sector organizations. Therefore if a process wanted to be improved, these people need to be involved otherwise a change may be implemented that makes the job of someone further downstream difficult if not possible. Only cross functional team can effectively solve such cross functional or inter-department problem to optimum level.

Main challenges faced in introducing Six Sigma within the government agencies

1. KKN (a term coined and used in Indonesia) or Corruption, Colonialism and Nepotism is a main threat to effective and efficient public service in Asia. Six Sigma culture only can be embedded successfully under an honest, trusted and accountable government.
2. Government agency is mandated to provide service without real competition from other competitors. Without real and free competition under the free market environment, many government agencies found no incentives to meet customers' expectation. This problem

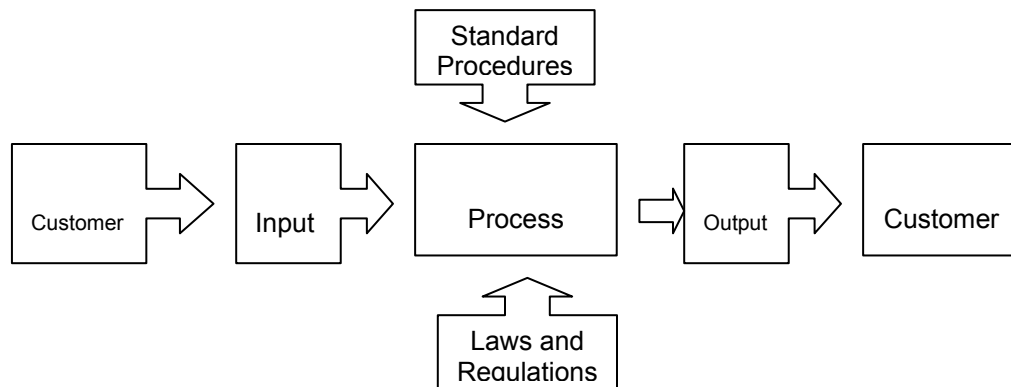


- is compounded by old-fashioned bureaucracy and lack of free democratic process to choose local councilors or mayors especially in Malaysia.
3. Reward scheme in public agencies is tied to seniority. The uphill challenge is to reform reward or salary scheme of the public servants to performance based adjustment system. The salary review system in the public agencies should be designed on agreeable and measurable metrics. Besides that, public members shall also be given opportunity to assess the performance of public agencies.
 4. To remove politics from public agencies to make Six Sigma sustainable when administration and leadership change. Six Sigma culture in organization shall be treated as non-partisan subject and Six Sigma projects are handled by professionals and not politicians.
 5. Senior management or top leader buy-in. Many public agencies are administrated by people who have no experience in running private businesses. Maintaining status-quo mentality is not uncommon in these organizations. As long as a public agency is doing the rudimentary part of their job, it is pretty difficult to change their “no care” mentality on new expectations from the public.
 6. Basic skill training is lacking in the public sector. Training and retraining scheme is necessary to create an innovative, thinking and productive workforce. Generally, public agencies have no structured training program for their employees unlike private companies. For instance, ST Microelectronics (M) is providing 50 hours annual training program for all employees.
 7. Lacking qualified Six Sigma trainers in public sectors. Implementing Six Sigma is a new frontier in the public agencies and availability of a pool of Six Sigma experts in the public sector is still non-existence nowadays.
 8. Dealing with limited (or wrongly allocated) resources for hiring right employees. Public agencies are prohibiting to employ right staff like full-time Master Black Belts and Black Belt without the approval of JPA (Civil Service Department) and Treasury Department. This sort of long and time consuming bureaucratic application process for a new project budget may hinder enthusiasm and initiative to kicking start Six Sigma projects.
 9. “I am the boss” mentality or culture inherited from the old colonial days is still too prevalent in the public service. Many public servants are still thinking that they are customers and those public members are suppliers under the traditional unbreakable “iron bowl” public service system. Undeniably, sometimes people have difficulty to identify who is customer in the public sector. For example, litigation case in the court.
 10. Poor maintenance culture hinders “Control” stage of DMAIC. Our new Malaysian Prime Minister, Dato’ Seri Abdullah Ahmad Badawi had commented that Malaysia has built first world infrastructure, but equipped with third world maintenance culture or mindset. Poor maintenance culture makes control or monitoring stage in DMAIC in jeopardized and causing Six Sigma projects unsustainable in the long run.



