IE23
Six Sigma Improvement Opportunities in the Working Techniques of Bachhpan NGO

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Abstract

The non-profit organizations across the globe are an integral part of our communities. They are the source of providing us with vast varieties of services, nurturing public participation and cultivating social unity. For any organization to be efficient and effective it is usually obligatory to struggle for the development of processes that track and record why organizational changes are essential. This paper provides an insight into the basic process improvement principles that can be implemented by Bachhpan Non-Governmental Organization (NGO) and stand out as the guide for the NGO towards achieving their desired result. Bachhpan is a student run NGO which educates children living in the slum areas for free since 5 years. In order to reduce the failure rate of students and improve their understanding of basics with the least wastage of human efforts, the six sigma project had been undertaken. Based on the performance of students in examination and with the help of different analytical techniques; guidelines, rules and regulations have been framed both for students & volunteers for the efficient functioning of the NGO. The guidance is provided on process improvement activities appropriate to the current state of organization's process as well as frameworks for future actions.

1. Introduction

An organization in which no owner, stockholder or trustee shares in profits and losses [2], and which exists not to earn revenue but to promote a mission that typically but not necessarily enhances the public welfare is considered a non-profit [3,6]. 'Bachhpan' (English meaning: Childhood) is a student-run organization; a registered NGO under Reg. No. F/15754 (Dated: 21st May, 2011, Ahmedabad) actively functioning in Anand-Vidyanagar and Ahemdabad cities. It is an organization where the college students teach the needy slum kids for free with an aim to eradicate child-labour and for children welfare. Providing 500+ children with basic educational needs like stationary, uniform and school bags is the sole purpose of this organization. There are currently 4 ongoing projects-

1) Aadhaar: The NGO provides complete support to the talented kids who are child labourers, but wish to study by enrolling them in the best schools of the city and taking care of their needs from school fees, books and uniform.

2) Paathshala: This NGO takes education to places where schools can't. A dedicated team of volunteers provide education to the children in different slums everyday through evening classes.

3) Any Body Can Dream (ABCD): Providing students with different types of books just like a real library is the aim behind this project.

4) Jawahar Navodaya Vidyalaya (JNV): JNV is an exam conducted by Central Board of Secondary Education under which the 5th Grade students appear for the JNV exam and meritorious students qualify for 'Free Education' in 6th Grade sponsored by the government.

Along with studies, Bachhpan focuses on their overall development too. Every weekend, they are made to do some creative work like drawing, showing documentaries, learning new poems, inspirational stories, science experiments, etc.

1.1   Problem Statement

This NGO has been working since last 5 years, but is somehow lacking to create the desired impact on the students due to lack of proper techniques in teaching-learning process. Moreover, the volunteers also might be facing some problems because of which they might be failing to work at their full potential.

The regular counselling of students and volunteers will help to get an insight into the working method of the organization and proceed with necessary steps for the betterment of students' education. The six sigma methodology needs to be implemented to reduce the failure rate of students by using efficient techniques and improving the existing system of working.

2.   Methodology

The six sigma process requires the implementation of the five phases [5]- Define **(D)**, Measure **(M)**, Analyze **(A)**, Improve **(I)** & Control **(C)**. Starting with defining the aim of using this process improvement activity and carrying it forward using different quality assurance techniques helps in progressing the project further.

2.1   Define (D)

This NGO is aimed at helping the students with their academics irrespective of their financial condition. The results of the students studying under this organization is the key point of discussion for the project as these results highlights the flaws & success present in the current working system. Hence, the results are important which can indicate a major change required in the process.

The students currently studying in different standards have a good chance of improvement up to a certain level. Based on their study techniques, the teaching methods of volunteers and the home-paathshala environment can affect the outcome as a whole.

2.1.1   Objective (Based on the calculation in Measure Phase)

The failure rate of the students living in slum areas from standard 1st to 10th is 68.48% and calculated current sigma level is 2.45. Hence, it is desired to reduce the failure rate by half and thereby improve the sigma level to 2.85.

2.1.2   Action Plan

A properly designed examination paper with specific number of subjects, appropriate marks allotment and level of the students & exam were kept in mind which helped in determining the initial level of knowledge and understanding in the students.

