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# A CONTEMPLATION OF THE LOCKOUTS AND RESOLUTION BY INDUSTRIAL ENGINEERING TOOLS

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**ABSTRACT**

*Author has witnessed some undesirable and unpredictable situation in some reputed educational institute of the region. It was observed that it was the boycott of the classes but named as strike commonly used for such situation. Author has tried to analyze the situation, why it happened, by brainstorming among the students, faculty members and other administrative staff. He then tried to find out the root cause of the situation created by the students. In such situation cause and effect analysis was done and then prioritize the causes which were supposed to be removed to overcome such situation, which is ultimately not in favor of the students and the organization as well. The career of the students and other associated members and the existence of the organization may be in danger.*

***Key Words: Strikes, Unpredictable Situation, Brainstorming***

## I. INTRODUCTION

Strikes generally introduce the stoppage of the work also referred as lockouts. In colleges the students are now involved in lockouts to meet their demands which creates a agitation among the management and all the other higher staff personals. Lockouts refer as the gathering of people and decision of the workers/students not to go to the work until their demands are met. These strikes have also made its way in the educational institutions and creating a lot of ruffle in the functioning of the educational organizations. The student's strikes are very closely related to the Industrial Disputes on the ground of the conflicts and disorder, unrest.

According to Patterson "Industrial strike constituent militant and organized protest against existing industrial conditions, they are symptoms of industrial unrest in the same way that boils are symptoms of disorder of body."

When an industrial disputes occur both the parties i.e. management and workers tries to pressurize each other as happens in case of the students and the management. Strikes may not only be the outcome of the demands only but can also arise due to the lack of the opinion also. Student's strikes in colleges have created various problems in the functioning of the institutions which the author has tried to formulate the problem by using the tools of the industrial engineering. Author has collected data through questionnaire from the students and then applied the quality tools FMEA, Ishiwaka and Pareto analysis to the data collected which helps in the restrain the strikes.

## II. LITERATURE REVIEW

### 2.1 Introduction

Statistical Process Control (SPC) is very widely used in manufacturing industries as well as service sectors. SPC techniques were firstly proposed by Shewhart in 1931. This was the basic quality control theory which was followed by the different industries and the companies but after the introduction of the Juran's "Quality Cantrol Handbook" there occured a diversification among the different sections viz. supplier, employee, management, leadership, customer and service issues. In the late 1950's Japanese adopted the principles of TQM and created a very big recognition in the international market and also led to the rise in the economy of the Japan after the devastating incidents of the Second World War. Majority of the companies then adopted small and significant results which were the outcome of the implementation of TQM in Japan. TQM was a major tool for the quality check but studies also indicated that TQM was not also reliable and led to failure in some of the organizations.

Parasuraman et al. (1994) had come up with a ten determinants such as tangibles, reliability, responsiveness, communications, access, competence, courtesy, credibility, security and knowledge provided to customer. Parasuraman named it "SERVQUAL". He defined the tangibility as a function of physical activities and equipment, reliability as ability to perform, communication as how well consumer and producer are interacting, competency as an urge to provide service.

Sajal (1998) made a study on Indian Engineering Institutes and technical education revealed that the leading institutions had adopted standard competitive research and object-oriented engineering study programmes. Some of the programmes were innovative in nature and offer tremendous advantages and benefits to students, universities and industries. The main benefits to the students were summarised as: gaining confidence in decision making, relating theory with practice, increased job opportunities, realisation of responsibility, opportunities to know one's weaknesses and strengths and opportunities to work with modern equipment and on problems of importance. It was concluded that other universities and institutions should adopt more object-oriented engineering education curriculum linked with industries and research organisations to meet the future challenges of rapid technological changes and industrial development in India.

Ramasubramanian (2005) had outlined how Six Sigma was used to operate all the existing work processes in an institution in the best possible way. The paper also dealt with Six Sigma and its role in quality management, since many aspects were based on scenario in an educational institution. However, the author believed that the general trend was right and believed that Six Sigma was the best strategy for quality education system for its quality improvement.

Pandi et al. (2006) signified the importance of TQM and Six-Sigma methodology (DMAIC) in engineering institution. Only attitude of the people at every level determined the success of the institution. The right quality culture was the result of consistent and persistent quality education that formed by the system of integrated TQM model. It was clear that if the proposed structure of excellent engineering institutions and integrated TQM model was implemented, Engineering Institutions could assure quality and desired placements in reputed companies for student community.