Lessons Learned and pitfalls to avoid

1. Service in the public agencies is transactional processes. SIPOC model may not be very helpful since the customers are often the suppliers. Example, MyKad application. The applicant (customer) submits an application form (the input) and hands it to the Officer In Charge. The officer following the National Registration Department's procedures, undertakes a number of task (the process) and may give the applicant a receipt (the process) after the form submission and a collecting notice (the process) by mail at about two months later for the applicant to collect MyKad (the output). Within the public sector the process may be less clear.



The key is for public agencies to define who is the customers and suppliers and also understand the customers' requirement. Then conducting value analysis or waste elimination for the processes to create value added (not cost added) service.

2. Private sector Black Belts or Consultants are needed for mentoring. External Six Sigma Black Belts are valuable source to provide training and mentoring for pilot projects to avoid or repeat some unnecessary mistakes encountered in the private sectors. Besides that, advisors from private sector sitting in the Six Sigma steering committee or board make certain that report savings are valid and accurate.
3. Start off with high impact, attainable and manageable pilot projects to keep momentum rolling and high morale. A national level project like solving high road accident rate in Malaysia may not suitable for those organizations new to Six Sigma concept. Six Sigma projects are carefully chosen to make significant improvements in customer satisfaction and cost. Always give some spaces or allowances for learning curve and failure.
4. Six Sigma is money makes money investment. It involved high investment cost in staff training, IT infrastructure, staffing, etc. Investments in Six Sigma projects are accretive where all projects are selected based on their ability to achieve clear return-on-investment goals. But the benefits and payback are also high in the long run.



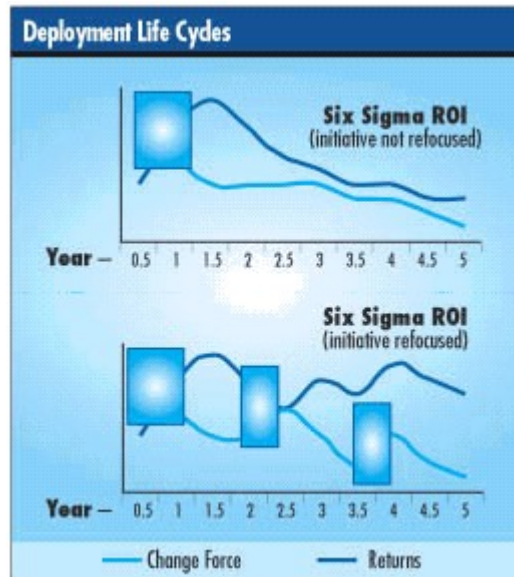
5. Culture and attitude change to customer oriented mindset is not uncommon for those organizations successfully deploying Six Sigma initiative. Besides that everyone in the organization shall communicate in a same “quality” language like Sigma, Cp, Cpk, DPMO, etc.
6. Six Sigma concept is easy to understand and learn, but its implementation in real life is difficult than say. Top management sometimes has to admit failure and setback for certain Six Sigma projects and learn from the mistakes.
7. Measurement is a means of communication. Timely and accurate measurements from good IT infrastructure for management to make informed decisions on resources allocation, quality issue, etc. A date driven performance management shall replace obsolete annual fixed increment scheme practiced in the government.
8. Six Sigma does not require a Ph.D. in Statistics. Breakthrough in desktop software and improved courseware enable teams to complete complex analysis and experiments quickly and easily.
9. Six Sigma is not a new buzzword for TQM. Yes, Six Sigma utilizes many TQM tools, but these tools are applied for breakthrough business improvement and sustainable financial returns.
10. Six Sigma is not enough, innovative and creative thinking are still needed to think outside the box. (Thomas Pyzdek, Quality Digest, Nov 1999)

What is the next once Six Sigma is demonstrated with significant results?