Once the results can be obtained, the current sigma level needs to be determined which will help in deciding the future processes and improvement phases. Thereafter, the problems preventing the students' progress have to be determined using proper tools and techniques. The last two phases would focus on finding the relevant solutions and implementing them in the field work for testing their effectiveness.

3.   Result & Analysis

3.1   Measure (M)

The entire six sigma project started in late February 2016. In the initial stage, the existing sigma level of the organization was needed to be found out in order to decide which factors have to be improved. Therefore, an examination was conducted without prior notice to students to test their knowledge. This examination paper was designed by the volunteers having experience of teaching different standards. Since the level of students was not at par with the regular students, two standards were combined into one and both of them appeared for the same paper sharing similar course content.

A total of 5 exam papers were made for standards from 1st to 10th. Each paper weighed 40 marks; 10 marks each for Mathematics, Science, Gujarati and English section. The passing marks for each section were 3.0 or more. The *failure rate* of the students in the examination had to be measured. This failure rate will be dependent on the students' performance in all the subjects. He/She has to pass in all the subjects with no exception.

3.1.1   Type of Data

The data measured in the Measure Phase is of discrete type based on Pass/Fail criteria of the student appearing for the exam. Hence, we have only 2 outputs. A properly designed examination paper with specific no. of subjects, appropriate marks allotment and difficulty level tested the existing knowledge of students (Table-1). The exam was held in March 2016.

Standard	Total Students	No. of Students Failed	% of Failed Students
1st, 2nd	102	56	54.90
3rd, 4th	41	38	92.68
5th, 6th	39	21	53.84
7th, 8th	93	75	80.64
9th, 10th	55	40	72.72
Total	336	230	68.45

Table-1 Initial result of students based on the group of 2 standards

3.1.2   Analysis of Result:

In order to analyze the results, there needs to be a benchmark based on which it can be decided how the sigma level needs to be calculated. Since, here it is to be determined based on the examination results, the data here would be discrete instead of continuous as a specific output in terms of marks is obtained i.e. Pass or Fail. Also, as there are a total of 4 subjects, the student needs to qualify in all of them to be considered for the calculation.

The most efficient method for this is the DPMO to Sigma Level. **D**efects **P**er **M**illion **O**pportunities (DPMO) is the no. of defects present in one million opportunities while considering the no. of ways in which a product can fail. The eq. for DPMO [5] is as follows:

$$DPMO = \frac{(\text{Failure Rate})}{(\text{No. of Opportunities} * \text{Total Available Opportunities})} * 10^6 \qquad \text{...eq. (1)}$$

3.1.3 Calculation of DPMO and Sigma Level:

From Table-1, we have the values of failure rate (number of students failed; 230) and the total available opportunities (total students appeared for the exam; 336). As previously mentioned, there are 4 subjects in the examination hence the student can fail in 4 different ways. Therefore, the number of opportunities a student gets to qualify for the exam is 4. Substituting in eq. (1), we get:

$$DPMO = \frac{230}{4 * 336} * 10^6 = \mathbf{171131}$$

The table-2 [4] shown below depicts the relationship between the values of DPMO and the corresponding sigma level.

DPMO	Sigma Level (with 1.5 Sigma Shift)*
226627	2.250
190787	2.375
158655	2.500
130295	2.625

Table-2 DPMO with corresponding Sigma Level
(*The table assumes a 1.5 sigma shift because processes tend to exhibit instability of that magnitude over time.)

In order to avoid interpolation and to obtain the accurate Sigma Level, the online 'iSixSigma Calculator' has been used. It utilizes the input values of DPMO and produces Sigma Level.

∴ Initial Sigma Level = **2.45**

3.2 Analyze (A)

With an aim to proceed ahead, the next important step of Analyze was brought into picture. Some of the basic techniques used for analysis and problem identification are- Brainstorming, Multi-Voting and Cause & Effect Diagram. Each of the techniques helped in narrowing down the significant problem and select which suited the best for the overall development of the organization.