Viswanadhan (2009) had found that the performances of Autonomous colleges were found to be superior to those of other categories of programmes especially that of self-financing colleges. Supporting processes like Supplementary Processes, Industry-Institute interactions and R & D activities, which promoted informal

interactions among the students and with the experts from various fields were inadequate in most categories of engineering colleges. The outcome of the programmes viz. student performance was not at a satisfactory level in most of the programmes.

Oliveira (2009) had studied the service quality evaluation among the Brazilian engineering college and made a study regarding the improvement of the technical education in Mechanical Department. After the development of SERVQUAL he came out with results that production engineering has largest gap for promptness dimensions followed by empathy, reliability, security and tangibility dimensions.

Ronald et al. (2009) had found that the service sectors were different from manufacturing sectors when it came to applying lean six sigma. Manufacturing companies experienced success of lean six sigma in improving their processes. So he studied that the process viewed as any combination of people, materials, equipment, methods and information that performed work. A service process was a process that do not directly involved making a physical product, but was involved in making their customers satisfied. Lean six sigma had much to improve the process in both manufacturing and service arenas.

Shauchenka (2010) studied the education sector, intangibility and lack of physical evidence of service made the perceptions of service quality a complex composition and possessed difficulties for analysis. In order to evaluate the high education service quality fitting to most of the key stakeholders, a new attempt had been introduced. At the same time the long practice and experimental application of SERVQUAL were quite important for further research. More than forty items in the survey are being considered which were found relevant to high education service quality assessment compiled from various sources and were considered in this study.

Kaushik et al. (2010) had studied a relationship between application of Six Sigma in corporations and in higher education. Six sigma provided a philosophy to meet the diverse needs of industry with improved customer satisfaction and similarly in academics, six sigma strategy could be applied to improve productivity. In industry, a company looked at defects in its final manufactured products, whereas in education defects were related to falling pass percentage among students. The study was specific to technical education institutes.

Pourrajab et al. (2011) concluded that successful application of either by adapting to the Deming model of TQM or Crosby model of TQM in schools probably rested upon certain criteria relevant to the intention or the learning outcomes of the curriculum, regardless of the chosen model.

Nakhai (2010) had studied the SERVQUAL framework to address the difficulties that have been in the service organizations. In service organizations using quality and reducing costs had been the applications of Six Sigma. The amount of the successful applications have been reported in the literature and there implication in the service sectors. However, study had also mentioned some of the limitations like highly repetitive processes like process manufacturing of sugarcane or oil refineries.

Singh (2012) had concluded that the institution should allow to develop entrepreneurial skill of its faculty and students in developing the CEE (Continuing Engineering Education) which was only deliverable through ICT (Information and Communication Technology). Corporate sector and professional bodies should be involved in management of CEE and if they were already present they needed to expand their involvement.

Mandal et al. (2012) studied that quality of an academic program largely depended on the human behavior, the quality dimensions and items under each dimension of the measuring instrument usually differed depending on the perception of quality among the consumers. This paper investigated and revealed the gaps between the faculty and Industry executives on the quality of an engineering program. He also suggested that gaps between

faculty and industry must be bridged to improve the quality of the engineering program and enhance the quality of an engineering education as a whole.

Prasad et al. (2012) had found out Six sigma was a powerful tool to achieve customer satisfaction by improving the processes in any system, which was production or service sector in the study. The study demonstrated the novel application of six sigma approach for improving the quality in an engineering educational institution by eliminating the failure causes. The six sigma approach proposed in the paper assured quality in education, desired placements in reputed companies, opportunity of higher studies, developing prospective entrepreneurs and higher percentage of passed out.

Subbarao (2013) proposed that India's higher technical education was good in small pockets, but far from world class. The bulk of it was of poor quality, producing graduates many of whom were unemployable. The main reason for this pathetic situation was rapid expansion of the education system without adequate number of qualified teachers, shortage or absence of infrastructure and lack of autonomy in all aspects of the technical education system. India's strength lies in our next generation as we had young, energetic and large human capital. We had good intellectual capital which required improved quality education and careful mentoring with right strategies for higher technical education.

Dhariwal et al. (2013) described the improvement observed in the performance of students in a subject taught at a renowned technical institute over a period of a year. The results suggested that the major points executed from the action plan which included attendance, examination pattern, student- faculty interaction, level of interest in subject and resources made the difference. The findings could well be a platform for bringing in changes and improvements on various aspects in the education system.

