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OUTCOMES OF SIX SIGMA IMPLEMENTATION – A CASE STUDY OF SUGAR FACTORIES IN KARNATAKA

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ABSTRACT

India is the world's largest producer of sugarcane and second largest producer of sugar after Cuba. But India becomes the largest producer if gur and khandsari are also included. This industry involves a total capital investment of Rs. 1,250 crore and provides employment to 2.86 lakh workers. In addition, 2.50 crore sugarcane growers also get benefit from this industry. The economic health of a nation is decided on the basis of financial health of manufacturing sectors. It is mandatory for the manufacturing organisations to control the cost as they do not have the control over the price. To minimize the cost, it is required for them to reduce the defect rate. Six Sigma is a quality management system, is a customer-focused and data-driven quality strategy. It is a rigorous and systematic methodology that utilizes collected information and statistical analysis to reduce defect rate, measure and improve performance. In this paper the role of Six Sigma has been analyzed through case study of sugar factories in Karnataka. It is observed through the study that Six Sigma has contributed to the improved financial status, productivity and customer satisfaction. However its contribution towards the welfare of the work force and growth of the factory is satisfactory.

Key words: Manufacturing, Cost Control, Six Sigma, Implementation, Financial Health etc.

INTRODUCTION:

The concept of Six Sigma was developed in 1986 by Motorola as a set of tools and techniques to improve their manufacturing processes. In 1995 this concept was used by Jack Welch as the main concept of the business strategy of General Electric now used by a number of industrial sectors. Six Sigma is an approach that improves quality by analysing data with statistics. In recent years there has been a significant increase in the use and development of the Six Sigma methodology in manufacturing industry and others. The Six Sigma approach has been increasingly adopted worldwide in the manufacturing sector in order to enhance productivity and quality performance and to make the process robust to quality variations. The word is a statistical term that measures how far a given process deviates from perfection. Six Sigma is named after the process that has six standard deviations on each side of the specification window. It is a disciplined, data-driven approach and methodology for eliminating defects. The central idea behind Six Sigma is that can measure how many "defects" have in a process, it can also systematically figure out how to eliminate them and get as close to "zero defects" as possible. Six Sigma starts with the application of statistical methods for translating information from customers into specifications for products or services being developed or produced.

Current sugar manufacturing factories environment have become extremely competitive due to global competition, rapidly changing technologies and shorter product life cycles. Sugar factories face significant uncertainties and continuous changes. Traditional quality improvement approaches used by the factories are no longer sufficiently competitive weapons by themselves. Customers always demands of high quality, low cost products and services. Sugar factories must consequently look for new methods and perspectives to meet these customer demands in a timely and cost effective manner. Embracing practices like six sigma will create world class manufacturing factory, produce high quality of sugar and can deal with many challenges. An industry, which is following quality practices like; six sigma, possesses a set of strategic options and can deal effectively to ever changing and volatile environments. Six sigma is one of the fastest evolving areas of interest to industries and practitioners because it is a powerful business improvement strategy that enables companies to use simple but powerful statistical methods for achieving and sustaining operational excellence and many companies have reported significant benefits of implementation of six sigma.

SUGAR INDUSTRY IN INDIA AND IN KARNATAKA:

The sugar industry is playing a pivotal role in the Indian economy by contributing a major share to the national income and helping in the development of rural areas by being an agro-based industry. It has also emerged as a major foreign exchange earner. Nearly 70 percent of the country's working population is dependent on the agriculture and very significant portion of its national income comes from agriculture. Agricultural development followed by rural development is therefore, need of the hour to boost the national economy. Sugar industry is such an industry located in rural areas which provides opportunities for the upliftment ofrural masses.

Karnataka is one of the prosperous states in terms of agricultural economy and agro-based industrial activities too. Sugar industry is one of the important agro-basedindustries in Karnataka. Karnataka is the fifth largest producer of sugarcane in India contributing about 10 percent of the entire production.

REVIEW OF LITERATURE:

Man Mohan Siddh, Gaurav Gadekar, Gunjan Soni and Rakesh Jain (2013) in their paper discussed about the quality of the product is its ability to satisfy and preferably exceed the needs and expectations of the customers. Lean Six Sigma's growing prevalence and importance in industry, presently companies have acknowledged that Lean and Six Sigma share a common objective: to create value based end customer requirement.

Kumar Dhiraj and Kaushish Deepak (2014) in their work reveals the reviews Methodology, obstacles and Benefits of six sigma practices and identifies the key factors influencing successful six sigma project implementations. Effective six sigma principles and practices will succeed by refining the organisational culture continuously. Cultural changes require time and commitment before they are strongly implanted into the organisation.

Lura Rexhepi Mahmutaj, Gent Jusufi and Kujtim Zylfijaj (2015) The purpose of this paper is to present a review of literature on the evolution and applicability of quality management practices in financial service organisations and key findings from secondary research in their efficiency and effectiveness.

