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Six sigma to improve disaster management process

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Abstract
Disasters are those hazards which have potential to get transformed to disasters. They negatively impact environment and human life on a large scale. Some of the disasters can be predicted some not. There arises need for managing those disasters so as the loss to human kind can be minimized. Six Sigma is a methodology through which the process of disaster management can be studied effectively keeping the issues behind disaster management in mind. This paper intends to introduce the reader about features, issues of disaster management and how six sigma can be used to achieve process excellence in disaster management.

Keywords: Disaster Management, Six Sigma, Defects, Process Improvement

1. Introduction

A disaster is an event that occurs suddenly and unexpectedly. The term disaster owes its origin to the French word "Desastre" which is a combination of two words 'des' meaning bad and 'aster' meaning star. This the term refers to 'Bad or Evil Star'. A disaster can be defined as "A serious disruption in the functioning of the community or a society causing wide spread material, economic, social or environmental losses which exceed the ability of the affected society to cope using its own resources." A disaster is a result from the combination of hazard, vulnerability and insufficient capacity or measures to reduce the potential chances of risk. A disaster happens when a hazard impacts on the vulnerable population and causes damage, causalities and disruptions.

Related Literature

Anderson et al. (1989) [1] in his work talked about strategies in the times of disasters. A handbook by Carter (1991) [3] on disaster management published by the Asian Development Bank provides a comprehensive overview of the issue. Chung et al. (1999) [4] developed probabilistic models for landslides hazard mapping. Harry et al. (2000) [5] discussed how six sigma can be a breakthrough method for management strategy. Lee et al. (2000) [7] presented a template based methodology for disaster management. Andrienko et al. (2005) [2] presented a concept of an intelligent decision support for crisis management. Antony (2006) [6] studied six sigma for service processes. Robert P. Wolensky & Kenneth C. Wolensky (2009) [9] highlighted how local Governments managed the demands associated with major natural disasters and what explanation have been offered for the performance patterns observed. D. B. N. Murthy (2009) [8] in his book about disaster management covered the various disasters happened in the India during 1980 to 2006 and highlighted the need for national policy on disaster management and mitigation policy. Vagelis et al. (2010) [11] surveyed and organized the knowledge about management and analysis of data in disaster situations. A.J. Shah (2011) [10] presented an overview of disaster management in India.

What is disaster management?

Disaster management is reduction of risk. It includes all activities, programmers and measures which can be taken up before, during and after a disaster so as to reduce its impact or recover from its losses. Following are the features of a disaster:

- Prevention
- Advance Warning
- Early detection
- Analysis of the problem and assessment of scope

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- Notification of the public and appropriate authorities
- Mobilization of a response
- Containment of damage
- Relief and medical care of the affected people

Disaster management can be divide into four phases *viz* Preparedness, Mitigation, Response and Recovery. The issues which come up dealing with disasters are:

- Large number of producers and consumers of information
- Time sensitivity of the exchanged information
- Various level of trustworthiness of the information sources
- Combination of static (e.g. maps) and streaming (e.g. damage reports) data
- Lack of Common Terminology
- Heterogeneous formats of sharing information

The above issues need to be addressed for efficient and effective disaster management. This creates need for considering the disaster management as a process and process mapping of the same. To further understand issues behind disaster management the need is to collate data around those and analysis to segregate into short term and long term goals. Let's understand how six sigma as methodology can help in achieving process excellence in disaster management.

Six Sigma Method

The term "sigma" is used to designate the distribution or spread about the mean (average) of any process or procedure. The sigma capability (z value) is a metric that indicates how well that process is performing. The higher the sigma capability, the better. Sigma capability measures the capability of the process to perform defect-free work. A defect is anything that results in customer dissatisfaction. In statistical nomenclature, "sigma" (σ, a lower case Greek s) denotes the standard deviation of a set of data. The standard deviation is a measure of the variation or spread about the mean of the process or procedure represented by the data. The larger the sigma (standard deviation), the greater the variation in the process. As variation goes down, sigma (standard deviation) goes down and the sigma capability of the process increases.
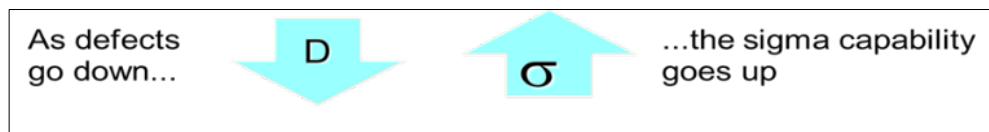
Fig 1: Six Sigma method

Six sigma is a methodology which aims to reduce errors and eliminate variations. Its aim is to improve process so as it makes zero error. Six Sigma is a simple statistical tool which can be used to measure the quality of service. It uses quantitative, data-driven DMAIC methodology to improve existing processes e.g. Loan Approval process in Banks, Admission Process in Institutes. Six Sigma Starts and Ends with the Organization/Institution need for Process Excellence. Six sigma is a 5 step process *viz* Define, Measure, Analyze, Improve and Control. In short, it is DMAIC. Below is a snapshot of classical view of quality and six sigma view of quality:

