



LINKING QUALITY & SAFETY IN MANUFACTURING INDUSTRIES

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Article History: Received: 01.06.2023 **Revised:** 12.06.2023 **Accepted:** 26.06.2023

Abstract

Occupational safety and health are mounting concerns now a days for majority of manufacturing industries. The objective of this paper is to determine how Safety & Quality are integrated. To understand the relation between occupational safety performance & quality of a product has now become a subject of elusive undertaking. The study shows that it is possible to devise measures which improve both Safety & Quality simultaneously. The study examines the relationship between two aspects and suggests that stronger safety climate results in better quality.

Key words: Quality, safety, manufacturing industries.

1. Introduction

Quality guru Deming saw safety and quality as complimentary workplace goals. As Safety deteriorates, both the quality of the product & plant performance suffers. When the employees feel unsafe at the work place they do their jobs unlikely as a result of which quality of product deteriorates.

1.1 Quality

Nowadays there is stiff competition in the national & international level. Also, the customers are much aware about the quality products, hence for the survival & growth of the company, the companies are more focused towards quality production. Quality is a relative term and is used with reference to the end use of the product (Mahajan, 2010). Quality is defined as fitness for purpose (Juran, 1994). If the component performs in the safe manner in the required situation, it is called Quality product (Mahajan, 2010).

1.2 Safety

Safety describes the ability of system to function without harm or damage to property or environment (OHS, 1970). Safety is healthy living with no injury. Basically, safety is freedom from risk up to a desired acceptable level. Safety also refers to the preventive measures taken by people to prevent accidents, harm, danger, damage & loss. Safety can also be considered as improvements in working conditions for better health. Health and wellbeing of employees should be the concern of top management, because occupational diseases and poor health of employees may itself result in a big accident (Jain, 2017) [10]

2. Linkages between Quality and Safety

It has been found in study that many industrialists feel that any money invested in the health care of employees is a waste for them. But in long run, poor health of employees may decrease the level of safety which in turn will result in industrial

accident. In the past few decades the marked improvement in workplace safety levels causes fewer accidents as compared to past, hence proving that money spent on workplace safety is a good business. To understand the relation between occupational safety performance & quality of a product has now become a subject of elusive undertaking.

The first and most important concern of any industry is to do business profitably. It is important for management to understand that safety & health programming embraces profitable ways of operating effectiveness to achieve corporate goals. It has been valuable & efficient business tool today. The safety culture positively contributes to the business by eliminating non-profit generating costs & also promote participative & involved workforce. All such things promote Quality manufacturing, (Jain, 2017) [10].

According to Krause (1994) [13], Safety management & Quality improvement have now become two sides of the same coin. Doing job as per set standards integrates Quality & Safety which in turns increases productivity. Doing job right with high quality & productivity provides a safer work environment due to exhibition of safer behaviours. Krause [13] reported that a positive change in safety spills over & affects the entire organization. - from productivity & quality to morale & culture. After collecting the data from nineteen manufacturing firms, Anthony Veltri et. al. [23] concluded that good safety performance leads to good manufacturing firm's operating performance. With the decrease in safety performance quality gets worst. When safety perceptions are positive, internal reliability & durability performance improves. Internal reliability & durability are a measure of quality describing internal measures that will show up externally at the customers. Safety perception disconnect is related to operational performance. Safety affects internal measures most. As disconnect increases, & safety climate deteriorates,

product quality suffers. There is more scrap & rework as a result of which reliability & durability of products decreases. Such outcomes are in line with the core concepts of total quality management which would suggest that employees who do not feel safe in their jobs are not likely to do their jobs well.

Luis M. et.al. [16] carried out work in construction companies and came to the conclusion that there exist similarities between two types of systems: quality system & safety system. An accident is the result of chain of events, in the same way a product or service defect results from a set of non-conforming factors in a production process. It needs to be approached in the same way as defects. Further he concluded that in construction company's safety management can be included in the sphere of quality management, if a TQM approach is adopted, comprising requirements from all the relevant stakeholders, not only the customers.

According to Kumar S et al. (2010) [14] safety and quality are a lot alike. He carried out work in agriculture industries & concluded that they have many common characteristics. According to Hardy (2010) [9], there exists a link between safety & quality; also, Quality management principles & cost models can be adapted to analyze safety cost. Although quality is not safety, quality engineering & management techniques help to improve safety; they can improve the bottom line through safety improvements. It concludes that safety improvements improve an operator's financial position because most of the safety improvements also lead to quality & reliability improvements

According to Terry L. Hardy [9] there exists a link between safety & quality; also Quality management principles & cost models can be adapted to analyze safety cost. Although quality is not safety, quality engineering & management techniques help to improve safety, they can improve the bottom line through safety

improvements. cost of quality model can also be used as a useful management technique. The paper has described a safety cost analysis model based on effective quality management practices. It concludes that safety improvements can help improve an operator's financial position in large part because most of the safety improvements will likely also lead to quality & reliability improvements

A safety-driven risk analysis initiative eliminates unplanned events that may expose the worker to an unexpected operating condition, thus it creates a higher degree of variability in the process. A quality initiative eliminates variability in the process, as unplanned events frequently result in lost time, which must be scrapped or reworked. Even though safety & quality have different outcomes but both depend on the implementation of process controls (Maudgalya et al., 2008).[17] By eliminating process variability the probability of a quality failure as well the probability of safety event, both are minimized.

