

Fundamental elements for the successful performance of Six Sigma projects in service industries

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Abstract

Purpose --- Six-sigma has been a powerful and successful tool in manufacturing industries to reduce rate of rejects and to enhance productivity. The service industries are diversified and the features are different from manufacturing industries. Thus, the use of Six Sigma in service industries and its benefits are limited to some specific types of services like health care and banks. This paper focuses on key performance indicators of six-sigma and elements to cover a wider range of services.

Design/methodology/approach --- From the analyses of the service models, service industries structures and also by comparing between the features of service and manufacturing industries, the main challenges in application of Six Sigma in service industries can be identified. Further analyses of these challenges showed that the proper implementation of Six Sigma in service industries requires not only the effective operational strategies, but also customers needs and satisfaction must be considered and designed into the implementation phase.

Findings --- The paper proposed that for the successful implementation of Six Sigma in service industry, instead of just DMAIC, a design phase should be included (DDMAIC). The main meaning of this new phase and its affection will be described.

Research limitations/implications ---

Keywords --- Six Sigma, Service industry, implementation of Six Sigma

Paper type: research paper

Introduction

Quality management has been an important management strategy for achieving competitive advantages and improvements. Traditional quality concepts like Statistical Quality Control¹, Statistical Process Control², Zero Defects and Total Quality Management³, have been key players for many years; While Six Sigma is a more recent initiative quality improvement to gain popularity and acceptance in many industries across the world (Hendry and Nonthaleerak, 2005). The basic elements of Six Sigma like, Statistical Process Control, Failure Mode Effect Analysis⁴, Gage Repeatability and Reproducibility and other tools that have been on reduction of

1 - SQC
2 - SPC
3 - TQM
4 - FMEA

rejects and enhancing the quality. Six Sigma provides a framework in which all these tools can be performed with management support.

Though Six Sigma was originally developed for manufacturing processes, but today service firms and service functions within almost every sector are using Six Sigma to improve profits and performance. They are deploying Six Sigma in their marketing, finance, information systems, legal, and human resources processes in order to solve the problems. So Six Sigma methodology has a major role to play under these circumstances to pinpoint the major problem areas and devise powerful strategies to tackle such problems which improve the customer experience (Antony, 2004).

Six Sigma methodology

In the midst of 1980s, Motorola (Stamatis, 2004), under the leadership of Robert W. Galvin, was the initial developer of Six Sigma. Six Sigma is a disciplined methodology that uses data and statistical analysis to measure and improve a company's operational performance. It focuses on identifying and eliminating "defects" in processes and has produced hundreds of millions of dollars in new profitability in a wide variety of industries.

A large part of the success of Six Sigma lies in its ability to add a communication layer to industrial processes. Visual information systems populate the working environment with clear signals for parts delivery or tool changeover (Antony, 2004). Briefly, Six Sigma provides a suitable strategy with appropriate indicators toward continuous improvement.

Six Sigma methodology and statistical methods ensure the throughout improvement in quality and reduction in rejects with the definition of targets and visions. Implementation of Six Sigma will be achieved through a series of successful projects. Project can have different sizes and durations. Depending on the scope of the project, they are categorized as: (Haik, 2005)

- Transactional Business Process Project: an improvement of a transactional business process that extends across an organization; such as order processing, inventory control and customer service.
- Traditional Quality Improvement Project: aimed at solving chronic problems crossing multiple functions of an organization.
- Design for Six Sigma Project: a project aimed at incorporating the "voice of the customer" (i.e. customer's needs) and Six Sigma level targets into the design of products, services or processes

Six Sigma improvement model typically has five phases: Define, Measure, Analyze, Improve and Control: (Sleeper, 2006)

Phase 1- Define: In the Define phase, the Black Belt forms the team, including members from different departments affected by the problem. The team clearly specifies the problem and quantifies its financial impact on the company. The team identifies metrics to assess the impact of the problem in the past, and to document improvements as the problem is fixed.

Phase 2- Measure: In the Measure phase, the Black Belt team studies the process and measurements associated with the problem. The team produces process maps and assesses the accuracy and precision of measurement systems. If necessary, the team establishes new metrics. The team identifies potential causes for the problem by applying a variety of tools.