Classical View of the Quality Six Sigma view of Quality

The statistical objective of the six sigma can be explained with the following diagram:
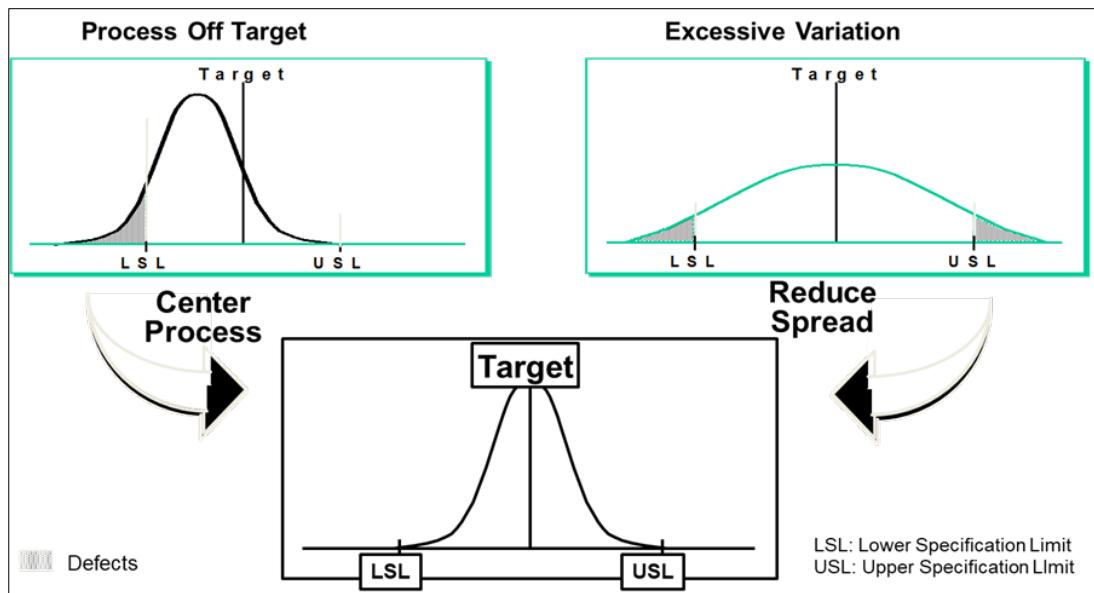
Fig 2: The statistical objective of the six sigma

The goal of six sigma is to reduce variation in the process as well as centre our process. People feel variation more than the mean. Variation hits them more rather than the mean. It can be explained with the help of an example as:

If the process of delivering cheques for rehabilitation after a disaster has high variation ranging from 5 days to 45 days, with a target of 20 days then people may receive a cheque any time in this range. Eight cheques received by the people may be 7, 34, 12, 27, 9, 12, 36 and 39. The average would be 22 days. Authority may perceive that the people are receiving their cheques close to the target of 20 days. However they feel the late delivery of 34, 36 and 39 days.

But improving quality does not come easy. To increase the capability of the processes requires increasing complexity of the quality system. It needs to focus upon 3 pillars for any kind of improvement. These pillars are people, process and technology. The more you invest in technology the less is dependence on people. People are bound to error while technology helps them to stop committing errors.

Need for Six Sigma for Disaster Management

Disaster management as a process has lot of shortcomings. Wherever it happens in the country, we get number of issues like helpline number not available, correct information mechanism not in place, rumors which further aggravate the problems, no ownership of actions, lack of coordination among various departments of the government, lack of proper public address mechanism which are process gaps during disaster. Even the road after disaster is equally bad as the affected people face number of issues *viz* no ownership of rehabilitation package as the state government and central government lack coordination and clarity of roles, no proper identification of affected people and so the relief package does not reach to the correct persons. Sometimes this relief package reaches to wrong persons and sometimes it reaches so late that the affected people lose faith in the system. Therefore there are number of issues which need to be addressed so as to be better prepared for disaster management. Six sigma methodology can help us in resolving all these issues. With the adoption of six sigma, the disaster management process can be taken to the next level of performance. The diagram below explains this:
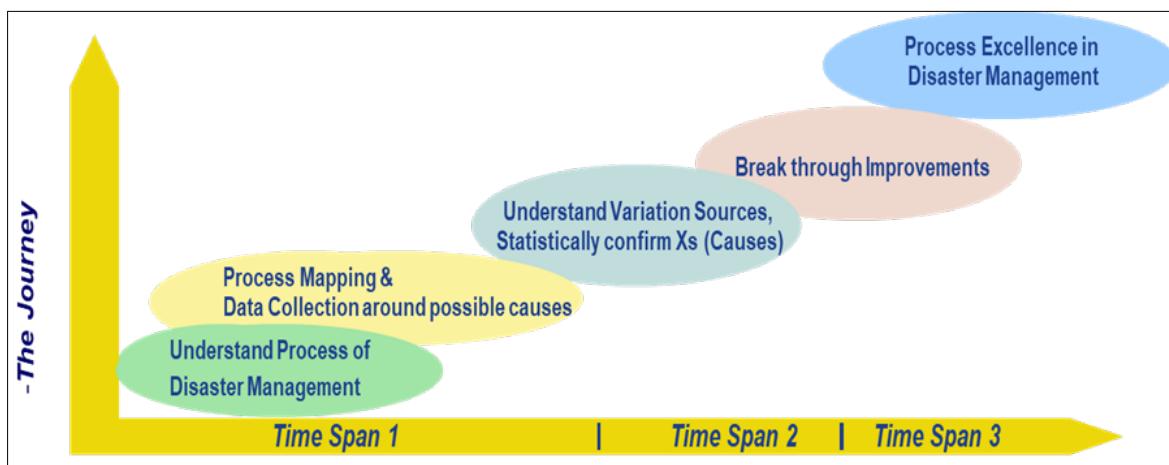

Fig 3: Six Sigma for Disaster Management

Conclusion
To improve upon disaster management, we have to consider it as a process. Then to improve this process, we have

different ways and means. One of such methodology which can help us to achieve process excellence is Six Sigma. If the possible causes are identified with desire precision and

data is collated around those causes then six sigma can do wonders. It can help us in improving all three ingredients of any system *viz* people, process and technology.

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