Shah et al. (2013) made a study in the which the students had portrayed themselves as confident consumers who were well informed of the institution and institution's needs. He also studied that student perception of the private higher education institutions was an important factor in influencing student choice to study at the institution. He found out that almost 60 per cent of students who enrolled in private higher education institutions do so because of the reputation of the institutions.

Jha et al (2013) had found that lean six sigma can be successfully implemented in the service sector and moreover it can also be implemented in medicine and health sector. It had been observed from his research that a very little work has been done in the education sector and more studies should be conducted in this area.

Ezer et al. (2013) made study for the examination of faculty member's perceptions over time with respect to the concept of quality assurance. He also studied that the leading faculty members were supportive of quality assurance, which they see as meeting genuine needs of the academic unit and the institution, rather than as a technical requisite requiring reporting to external stakeholders, such as the Ministry of Human Resource & Education and the Council for Higher Education. Study's findings indicated that positive implications emerge when members of the academic faculty were given the opportunity to act autonomously, when decentralization and variety were legitimized, when learning frameworks were developed and when faculty members were allowed to choose relevant evaluation objects wisely and intelligently.

Chahal et al. (2013) had explored various satisfied and dissatisfied service encounters in Indian higher education system. Collection of 206 critical incidents were collected. CIT (Critical Incident Technique) was used and the dissatisfaction among the students and teachers were being studied. It thoroughly presented the domain of satisfactory and dissatisfactory student-professor encounters. In this research he also indicated that future

research encompassing viewpoints of stakeholders (e.g. students, teachers, student's families and government etc.) had been taken up to examine satisfied/dissatisfied service incidents in higher education.

Yerneni et al (2013) had presented the tools to achieve excellence in the field of higher education in India and found that there was a good amount of research work done on quality of higher education sector but the work was done with respect to particular parameters and to particular areas like engineering etc. thus there was a need to view the higher education system as a whole and study the scope of enhancing the higher education system in India. Thus there was a need to conduct research in higher education area.

Sandmaung et al. ( 2013) had proposed the results of study cannot readily be generalized to other countries than South Africa especially industrialized countries with well-established higher education traditions, it was expected that HEI (Higher Engineering Institutions) and the responsible government agencies in developing countries can gain useful insights concerning quality assurance systems. Specifically, the conclusion that the governing bodies had relied more on both theoretical and empirical foundations in establishing the quality indicators could arguably be applied to countries.

Manca et al. (2014) had studied about the use of social media tools for the education system. The University of Dundee had started to facilitate a learning activity as a part of public health. Although the study made by Manca did not resulted in the output expected, but from study it was clear that more efforts were needed like learning design and scaffolding strategies to engage students in learning.

Vasiu et al. (2014) had made a study and started a programme named MOOC (Massive Open Online Courses) for globalised learning. The MOOC's were facilitated with online courses with connectivity from social media along with the facilitation of an acknowledged expert in the field of study. It helped to study about the motivation level that had increased in the student perception. This research showed gaps and the criticalities as well as suggested the future directions to be used in academic areas.

Siiman et al. (2014) had made a study about the interactive use of 3D content in the field of education. Study suggested that digital content formed the reliable and fast content. Digital 3D models allowed learners to interactively and visually examine the spatial structure, composition and arrangement of the objects. Study suggested the interactivity supports spatial thinking, which was strongly linked to academic success in STEM (science, technology, engineering and mathematics) disciplines.

Tomos et al. (2014) made a study of student's learning preferences and patterns of media and information technology usage in higher education institution. Study indicated the demand of designing educational technologies with the changing trends in student's behaviour had made emergence of the new technologies. Empirical survey in HEI in Wales, using a structured questionnaire with 143 questions. Preliminary result showed that Facebook, Google and instant messenger were the most used by the students. The results of survey will support the study made by Siiman with the aim to improve understanding of information and technological changes.

Sanchez et al. (2014) made study about the relational coordination and quality in online education. They made a questionnaire which composed of important blocks named as: coordination, general quality and methodology, technical quality on design and easy use, technical quality on multimedia resources. The distribution of questionnaire had been made in three universities, two Spanish Universities (Alcala de Henares and Rey Juan Carlos University) and one American University (Norwich University). For analysis, SPSS statistical program had been used to apply descriptive and factorial analysis in a sample of 194 agents. The goal was to study the

relation between the relational coordination and the quality of learning at University. The results showed the relevance of relational coordination in the quality of online learning.