Phase 3- Analyze: In the Analyze phase, the Black Belt team determines what actually causes the problem. To do this, they apply a variety of statistical tools to test

hypotheses and experiment on the process. Once the relationship between the causes and effects is understood, the team can determine how best to improve the process, and how much benefit to expect from the improvement.

Phase 4- Improve: In the Improve phase, the Black Belt team implements changes to improve process performance. Using the metrics already deployed, the team monitors the process to verify the expected improvement.

Phase 5- Control: In the Control phase, the Black Belt team selects and implements methods to control future process variation. These methods could include documented procedures or statistical process control methods. This vital step assures that the same problem will not return in the future. With the process completed, the Black Belt team disbands.

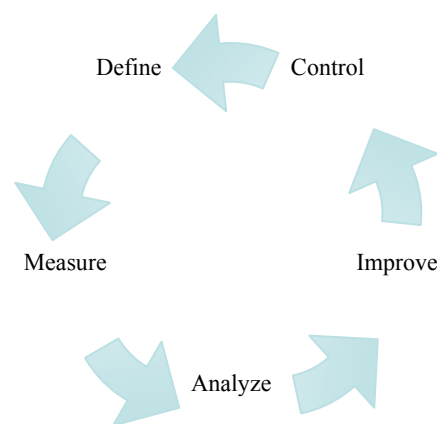


Figure 1- Typical main phases of Six Sigma improvement model

Service industries

Nowadays we witness the increasing role of service industries in the world. So service industries have been more considerable aspects. Even though the concept of service goes back to 1950, but till now there isn't an accepted definition of services. The earliest approach to define service is by Shostack, in which the author feels that services are rendered, it is experienced. Absolutely there are many critical differences between service and product. A service cannot be stored on a shelf, touched, tasted or tried on for a size. Services are generally obtained by engaging an interactive process with the provider (Harvey, 1998). Vargo and Lusch define service as the application of specialized competences (skills and knowledge). Woodall feels that service can or could mean any or all of the following:

- The entire manifestation of a business or not for profit
- Structure perceived to reside within the service sector (e.g. restaurant, insurance company, local council repair depot) – service as an organization.
- The key commercial outputs of a service organization (e.g. bank account, insurance policy, and holiday) – service as core product.
- Any peripheral activity designed to enhance the delivery of a core product (e.g. provision of a courtesy car, complimentary coffee) – service as product augmentation.
- Any product or customer-oriented activity that takes place after the point of delivery (monitoring, repair, up-dating) – service as product support.
- Service as a mode of behavior (helping out, giving advice) – service as an act.

Service Classification

Classification in manufacturing systems is quite clear, and this is mainly based on their processes. Similar need has been identified for service sector and various researchers have come forward with different ways of classifying services.

The need for classifying arises mainly as

- Lack of exposure to marketing problems and strategies in different industries among managers in the service industries (Lovelock, 1983).
- Working only in one particular type of service industry limits the exposure of managers, which results in lack of ability to identify and learn from the experience of organizations which are facing parallel situations in other service industries (Lovelock, 1983).
- Classifications may lead us to some new ideas and to an understanding of the appropriate management methods and techniques to each service type (Voss, 1992).

So in this paper, we have a brief review of main classifications of services. There is several classification schemes in research articles, selected few are listed below.

Table 1- Summary of selected schemes for the classification of services (Oakland et al [14])

1	Judd	1964	Rented; Owned; Non-goods
2	Shostack	1977	Tangible/intangible service element Domination
3	Sasser	1978	Service/ facilitating goods emphasis
4	Thomas	1978	Equipment/ People-based delivery
5	Chase	1978	High/low customer contact
6	Kotler	1980	People/equipment; customer presence; personal/business; public/private/profit/non-profit
7	Lovelock	1983	Nature of service; relationships; judgment; demand pattern; delivery method
8	Johnston and Morris	1985	Product/process basis
9	Schmenner	1986	Degree of interaction/customization; labour intensity
10	Haywood – Farmer	1988	Labour intensity; contact with customer; customization
11	Johnston	1989	Frequency of transaction
12	Voss	1992	Professional services; service shop; mass services

So in table 1 it is obvious that the attitude to service was changed. As mentioned nowadays services have a wide range of industries and new attitude about service in on the base of professional services; service shop and mass services.