3.2.1 Brainstorming

The team of most experienced volunteers participated in this brainstorming session. The discussion was open about problems related to students & volunteers. A total of 18 problems were identified for both categories (Table-3).

Student Problems	Volunteer Problems
• Quality of Education	▪ Distribution of Work to Volunteers
• Discipline of Students	▪ Fund Allocation
• Punctuality of Students/Volunteers	▪ Leaving Bachhpan
• Counseling of Students/Volunteers/Parents	▪ Approach to New Volunteers

• Home Atmosphere	▪ Social Media Awareness
• Teaching Methods	▪ Feedback & Follow up of Donors
• Time-Table Following	▪ Behavior of Core Team
• School/Paathshala Homework	▪ Workload to Paathshala Representatives
• Lack of Resources/Technology in Teaching	
• Training & Guidelines to Volunteers for Teaching	

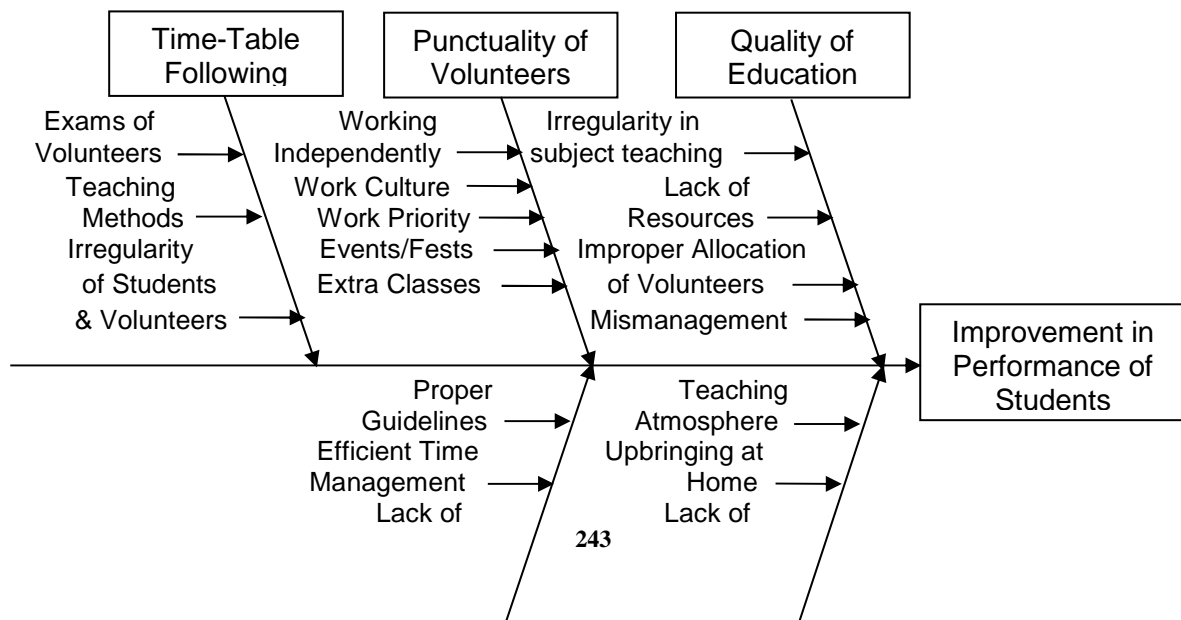Table-3 List of Problems faced by Students & Volunteers

3.2.2 Multi-Voting

In order to find which problems needed the maximum focus, the Core Team of Bachhpan opted for multi-voting. Mr. Vimal Kamani, Mr. Yash Kalariya, Mr. Paras Chauhan, Mr. Prem Sangani, Mr. Dharmesh Pateliya, Mr. Dipam Patel and Mr. Gautam Dobariya were the team members who gave their views on each problem along with assigning marks out of 5 for each of them. Based on the total marks obtained, the following were listed as the main problems which needed to be addressed in the near future (Table-4).