Panda et al. (2015) developed a conceptual framework for a large sample of teaching material (hardware, software, curriculum, and teaching methods) had become an established operational practice. The patterns of acquisition of knowledge and skills, and about the effectiveness of specific forms of teaching and learning have benefits. E-learning defined as one such initiative in education aimed at making learning and teaching process independent of time, place and pace. It was possible to break conventional classroom boundaries to develop open, low-cost and modern technology through the available modern technology. Therefore, broadly speaking, to sustain, we needed to develop and implement new learning systems of learning science, educational technologies and innovations in professional education for the greater interests of community and for the society at large for a roaring success.

### 2.2. Summary

The study of literature has made it clear that there is work needed to be done in the field of education sector. Today, quality was not just for manufacturers; rather it is a prime focus for service providers as well. Being an important mediator, education service providers are now taking initiative to improve its services, because they realize the importance of quality to tackle global challenges like client's satisfaction, competition and maintain international standards. There are many different perceptive of the term "quality", which often reflect the interests of different stakeholders in higher education. The priority of different stakeholders were likely to be different on the dimensions of quality according to their interest and motivations. Therefore, designing of an ideal program for higher education, like engineering is a complex mission, because education is a multi-stakeholder (employer, students, faculties, Institutes, and Government) segment with varied expectations. It was evident from the current literature study that the engineering education program must be capable to confront the local challenges and explore global opportunities.

## III. CASE STUDY

As everybody is some body's customer. So as most of the organizations are now business oriented and students are assumed as the customers. But on the other hand an organization has external as well as internal customers. As it is a service organization one must be customer centric and put the efforts to satisfy their customer both external and internal. These days emphasis is on external customers without bothering the satisfaction of internal customers. Many attractive schemes, scholarships and commitments are made to increase customer satisfaction at the time of intake and when these are withdrawn by the top management plays the role of catalyst in creating the disturbance.

Brainstorming was done during the strike among the students, the observation was as under:

- Why placement support charged from the students while at the time of intake it was promised this was the sole duty of the management.
- Transparency, there was no transparency among the students and management. Whenever students go for some query, they were sent back by saying "You will not understand", just pay and regarding the

development some misguiding statements were also thrown by the students. It also indicates that there is lack of transparency between the students and management. Though whole of the situation was 90% observed to be genuine and 10% of the students were misled by some other bully students who do not attend the classes generally.

- Liberty Students were not given any liberty to express their thinking e.g. at the time of any cultural event every decision put into application was made by higher authorities and students were just supposed to follow those decision or the decision were imposed on them.
- It was also observed by the author that while students started agitating, no faculty members tried to make the situation calm or under control. This indicates that somewhere from the corner of the heart faculty members were also not satisfied by the management. Coincidentally it was the mid of the month and till then they were not given salaries, everybody was borrowing from their colleague for the survival. But middle management were trying to control the situation willingly or unwillingly, because there may be sense of responsibility or the fobia of higher authorities. There may be some tout who want to make impressive statements among the students to please the higher authorities.
- Approximately a loss of Rs 50000/- was calculated by the higher authorities made by the students. This loss can be avoided or vanished if timely and precise information was given to the students so they do not lose their temper and ethics.

On the other hand it was also the duty of the middle management, who have direct contact with the students that they make aware all the students about the development activities of the organization and timely fed them with day-to-day activities of the organization and the effort put by the organization in the betterment of the students and for their career enhancement, their employability which ultimately in favour of the students.