Service industries, new environment for Six Sigma projects

Techniques such as Six Sigma have made lots of noise. After all, a process is a process. If these established, well proven and well documented approaches so can dramatically improve things on the factory floor then they must also be relevant to the white collar factory. But the bases of service businesses are different, because they shift information rather than parts. And the information flows that exist in

manufacturing organizations simply aren't of the same kinds as the information generated by services.

Service businesses are characterized by unpredictable events that occur in part outside the organization and are largely invisible (Antony, 2004). A service organization may have explicit and defined processes, but any enactment of a process will be highly variable. For example suppose a mortgage application. The product vehicle is, of course, standardized as much as possible. The processes for assessment, approval and enactment are also specified with a high degree of accuracy, but we cannot predict the number of exact journey any single mortgage application will take. The application may need to collect several items of information from parties beyond the organization, such as surveyors and insurers. It may need to be modified in the light of new information, or adjusted to changing customer requirements. Each mortgage application is a unique entity, born of individual customer's need, which evolves as the business attempts to satisfy the goals of all the stakeholders attached to it.

Services, then, are demand-driven (Sehwall, 2003). And 'demand-driven' doesn't just mean that a service experience is triggered by a customer action: demand is a continuous, evolving factor. The processes of a service organization are like a protracted, complex conversation. Our systems help us negotiate between competing aims. This is completely different from the manufacturing areas, where 'demand-driven' is a means of controlling the production tap and where customer choice is reduced to choosing between configurable attributes. In the following table there are fundamental differences between service industries and manufacturing industries.

Table 2- Fundamental differences between service industries and manufacturing industries

Item	Service	Manufacturing
Input	<ul style="list-style-type: none"> • Information • Tools/Systems • Approach • Inter-personal skills • Work environment 	<ul style="list-style-type: none"> • Material • Machine • Method • Technical skills • Physical environment
Input measure	<ul style="list-style-type: none"> • Call volume • Call types – eg value versus failure • Customer preference/style • Time measurements • Process performance 	<ul style="list-style-type: none"> • Customer demand • Production schedule • Process performance • Quality measurements
Type of flow	<ul style="list-style-type: none"> • Information 	<ul style="list-style-type: none"> • Materials
Work flow	<ul style="list-style-type: none"> • Could follow a number of paths • Open to non-standard response • May have many decision points 	<ul style="list-style-type: none"> • Highly standardized flow • The non-standard is difficult • Very few decision points
Output measure	<ul style="list-style-type: none"> • Acceptable service • Absolute resolution time • Mean resolution time and variation • Customer satisfaction 	<ul style="list-style-type: none"> • Production volumes • Beat time⁵ • Number of defects • Measure quality
Success strategies	<ul style="list-style-type: none"> • Implement volume • Reduction in variation • Long-term customer relationship • Customer satisfaction 	<ul style="list-style-type: none"> • Implement standard work • Implement problem solving • High quality • High productivity

Challenges in the application of Six Sigma in service industries

5 - Beat time can be detailed as the maximum time allowed to produce a product in order to meet demand.

Six Sigma projects encounter challenges in the case of service industries, because of special features of this sector. On the base of table 2 and some other relevant topics which were mentioned, we can categorize these challenges to eight subjects. Some of these subjects have relevant predecessors or there is interaction between them. Finding solutions regarding to these categorization, will be the next step.

1- High customer satisfaction

Service functions have been an integral part of most corporations. Organizing service functions into a business entity creates a totally different mindset. A service organization acts differently because of a focus on customer requirements and prompt feedback from customers. Service offerings are experienced much faster than products, which sometimes are stocked in a warehouse or a showroom: Once service is delivered, the customer experiences it and expresses satisfaction or dissatisfaction. Because problems must be resolved faster, the challenges in service are different.

2- Various customer's need

Service organizations consist of transaction and interaction components. The transaction component implies more process dependence for outcome of high-volume functions. Such industries include fast food restaurants, direct mail, banking, health care, insurance and ticketing. The interaction component requires more personal care and attention for outcomes of low-volume and high value services. Such industries include sit-in restaurants, specialized health care and personal services. The transaction services are expected to be delivered faster, better and cheaper, while the interaction services are expected to be delivered better, faster and cheaper. In other words, the speed of service is more critical in transaction-based services, whereas quality is paramount in interaction-based services.