Student Problems	Volunteer Problems
• Quality of Education	▪ Distribution of Work to Volunteers
• Discipline of Students	▪ Behavior of Core Team
• Punctuality of Volunteers	▪ Leaving Bachhpan
• Teaching Methods	▪ Approach to New Volunteers
• Time-Table Following	▪ Feedback & Follow up of Donors

Table-4 Key problems to be solved

3.2.3 Cause & Effect Diagram

The multi-voting technique helped to narrow down the total number of problems that were identified to 9; 5 in the category of student problems and 4 for volunteer problems. Individually, the fish bone diagram [1] has been prepared to get a deeper understanding about the two aspects involved with it (Figure-3, 4).
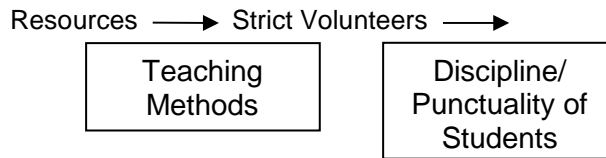
Resources ⟶ Strict Volunteers ⟶

Teaching Methods	Discipline/ Punctuality of Students

Figure-3 Cause & Effect Diagram for Student Problems

Feedback/ Follow up of Donors	Volunteers Leaving Bachhpan	Approaching New Volunteers

Mismanagement of Time   Losing Interest ⟶   Campaigning
Irresponsible   Changed Priority ⟶   Techniques ⟶
Volunteer ⟶   Lacking   Visit to slum areas ⟶
Enjoyment ⟶   Improper care at
Exclusion from   Paathshala ⟶
Groups ⟶   Excuses

Work Repetition ⟶   Lack of Unity ⟶
Lacking   Problem
Managerial Skills ⟶   Ownership ⟶
Co-ordination   New Initiatives ⟶
among Members ⟶   Follow up Work ⟶
Leadership in   Dependability
Assigning Work ⟶   on Seniors ⟶

Improvement in Performance of Students

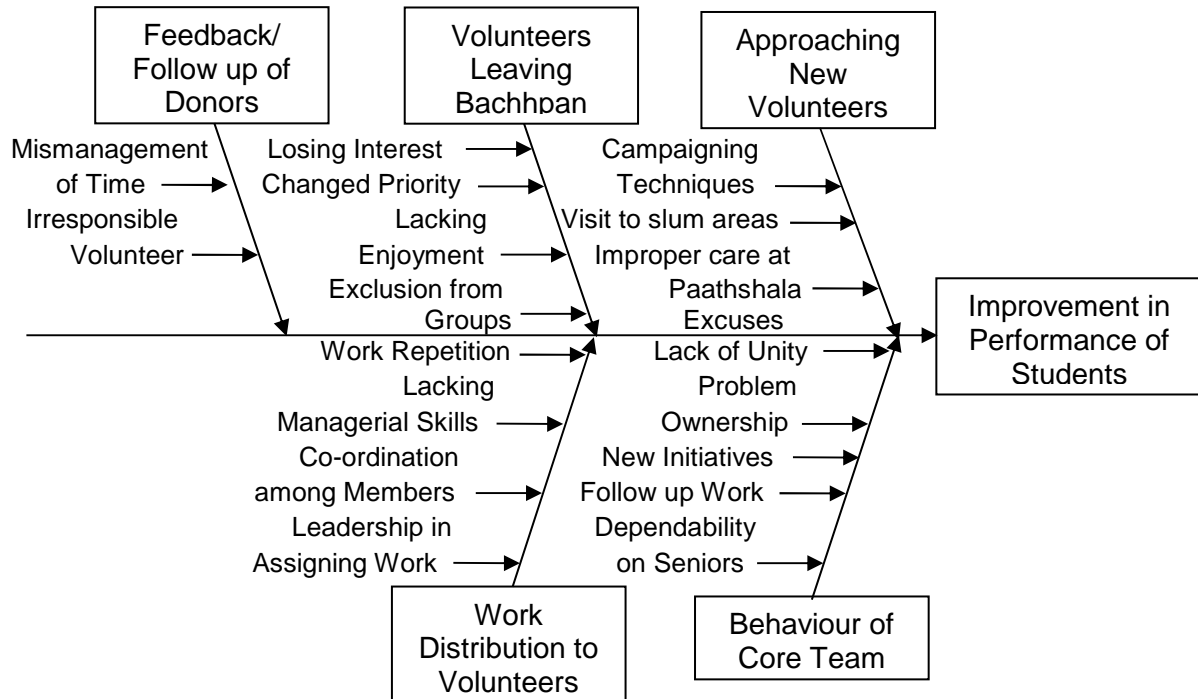| Work Distribution to Volunteers	Behaviour of Core Team