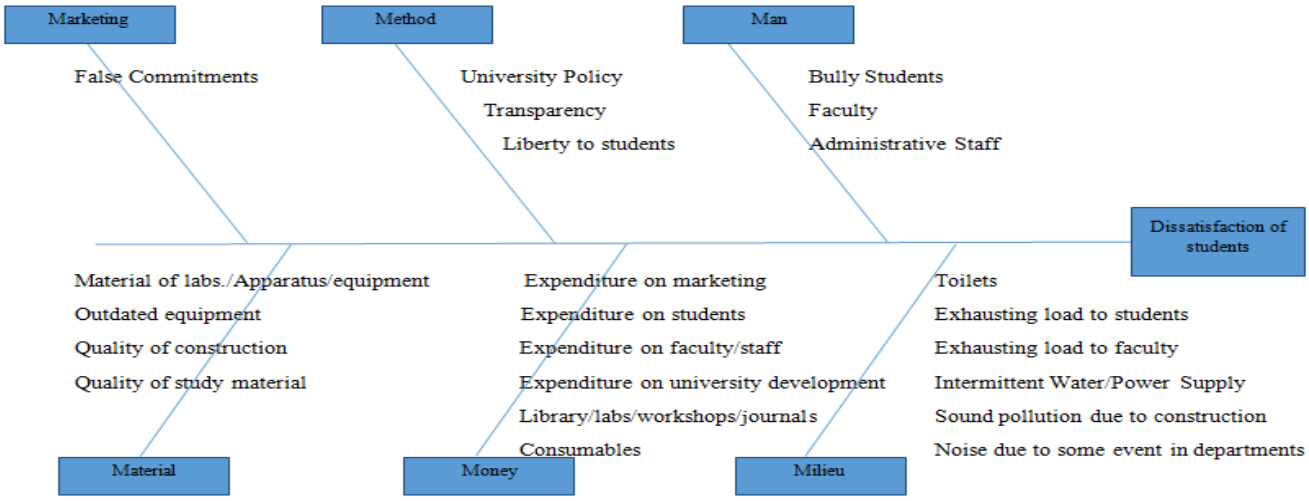


**Fig. 1. Cause & Effect Diagram for Dissatisfaction of Students**

Failure Mode and Effects Analysis (FMEA) was one of the first systematic techniques for failure analysis. It was developed by reliability engineers in the 1950s to study problems that might arise from malfunctions of military systems. An FMEA is often the first step of a system reliability study. It involves reviewing as many components, assemblies, and subsystems as possible to identify failure modes, and their causes and effects. For each component, the failure modes and their resulting effects on the rest of the system are recorded in a specific FMEA worksheet. There are numerous variations of such worksheets. An FMEA is mainly a qualitative analysis. We are applying FMEA to the strikes in the colleges to find out the failure and causes and effects of

the strikes that occurs in the colleges/educational institutes. We calculate here the Risk Priority Number which will help us in the detection of the strikes in the colleges and what are the potential causes of the STRIKES in Colleges.

**Table 1 Failure Mode & Effective Analysis before finding the solution**

| Process | Potential Failure Mode | Potential Effect of Failure Mode | Frequency (Likeliness Scale 1 – 10) | Potential Causes of Failure | Current Process Control (Prevention) | Current Process Control (Detection) | Severity (1 – 10) | Detect ability (Potential for Discovery 1 -10) | Risk Priority Number (RPN = Freq. x Sev. x Detect) |
|---|---|---|---|---|---|---|---|---|---|
| Strikes should not happen | Management being unfair | Low admission rate | 8 | Facilities not provided | Necessary should be given | Comparison of Need with available | 9 | 7 | 504 |
| | | | 9 | Increase in fees/funds | Should be kept fair | Fees structure being too high | 4 | 9 | 324 |
| | | | 7 | Betrayal | | | 8 | 6 | 336 |
| | Rules imposed on students | Progress of students may depreciate | 8 | Necessary regulations neglected | Students should be consulted | Not benefiting students | 7 | 5 | 280 |
| | | | 4 | Extra burden on students | | Depression among students | 4 | 8 | 128 |
| | Withdrawal of a privilege | Money given preference over education | 2 | No scholarships | Special arrangements for some students | Fees structure too high and lack of concern for poor students | 9 | 9 | 162 |
| | | | 8 | High fees structure | | | 5 | 8 | 320 |
| Students too aggressive | Communication being portrayed wrongly | Doubts in the minds of the society | 4 | Not providing circulars | Individual duties and multiple places display | Students not talking about it | 9 | 6 | 216 |
| | | | 9 | Not conveyed properly | | | 8 | 4 | 288 |
| Conflicts with management | Small issues being raised to massive movements | Own students will try to harm the educational institution | 9 | Anger among students against management | Time to time scheduling of the meetings with students | Small face to face situations between students and management | 336 | 8 | 504 |
| | | | 6 | Distrust | | | 6 | 5 | 180 |