Many private companies who have deployed and implemented Six Sigma say it's brilliant at solving chronic, complex and cross-functional problems, but returns on investments diminish after its initial applications in target-rich environment. This dilemma may be due to all low hanging fruits are plucked.

The Six Sigma slowdown after two years is not unusual phenomenon. The prime opportunities have been identified and acted upon, and companies must either allow Six Sigma to run its natural course, with returns diminishing at a steady pace over time, or re-energize and reposition the initiative.

Motorola's experience says Six Sigma began as an initiative for improving quality rather as a methodology for continuous business improvement. Once organizations achieved the Six Sigma goal, they stopped improving – they become “good enough”. This mindset caused complacency that allowed quality to actually deteriorate. (The New Six Sigma, Matt Barney and Tom McCarty, Motorola University, 2003)



The life cycle of Six Sigma deployment without (see upper graph) and with intervention (see lower graph) by the management. The lower graph shows how a Six Sigma investment is renewed and energized at certain points during its life cycle.

The most effective way to maintain Six Sigma and the results it deliver is to link it into an overall management system that identifies Critical To Quality (CTO) metrics. Ultimately, Six Sigma becomes one part of the overall business system, which also leverages other tools and methods such as balanced scorecard, ISO9000, lean manufacturing system, total productive maintenance etc as needed.

Applications & Case Study

A case study is presented showing how Alexandra Hospital in Singapore using Six Sigma to improve Patient Turnaround Time (TAT) at the Specialist Outpatient Clinic. The project aims to complete the entire process from seeing the specialist to having the medication dispensed within 60 minutes. After Six Sigma was used to streamline work processes, a 20% improvement has been recorded. Alexandra Hospital is working to improve this further. See Appendix 1.0.



Conclusion:

Six Sigma is a highly disciplined approach that helps an organization focus on the critical processes that need improvement. Together with the rigorous analysis of facts and statistics brings about breakthrough process improvements to the organization, but statistics associated with it need to be carefully handled so as not to discourage its potential users.

Six Sigma works in Government agencies and can be effectively integrated into management system of government agencies with proper planning, leadership commitment, political will to make change and those evils or challenges highlighted in the articles are properly addressed.

Public agencies usually start to initiate Six Sigma improvement projects after being triggered by certain general conditions such as budget cut; economic crisis; electorates' or taxpayers' pressure for better governance; the magnitude of a problem is unmanageable by public agencies alone; etc.

The areas with high volumes of transaction and direct interface with the public members are natural places to look for breakthrough improvements. Examples include:

- Customer interacting operations such as immigration department, police, licensing agencies, legal system, etc.
- Back office areas such as income tax processing, employee pension funds processing, etc.
- Logistical operations such as clinical, IT & logistics, etc.

The successful implementation of Six Sigma techniques or initiatives or programs will depend on how useful and beneficial they are seen to be in improving services in ways stakeholders i.e. public members, public servants and authorities can see and feel.

About the Author

NK Khoo is a founder and also managing consultant for Lean Sigma Institute. He was graduated from University Technology of Malaysia in Mechanical (Aeronautical) engineering degree. He was certified in Six Sigma Black Belt (SSBB), CQE, CQA and CRE by American Society for Quality (ASQ).

He has more than 15 years hands-on work experience in Six Sigma improvement, new factory setup, new product transfers, ISO9000/14000/TPM systems, IE productivity improvement, cycle time reduction, Kanban, SPC and DOE training, supplier auditing, etc in Malaysia, Singapore, Indonesia and Sri Lanka.