Priyanka, Dr. Suman Kant (2015) In this paper the applicability of Lean Six Sigma in an Indian bank isexplored .The subject of the case study is the Cheque Clearance process in Indian banking sector. The cheque clearance process is defined as the process of moving a cheque from the bank in which it is deposited to the bank on which it is drawn, and the movement of the money in the opposite direction.

Beatrice Chelangat (2016) in his artical examine that, the study found that the following application of tools and techniques of Lean and Six Sigma were used to a large extent; Voice of the Customers (VOC), Cause and effect analysis, Total Quality Management (TQM), Cross -functional work teams, Continuous Improvement (Kaizen), – Define- Measure- Analyse-Improve and Control (DMAIC), Total Preventive Maintenance and Plan, Do, Check, Act (PDCA). The study also found that two main ways through which the banks knew about Lean Six Sigma were through professional publications and through top management.

Gourav Kolhe , Vipul Upadhayay , Yogesh Ladhe, (2018) This work is based on the study on Implementation of Six Sigma Process in Industry. Six Sigma is the one of the most powerful management tool used to achieve process excellence.

Vimal Kumar Deshmukh, Dr. Suraj Kumar Mukti (2018) in their reveals study comparative overview of degree of implementation of Lean Six Sigma and effect on growth rate is also discussed. Findings show that "growth rate" is a strong function of critical success factors of Lean Six Sigma implementation in e-service based organisation. Impact of investment, trainers, communication, precise and accurate information may serve new opportunities for future researchers to measure growth rate. Quantified results are provided for better understanding.

NEED FOR THE STUDY

The literature review revealed that Six Sigma has contributed to the growth of the organisation in many ways provided its implementation is done in the right way and direction. Most of the studies have highlighted the implications of Six Sigma on tangible factors like, financial benefits, reduction of cost, improvement of sales, reduced defect rate, and the importance of human factor. However it was found that more research is required to analyse the

effect of implementation of Six Sigma and ascertain the above fact. Hence it was found necessary to take up this study titled, Outcome of Six Sigma implementation – a case study of selected sugar factories in Karnataka State.

OBJECTIVES OF THE STUDY

This paper makes an attempt to examine few sugar factories that have implemented Six Sigma. Factories selected included Ten Production based sugar factories in Karnataka State.

1. To know the successful implementation of six sigma and benefitted sugar factories in Karnataka
2. To investigate whether Six Sigma has contributed to the improvement of the organisation in terms of growth of the company, financial benefits, peoples'equity, productivity and customer satisfaction.

RESEARCH METHODOLOGY:

The primary data is collected from the employees working in the selected sugar factory in Karnataka State, who are undergone the implementation of six sigma contributed to improve the organization. A structured questionnaire is used for the data collection and the secondary data were collected from Books, reports, journals and magazines. Data were also collected by surfing the net and from relevant websites.

COMPONENTS OF SUCCESSFUL SIX SIGMA IMPLEMENTATIONS SUGAR FACTORIES IN KARNATAKA:

There are several key elements that are necessary for successfully implementing Six Sigma approach in sugar factory, the followings are components of successful implementation of Six Sigma elements in Sugar factory in Karnataka are:

1. Top management involvement
2. Training
3. Organisational infrastructure
4. Tools
5. Six Sigma home page.

In Six Sigma, many people have to be directly involved, and many support systems have to be in place to make it all work smoothly. Attaining Six Sigma quality levels requires total commitment from every department and active participation of every member of the company team. Employees with specific roles and responsibilities are important in deploying Six Sigma. The employees in an organisation practicing Six Sigma are highly trained, have undergone rigorous statistical training, and lead teams in identifying and executing Six Sigma projects. They can be divided into various levels of expertise: green belt, black belt, master black belt, and champions. Together they have helped generate hundreds of projects, ranging across every function of the company.

The black belt/green belt growth today includes a diverse population of technical and non-technical people, managers, and people from key business areas:

- Six Sigma experts are fully skilled business organisers who promote and lead the deployment of Six Sigma in a significant area of the business.
- Back belts are fully-trained Six Sigma experts who lead advances teams, who work across the industry and mentor green belts.
- Green belts are full time teachers with quantitative skills as well as teaching and leadership ability. They are fully trained quality leaders responsible for Six Sigma strategy, training, advice ring, arrangement, and outcomes.
- Team elements are entities that support definite projects in their area.

Employees should be armed with the proper tools to successfully approach and complete Six Sigma projects. A healthy portion of Six Sigma training involves introduction to, theory behind, typical use of, and practical experimentation with three groups of tool used: process tools, team tools, and statistical tools.

1. Process tools and team tools are those used to prepare the Six Sigma project leader with the team and leadership and skills required through the run of the project. These tools also help the project leader create a shared need for the project as well as establish an extended project team.
2. Statistical tools and a well-organised methodology used by specially trained individuals can improve processes by helping identify potential causes for variation and then reducing variation and defects.

In addition to these components of Six Sigma success, early communication to employees, measurement systems, and an information technology infrastructure are also important. The individual fear of the Six Sigma tools themselves became increasingly apparent as the mandate to train all exempt employees went into effect. As larger numbers of nonmanufacturing functions were enrolled in the training, some people were literally terrified of the thought of learning statistics and using a computer for more than just e-mail. Pertaining stress levels were unnecessarily high for many of the participants.