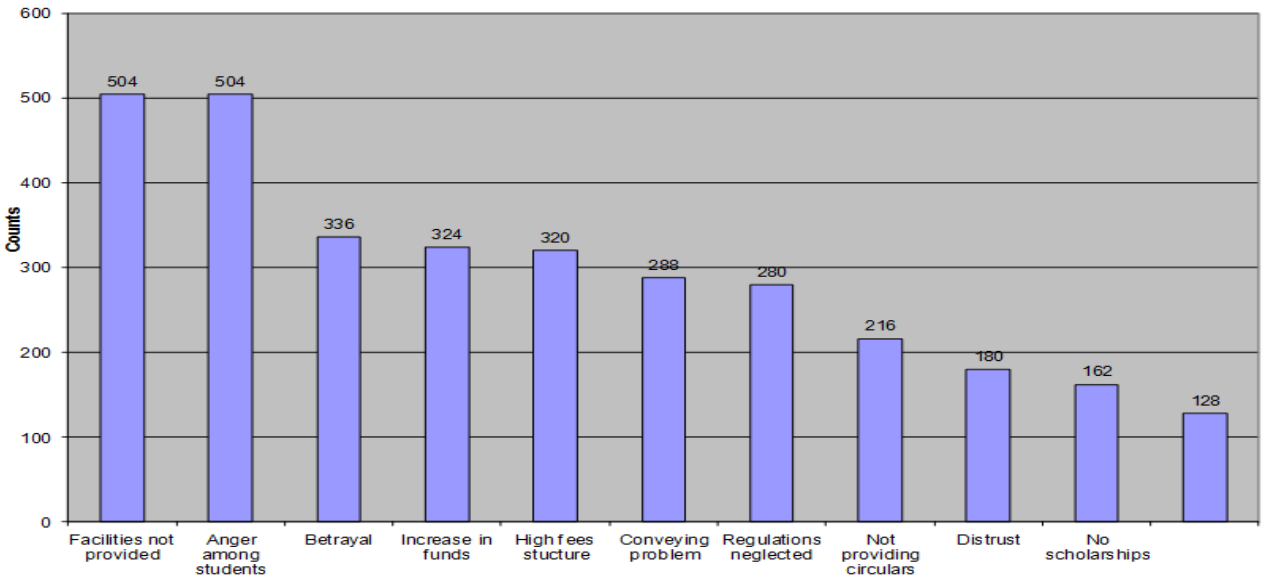


Fig. 2. Bar Chart for Student's Perception

For this purpose we have Cumulative RPN to generate Pareto Diagram.

**Table 2 Cumulative RPN**

| RPN | Cumulative | Relative |
|---|---|---|
| 504 | 504 | 0.15 |
| 504 | 1008 | 0.31 |
| 336 | 1344 | 0.41 |
| 324 | 1668 | 0.51 |
| 320 | 1988 | 0.61 |
| 288 | 2268 | 0.70 |
| 280 | 2548 | 0.78 |
| 216 | 2764 | 0.85 |
| 180 | 2944 | 0.91 |
| 162 | 3106 | 0.96 |
| 128 | 3234 | 1.00 |

The Pareto chart [2] is a special type of histogram used in business, it is used to illustrate the causes of a problem by making visual the causes of a problem, in order of severity, from largest to smallest. As such, it is a basic statistical tool, and is one of the foundation tools of continuous improvement, lean, etc. Pareto analysis is a formal technique useful where many possible courses of action are competing for attention. In essence, the problem-solver estimates the benefit delivered by each action, then selects a number of the most effective actions that deliver a total benefit reasonably close to the maximal possible one. Pareto analysis is a creative way of looking at causes of problems because it helps stimulate thinking and organize thoughts. However, it can be limited by its exclusion of possibly important problems which may be small initially, but which grow with time.