3. Behaviour Modification

The conclusion of research by Wilson [24] on organizational behavior & safety management indicate that the preventive steps that are appropriate for the manufacturing sector are often not quite apt for organic ones.

According to Krause [13] , behavior based safety management & quality improvement are the two sides of the same coin. He also defends that eight principles of continuous improvement find direct application on behavior based safety management:

1. Having constancy of purpose
2. Implementing a process, not a programme
3. Doing it right first time
4. Not blaming the employees
5. Specifying the standards in operational terms

6. Using measurement of upstream factors to assess performance
7. Improve the process, not the downstream results
8. Using statistical techniques to distinguish common cause variation from special cause variation.

According to Gretchen A. M.[8] , Safety and quality are a lot alike. He carried out work in agriculture industries & concluded that they have some common characteristics. According to him both Safety & Quality are

- Driven by management, often top-down
- Focus on continuous improvement
- Training procedures and standardized operating procedures play important role
- Emphasis is on prevention rather than reaction

He also concluded that that several processes can be used in both applications

- Process documentation
- Improvement and standardization of processes
- Statistical process control
- Decision-making based on data, trends, and evidence

4. Critical success factors

Critical Success Factors are also known as success factors or performance improvement factors. It defines key areas of performance that are essential for organization to accomplish its mission. It is essential for every organization to identify CSFs for ensuring overall performance development. From a large number of related works available in the literature few of the works are reviewed & summarized below:

Untawale et al. (2004) [22] carried out his work on Indian manufacturing industries. He has listed seven (7) Critical Success Factors for performance improvement.

Shrivastava et al. (2014) [20] carried out his research on Indian cement industries. He Identified 9 (nine) Critical Success Factors with 43 attributes for attaining Quality management goals.

An exhaustive study including number of surveys was carried out to determine various critical success factors and variables of these factors responsible for performance improvement in these industries. They are:

- 1 Involvement of top management
- 2 Knowing the overall mission of organization
- 3 The structure of organization
- 4 Proper machines and equipment
- 5 Better machine protectors
- 6 Use of personal protectors
- 7 Better education & experience
- 8 Initiating better housekeeping
- 9 Spacious worksites
- 10 Better personal relations between workmates
- 11 Supervisors discourage dangerous workhabits
- 12 Intensified safety inspections
- 13 Intensified accident investigations
- 14 Recognition of technological changes
- 15 Regular review of work produced
- 16 Tighter adherence to worktables
- 17 Morale of workers
- 18 Monitoring complaints about product/ services
- 19 Organizations finance monitoring
- 20 Comparison of performance data with goals
- 21 Planning in advance
- 22 Effective communication channels between departments in organization
- 23 Necessity of awareness
- 24 Teamwork in the organization
- 25 Monitoring quality improvement concerns at regular intervals
- 26 Conducting customer surveys about product on regular basis
- 27 Proper planning before purchase
- 28 Paying fairly for work done
- 29 Keeping a tracking system in organization for relevant quality information
- 30 Evaluating the change in business strategy from time to time
- 31 Proper worker training for equipment use
- 32 Use of statistical process control charts/ graphs to collect information
- 33 Survey within the organization for improvements needed
- 34 Accountability of people for success / failure
- 35 Acquiring recent technological improvements
- 36 Planning ahead for technological changes
- 37 Keeping priority to continuous improvement of work
- 38 Usage of right tools & equipment's
- 39 Analysis of data concerning goals in order to determine if improvements needed
- 40 Reward to creative thinking in organization
- 41 Improving an already acceptable quality record
- 42 Safety behaviours (safety awareness, training etc.)
- 43 Employee satisfaction related to safety efforts
- 44 Implementation of osha regulations
- 45 Improvement of safety knowledge of workers
- 46 Employee safety suggestions implemented
- 47 Proper employee utilization
- 48 Quality assurance
- 49 Supervisors promotion to safe work habits
- 50 Intensified safety inspection
- 51 Tighter adherence to timetables
- 52 ISO Awards
- 53 Compensation cost
- 54 Better organization climate

5. Effect on Operating Performance & Financial Performance

The operating performance measures are substitutes for actual safety performance. Employee satisfaction may be considered as its chief measure. Employee satisfaction does not directly relate to quality but it is a condition that that directly relates to outcome of the organization. Employee retention, net profit as % of sales in past years, annual employee turnover rate may also be considered as measurement parameters.

For improvement in financial performance the important measures may be scrap, rework, inspection, defects & customer satisfaction. Return on assets, increase in sales growth may also be considered as the important measures. Organization's financial monitoring, together with comparison of performance data with goals, standards, or objectives of the organization, & increase in responsibilities, to efficient workers also improve quality.