DATA ANALYSIS AND INTERPRETATION:

Table:1

Six Sigma Implementation and Opinion of the Respondents

Implementation of Six Sigma Factors	Opinion of the respondents about Six sigma implementation in selected sugar factory in Karnataka State				Total
	Fully Satisfied	Satisfied	Partly Satisfied	Not Satisfied	
Growth of the Company	102 (51%)	57 (28.5%)	36 (18%)	05 (2.5%)	200 (100%)
Financial Benefits	98 (49%)	63 (31.5%)	27 (13.5%)	12 (6%)	200 (100%)
Productivity	111 (55.5)	75 (37.5%)	12 (6%)	02 (1%)	200 (100%)
Peoples Equity	78 (39%)	82 (41%)	37 (18.5%)	03 (1.5%)	200 (100%)
Customers Satisfaction	88 (44%)	91 (45.5%)	17 (8.5%)	04 (2%)	200 (100%)

(Source: Field survey)

The above table -1, mentioned the survey the following variables were identified as benefits that companies can enjoy after implementing Six Sigma in sugar factory in Karnataka. It is found that majority of 51% of the respondents were opined that **growth of the factory** is measured with using nine parameters of statistical tools and they said they are fully satisfied, 28.5% respondents were satisfied, 18% are partly satisfied and only 2.5% of the respondents were not satisfied because they don't have the proper ideas about six sigma factor.

It is found that Majority 49% respondents were fully satisfied with Financial benefits The financial benefits are measured using eight parameters viz. improved sales, better revenue, reduced price of non conformance, lesser cost of poor quality, increased profit, rate of return, safe position in the market and whether the benefits are from Six Sigma alone.

It is clearly found that maximum number 55.5% of respondents fully satisfied about **Productivity** – This parameter is measured by considering following eighteen factors: reduced inventory, cost of set up, reduced cost of operations, Standard production methods, appropriate selection of the project, continuous monitoring after every project, removal of non-productive steps, continuous Identification and elimination of defects in the process, reduction of time to complete the project, continuous reduction of variation of the process, responding quickly to changes in demand of the market, lesser defect rate, lesser scrap rate, lesser rejection rate, reduced production lead time, better process capability, considering both short as well as long term goals and utilization of the resources optimally after implementation of Six Sigma.

It is found that 41% of respondents were satisfies about **Peoples' equity** – This parameter defined by such factors, which are expected to contribute to welfare of employees. Twenty seven factors were identified. They are commitment from top management, resources provided by senior management, proper leadership style, fact based decision making instead of hierarchy, increased employee involvement in making decisions, learning process adopted by employees', knowledge of Six Sigma techniques and tools, training based on needs, Incentive programme, management values high for human beings, improved interpersonal relationships, improved employee participation, recognition and rewards for Employees, Improved morale, better communication skills, improved work culture, increased pride in work, change in work culture, involvement of employees in getting customers' feedback, helping knowledge sharing between employees, Overall commitment from employees, better employee retention, Employees enjoy change, suppliers show improved commitment, enjoy the Six Sigma implementation, and Employees' willingness to work with Six Sigma projects.

The present study found that maximum number 45% of respondents opined that,**Customer satisfaction** is measured by sixteen different factors viz. Defining needs of customers, better satisfaction of customer, making products available of as per the needs of customers, better customer relationships, better commitment for customers' needs, Completely shifting focus towards customers, customers feedback, developing products based on needs of customers, sharing production plans with customers, making customers a part of the company, setting up of customer redressal mechanism, satisfy customers through continued service, risks and rewards are shared with customers, Reduction in customers' complaints, better customer relationship and achieve Competitive pricing policy through Win - Win situation with customers.

The main features of Six Sigma for improvement in the manufacturing industry include a clear focus on quantifying and measuring the financial returns of any project. All these features allow an organisation to clearly define the responsibilities and role of every individual within the team for improving the manufacturing process of the organisation.

The prime goal of Six Sigma production is to ensure the manufacturing process has minimum defects. The occurrence of 3.4 defects per million chances is the ultimate goal of this system. This may seem to be an unachievable task but most manufacturing companies achieve this final goal by adopting this technique to produce quality products.

CONCLUSION:

Six Sigma is seen as a savior by many companies. They feel that their position in the market can be significantlyimproved with the help of Six Sigma. This case study was also taken to prove a point about implementation of SixSigma. The survey results revealed the following facts about the implementation of Six Sigma in the manufacturingcompany. The implementation of Six Sigma has helped the company to gain benefits like growth, finance, peoples' equity,productivity and customer satisfaction.Further, the survey revealed a mixed response between the opinions of managers and workers. Their opinion aboutthe Six Sigma implementation is not significantly different for financial benefits, growth of the company andpeoples' equity. However for productivity and customer satisfaction, while managers believe that Six Sigmaimplementation has improved them, workers feel that the contribution of Six Sigma towards improved productivityand customer satisfaction is questionable

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