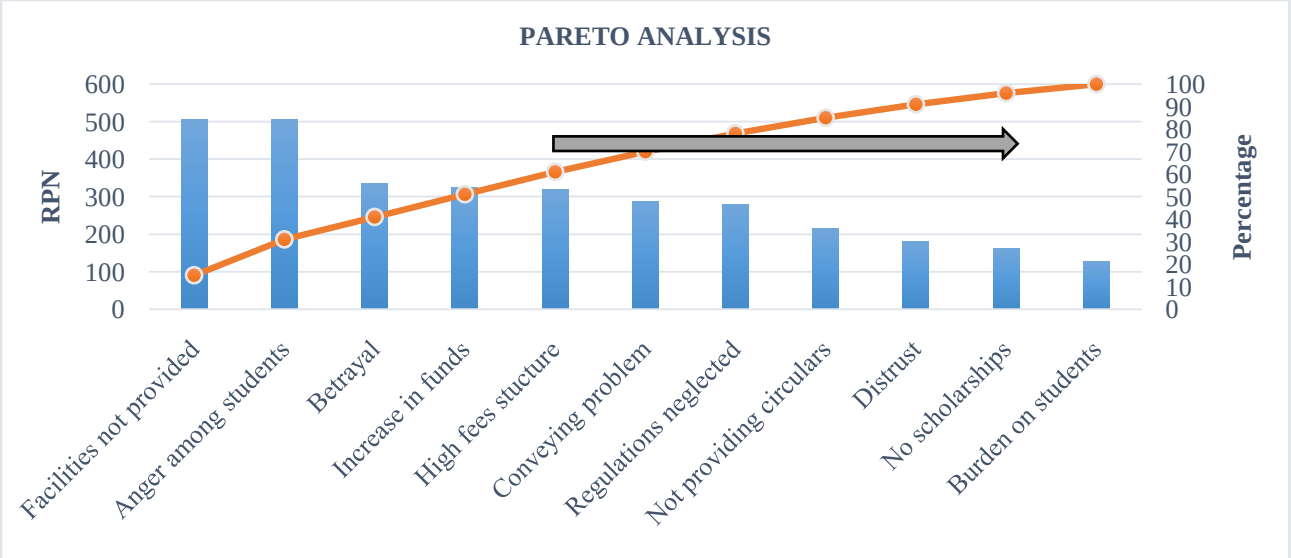


Fig. 3. Pareto Analysis

As per the above Pareto Analysis if we rely on the 80:20 principle, if we are able to resolve the 80 percent of the problems then we are able to solve most of our problem we are facing in the above mentioned problems. The problems that constitute the 80 percent mark are only considered in this.

The FMEA chart we get after resolving the problems.

**Table 3 FMEA after resolving the problems**

| Process | Potential Failure Mode | Potential Effect of Failure Mode | Frequency (Likelines s Scale 1 – 10) | Potential Causes of Failure | Current Process Control (Prevention) | Current Process Control (Detection) | Severity (1 – 10) | Detect ability (Potential for Discovery 1 - 10) | Risk Priority Number (RPN = Freq. x Sev. x Detect) |
|---|---|---|---|---|---|---|---|---|---|
| Strikes should not happen | Management being unfair | Low admission rate | 7 | Facilities not provided | Necessary should be given | Comparison of Need with available | 5 | 7 | 245 |
| | | | 5 | Increase in fees/funds | Should be kept fair | Fees structure being too high | 7 | 9 | 315 |
| | | | 6 | Betrayal | | | 6 | 6 | 216 |
| | Rules imposed on students | Progress of students may depreciate | 6 | Necessary regulations neglected | Students should be consulted | Not benefiting students | 4 | 5 | 120 |
| | | | 4 | High fees structure | | | 2 | 8 | 64 |
| Students too aggressive | Communication being portrayed wrongly | Doubts in the minds of the society | 4 | Not providing circulars | Individual duties and multiple places display | Students not talking about it | 5 | 6 | 120 |
| | | | 4 | Not conveyed properly | | | 5 | 4 | 80 |
| Conflicts with management | Small issues being raised to massive movements | Own students will try to harm the educational institution | 3 | Anger among students against management | Time to time scheduling of the meetings with students | Small face to face situations between students and management | 3 | 8 | 72 |

## IV. CONCLUSIONS

From the above analysis we conclude that the strikes that are happening in the educational as well as in the industries can be detected and contemplated with the use of the industrial tools. FMEA has made it clear that the data we have calculated is true and after we had calculated the RISK PRIORITY NUMBER the prevention/detection of the strikes is possible.as far as the author is concerned the strikes in colleges can be reduced if we provide facilities, do not create a wave of anger among students along with the trust issues, not imposing extra fees and conveying of the message should be proper. The management and the students are two major pillars of any educational entity, if any one of them is not performing well it actually affects the total functioning of the educational institute. This can be sorted out with the detection and prevention so that no much damage should occur and all the bodies should perform together work for the benefits of both the parties.

### Future scope

Such situations can be correlated with Einstein Pain Wave theory to analyze the intensity and impacts of the situations.

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