6. Conclusion

The literature indicate that major Quality performance measures used by industries must be based on overall customer satisfaction, customer complaints, customer retention, order processing time, defects produced & rectified, reliability & cost of quality. Some authors have conducted surveys and given hypothesis for the quality improvement based on safety. Results support that good safety is good business. Safety & operating performance measures should be viewed as in concert with each other rather than as competitive entities. The impact of safety performance can be noticed on plant's operating performance. Safety investment should be communicated as value added rather than cost. Safety & Quality go hand in hand.

References:

1. Angel. R. Martinez-Lorente Frank Dewhurst AlejandrinoGallego-Rodriguez, "Relating TQM,

- marketing and business performance: an exploratory study", pp1-34
2. Arumugam A.V., Rouhollah M., Malarvizh C.A. 2011 "Critical Success Factors of Total Quality Management and their impact on Performance of Iranian Automotive Industry", International Conference on Innovation, Management and Service IPEDR vol.14, IACSIT Press, Singapore, vol.14, pp312-316.
3. Berg George and Dutmer Richard, april 1998, productivity, quality and safety. pp96-105
4. Cristina MeleMalioCalirsio , 2006, "The evolving path of TQM : towards business excellence & stakeholder value" , International journal of quality & Reliability management
5. De Toni A.andTonchia S. , 2001"Performance Measurement Systems: Models, Characteristics and Measures" , International Journal of Operations & Production Management, vol.21, No.1-2, pp1-34
6. Dias A. et. al., 1996, Integration of Quality and Safety On Construction Companies, International Conference on implementation of safety and health on construction side, pp1-11,
7. Evans D. Michael J Weidenbeck J. Ray C., 2005, Relationship between organizational climate & safety related events at four wood manufacturers, Forestv Product Journal, vol. 55, no. 6, pp 23-28
8. Gretchen A. M., 2011, Measurement & analysis of the relationship between employee perceptions & safety & quality decision making in the country grain elevator, graduate theses & dissertation, paper11991

9. Hardy.T. L,2010, Using cost of quality approaches to improve safety, Great Circle Analytics, pp1-11
10. Jain R.K, Sunil S. and Rao K. 2017. Industrial safety, Health & Environment Management Systems. Khanna Publishers
11. Jeyaraman K. and Kee Teo L .2010. A conceptual framework for critical success factors of lean six sigma: implementation on the performance of electronic manufacturing service industry. International journal of lean six sigma. 1(3): 191-215
12. Khdair W.A. et. al., 2011, Improving Safety Performance by understanding relationship between management practices and leadership behavior in oil gas industries in Iraq: A proposed model, International conference on management and artificial intelligence, vol.6, pp85-93
13. Krause T.R. ,1994, Safety & Quality: Two sides of the same coin, Quality Progress, pp 51-55
14. Kumar Sushil and Ali Jabir. 2010. Indian agro-seed industry: understanding the entrepreneurial process. Journal of small business and enterprise development. 17(3): 455-474
15. Ludwig S., Beyer C., Mauermen R., 2010, “Improving manufacturing safety & performance Using an integrated risk management model “, Zurich, pp1-9
16. Luis M. Alves Dias, 1996, Integration of Quality & safety on construction companies, International conference on Implementation of Safety & Health on Construction Companies.
17. Maudgalya T., Genaidy Ash and Shell Richard .2008. Productivity-Quality-Costs-Safety:A sustained Approach to competitive advantage – a systematic Review of the national safety council’s case studies in safety & productivity . Human Factors and Ergonomics in Manufacturing. 18 (2) :152-179
18. Prajogo Daniel I. SohalAmrik S., 2006 “The Relationship Between Organization Strategy, Total Quality Management (TQM)”, and Organization Performance—the mediating role of TQM, European Journal of Operational Research, pp35-50.
19. Shikdar Ashraf A. and SawaqedNasseem M., 2003, Worker Productivity, and Occupational Health and Safety Issues in Industries
20. Shrivastava S., Shrivastava R.L. and Ganguly S.K. 2014. Critical Success Factors for cement industry in India: A case study analysis. Int. J. of Core Engg. And Management. 1(7): 79-99
21. TalibZillur Faisal Rahman. Qureshi M.N, 2005, “Pareto analysis of total quality management factors critical to success for service industries” International Journal for Quality research, vol. 4, No. 2, pp15-168.
22. Untawale S.P. and Akant S.S. 2004. Quality and productivity linking Methodologies for Industries using SPSS (Statistical Package for Social Sciences), Journal of production planning & control: 386-403
23. Veltri A. Das A. Behm M. Pagell M., 2007, A Data Base Evaluation of the Relationship Between Occupational Safety and Operational Performance, The journal of SH&E researh, vol.4, no1, pp1-22.
24. Wilson H.A., 1989, Organizational Behaviour& safety management in construction industry, Construction management & economics, 7:303-319