3- Relatively unpredictable volumes

Maybe an unpredictable volume in service sectors is one of the most challenges for implementing any quality tools. Because regarding to this challenge, concentration to quality and measuring rejects is so hard. However service companies attempt to predict the distribution of customers, but every prediction will have errors.

4- Nature of task unpredictable

In manufacturing factories each process and operation is fixed and clear, but in service sectors, many tasks must be done which are unpredictable. Because of high customer satisfaction and variant requirements, these companies must do unpredictable ineluctability tasks.

5- Lack of qualified information about quality

In manufacturing industries although materials are handling between different stations, data and information also transfer and analyze. Frequently the range of productions is constant and variety of production is less. So factories collect data from their fixed procedures and then analyze it easily. But service environments have a different kind of information visibility challenge. The problem of weak information and their analyses derives from:

- i) Variety of works which are done by service sectors
- ii) Variety of customer needs
- iii) Less attention to collect and analyze in service sectors

6- Lack of quality indicators and factors

Obviously because of lack of information in service industries in comparison with manufacturing industries, measuring the quality will have so many challenges. The root causes of these problems are:

- i) Lack of information
- ii) Rapid variant business strategy

- iii) Difficulty to define quality indicators and factors
- iv) Driven by customer whim

7- Lack of established quality program

Regarding to Deming’s cycle, control and getting feed back is one part of any improvement in an organization. So because of lack of quality indicators and factors, establishing a quality program will have so challenges. Consequently lack of established quality program causes poor performance of Six Sigma.

There are so many so many papers which discussed about critical factors for implementation of Six Sigma, But here we attempt to focus on service sectors and categorized the challenges in order to find best solutions. As it shown in figure 2 all of these challenges are driven from two main features of service industries.

- High customer satisfaction
- Various customer’s need

These features and challenges cause unpredictable volumes, rapid variant business strategy and unpredictable tasks. Because of these many variations, designing and collecting data and information cannot be established in a proper manner. So lack of information is tangible in the most of service organizations. Obviously regarding to these problems, organizations cannot focus on quality which it deserves. So frequently these organizations cannot pursue a proper and comprehensive quality indicators and quality programs. These problems lead the organization to the poor performance of Six Sigma as is shown in figure 2.

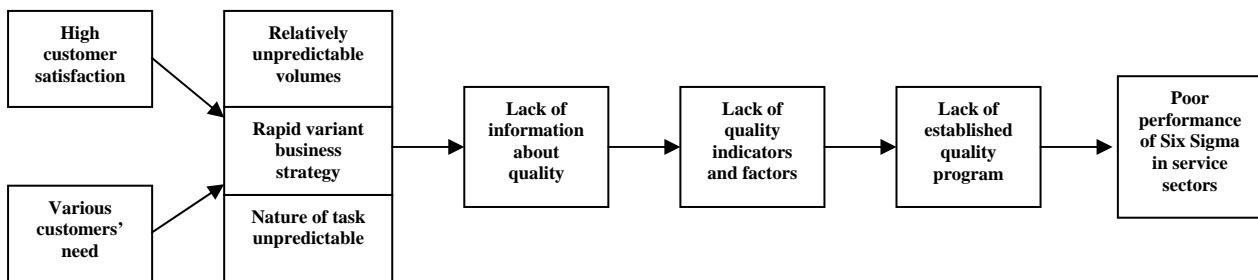


Figure 2- Main causes which leads service sectors to poor performance of Six Sigma

Defining defects in service industries is so important. Because the statistical definition of Six Sigma is 3.4 defects or failures per million opportunities. In service processes, a defect may be defined as anything which does not meet customer’s needs or expectations. It would be illogical to assume that all defects are equally same, when we calculate the sigma capability level of a process. So after defining defects they must be ranked. Maybe one defect Spark of so many crucial unsatisfactory and one another defect only cause little cranky responses from customers.

Always in the case of implementation of quality tools, one of main problems is lack of staff knowledge about quality concepts. Even managers sometimes don’t have sufficient knowledge about Six Sigma, so they don’t acknowledge that. In the other word manager will not support the project strongly. Training is required for all staff members to reduce misbehaviors.