Figure-4 Cause & Effect Diagram for Volunteer Problems

3.3   Improve (I)

Based on the results obtained from Brainstorming, Multi-Voting and Cause & Effect techniques, the following guidelines were designed which when followed accurately (with allowable flexibility) may result in to a desired output. Few of the important points have been illustrated here under different genres.

3.3.1   General Guidelines for All Volunteers

- The organization does not force any individual to compulsorily join as a volunteer.
- Volunteer should be punctual for their allotted day of teaching.
- Teach subjects according to the time-table.
- Conduct regular tests for checking their progress.
- Use of violence/unnecessary scolding should be prevented.

3.3.1   Guidelines for Students

- The student will always obey the teacher.
- The parents of students should not misbehave or disrespect the volunteers.
- Bachhpan NGO will never help any student (and/or his family) financially.
- If a child is spotted working, his/her candidature is liable to be cancelled.
- No child should be associated with tobacco, smoking or any other addiction. If found, his candidature is liable to be cancelled.

3.3.3 Directive Principles for Core Team

- Focus on implementing current plans and then shift to new ideas.
- Take proper follow up of donors, sponsors and newly enrolled volunteers.
- Make proper schedule of event, exams, festival celebration before sufficient days so that it can be completed in time.
- Monitoring of Aadhaar students and regularity of the volunteers.
- Regular reports of Aadhaar and Paathshala at the start or end of the month.

4. Control (C)

The newly suggested guidelines were implemented into day-to-day teaching-learning process. It started from the later part of March till to mid April and continued again from mid July to early October, 2016.

To check the validity of the proposed plan of action and improvement if observed any, in the mid October, 2016, the second examination was conducted with the same format as the previous one. Based on that result (Table-4), new sigma level was calculated and changes can be implemented for the process to be carried forward with the inclusion of old ones.

4.1 Conduction of Examination

Standard	Total Students	No. of Students Failed	% of Failed Students
1st, 2nd	56	14	39.28
3rd, 4th	93	59	63.44
5th, 6th	109	85	77.22
7th, 8th	108	64	59.25
9th, 10th	55	37	67.27
Total	421	259	61.27

Table-4 Final result of students based on the group of 2 standards

From eq. (1), DPMO $= \dfrac{259}{4 * 423} * 10^6$ **= 153800**

Based on the DPMO and Sigma Level relation (Table-2) and to get accurate results; from the 'iSixSigma Calculator', we have

∴ Final Sigma Level = **2.52**

4.2 Discussion of Result

It was clear from the newly conducted examination that a rise in the result was observed in majority of the students. In brief, the following data was observed-

1. Increase in number of students: 421 − 336 = **85**
2. Decrease in DPMO: 171131 - 153800 = **17331**
3. Increase in Sigma Level: 2.52 − 2.45 = **0.07**

The 3rd phase of examination will be held before March 2017, in order to observe the feasible change in an organization in a time period of one year after the successful implementation of process improvement.

5.   Conclusion

From the process improvement project undertaken, it is clear that six sigma process can be very effectively implemented for non-profit organizations and a very precise outcome can be obtained. Although, the small rise might not be as appealing as in the case of manufacturing units, but the improvement suggestions obtained during this phase stand out to be the ice-breaker which when observed sincerely can change the entire scenario of the functioning of an organization. This kind of research severely helps the non-profit organization as they rarely need to invest high capital for a major change required in their principle of operation.

Moreover, the rise in sigma level by 0.07 units after the 2nd phase of examination indicates that there is a wide scope of improvement in Bachhpan NGO with its operation techniques whose proper implementation would be reflected in the results of the students and help shape their future in a planned way. Even better results are possible after precisely following the guidelines formulated for the easy flow of work for volunteers.

References

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