Non-standardization procedures regarding to the processes cause so many problems. So Standardization the performance processes is one of the most important works which must be done initially. After that defining quality factors and indicators must be

done. Many service industries were confused definition of sufficient factors. These factors can be defined regarding to bellow items :(Y.H. Kwak, Anbari, 2006)

- i) Time (service time⁶, waiting time⁷, and cycle time⁸)
- ii) Cost
- iii) Employee behavior
- iv) Information (accurate and timely information)

So attention to the customer's need and customer satisfaction has a main role in the success of Six Sigma projects. One can identify critical inputs, in-process and service characteristics to monitor customer feedback. This factor is difficult to measure as it varies from service to service. For example, for a call center service, customer satisfaction is measured by the receipt of timely information. For a hospital, the comfort and assurance that patient feels may be is the most important criterion.

There are so many solutions for these problems and challenges which were mentioned. Absolutely for each challenge, special solutions must be taken. Because each challenge has it's special characteristics and features. In order to achieving solutions and key points which can help us for high performance of Six Sigma, key points are categorized in the base of main causes. The results are mentioned in table 3.

Table 3- Fundamental elements for the successful performance of Six Sigma projects in service industries

ID	Challenge	Solutions
1	High customer satisfaction	<ul style="list-style-type: none"> • Focus on selecting and measuring the correct metrics • Standardize the performance processes
2	Various customer's need	
3	Relatively unpredictable volumes	
4	Nature of task unpredictable	
5	Rapid variant business strategy	<ul style="list-style-type: none"> • Linking six-sigma to business strategy • Standardize the performance processes
6	Lack of qualified information about quality	<ul style="list-style-type: none"> • Defining and ranking defects • Focus on selecting and measuring • Focus on selecting and measuring the correct metrics
7	Lack of quality indicators and factors	<ul style="list-style-type: none"> • Training and education • Strong leadership and Top management commitment • Defining and ranking defects
8	Lack of established quality program	<ul style="list-style-type: none"> • Training and education • Strong leadership and Top management commitment • Establish quality program strongly • Selection of projects and project management skills; • Aligning Six Sigma projects to corporate business objectives • Attaching the success to financial benefits

Conclusion

In the case of implementing Six Sigma in service environment, it is vital to understand the unique aspects of service processes and identify opportunities for improvement and set up effective measures of performance before launching Six

6 - the time required to serve a particular customer

7 - The time a customer waits in the system to have the work completed

8 - The total time including service and waiting time

Sigma projects. Also fundamental elements which were mentioned in table 2 will be proper guide in order to implementation of Six Sigma in service industries. Consequently Six Sigma projects will be successful and brings financial benefits for organizations.

One of the most important limiting factors in this field is the difficulty in quantifying and gathering data from service processes, because most of these organizations don't mention to quality data and quality program. Quality of the service must be defined and measured by defining quality factors. Also quality programs which are focused on opportunities must be established strongly.

Customer has a main roll in service industries. Unconsidered strategy which doesn't include customer's needs and his or her satisfaction as mentioned in figure 3 consequently will cause poor implementation of Six Sigma projects. So for proper implementing of Six Sigma in service industries, the operational strategies and customer (needs and satisfaction) must be considered. This is one of the differences is the application of DMAIC (Define, Measure, Analyze, improve and Control) to a service project. As mentioned most of service industries don't have a proper attitude about customer and related qualified data. So it will be more efficient, if before 'define phase', a phase for considering customer and operational strategies is mentioned. This is a new approach to Six Sigma phases with considering customer and operational strategies in service industries. This application will guide Six Sigma projects linking to customer.

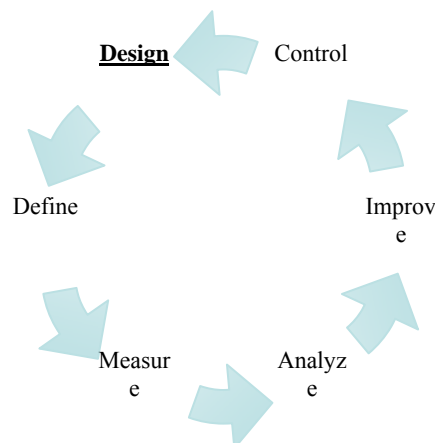


Figure 3- A new approach to the phases of Six Sigma in Service industries(DDMAIC). Design phase means considering the operational strategies, customer and design perspectives in the service environment

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