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Review Article

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ABSTRACT

Management has been a crucial and responsible job as the activity has been done within limited resources and time frame. Based on the job and its requirements, there are various departments allotted in the organizations. The main purpose of management is to plan, organize, direct and control. In this regard, various tools are employed for the efficient flow of the process. Earlier, most of the activities were human-focused. But these days' organizations are more focused on process rather than human. It has been found there are more expenditures in the process rather than humans as installation, commissioning and set-up of expensive materials. With the advent of technology, Six Sigma and quality control (QC) charts are used to study and analyses the efficiency of the production process. After the 1950s, Toyota Motors from Japan and Mercedes from Germany were the first two organization who implement Lean manufacturing and Six Sigma in its production purpose. This review is a study of the use of the Six Sigma methodology and QC chart in the different management processes. It will also study how AI can efficiently use prescriptive analytic to improve the efficiency of production.

Keywords: sigma, limited resource, job efficiency, time frame, AI
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1. REVIEW

Human beings start from his evolution tried to search for techniques to accomplish his task more efficiently and effectively. Here the two parameters signify qualitative and quantitative. Efficient is a quantitative parameter whereas quality is a non-quantitative parameter of the process. Operation management has been a very important task as it has various other variables that are attached like human resource, their skills and knowledge, production process along with financial inclusion. So, a deep look on their usage should be done to prevent its wastage or utilization in-efficiency. Currently, organizations are focusing on process rather on human. These days most production processes are being replaced by process and automation. Organizations are even giving several training programs on operation management. Keeping in mind the limitation of natural resources and also availability of time to meet the demand of the customers, organizations are employing several techniques to keep the production more efficient and effective. The techniques that are employed by organization sin present days are:

- ♦Six Sigma methodology
- ♦Quality Control Chart
- ♦Pareto Chart
- ♦5S technique

These processes ensure process smoothness along with wastage reduction with efficiency optimization using a limited quantity of natural resources. Six Sigma methodology aims at reduction of wastage with efficient utilization of limited resources, reduction of process wait-time, reduction of duty cycle, etc. A quality control chart speculates whether the quality of certain products is within a specified range of the benchmark. Based on the application, Quality Control (QC) charts are employed. The Pareto Chart is used to analyses the implication of the amount of wastage during production. 5S technique generally expands to Sort, Set-in-order-Standardize, Shine and Sustain generally used in the inventory management process in any warehouse.

DMAIC PROCESS **PARETO ANALYSIS** **5S TECHNIQUE**

Fig. 1: Quality Control Strategy

Several literatures of previous researchers have been studied and some interesting facts have been derived. The evolution of management practices has significantly transformed organizational operations, emphasizing the optimization of processes through advanced methodologies and technologies. Traditionally, management focused on human-centric activities, but contemporary approaches prioritize process efficiency, largely due to implementing Six Sigma, Lean manufacturing, and Quality Control (QC) charts (Zhang *et al*.,2018). Six Sigma, developed by Motorola in the 1980s, aims to enhance process quality by identifying and eliminating defects, while Lean manufacturing, originating from the Toyota Production System, focuses on minimizing waste to maximize customer value (Kolhe et al.,2018). The integration of these methodologies, known as Lean Six Sigma, combines the waste reduction principles of Lean with the quality control tools of Six Sigma, leading to substantial improvements in production efficiency. QC charts, a key component of Statistical Process Control (SPC), are extensively utilized to monitor process performance and identify variations that may signal underlying issues. Research highlights the integration of SPC with maintenance management, demonstrating that this combination can reduce costs and enhance process reliability by optimizing maintenance scheduling and ensuring equipment efficiency. Furthermore, the advent of Artificial Intelligence (AI) has introduced prescriptive analytics (Costa et al.,2019), which extends beyond descriptive and predictive analytics to recommend specific actions based on data analysis. AI-driven prescriptive analytics can optimize decision-making processes, predict potential failures, and suggest preventive measures, thereby enhancing production efficiency. By analyzing large datasets from QC charts and other sources, AI can uncover patterns and trends not readily apparent through traditional methods, enabling quicker and more informed decision-making (Zhou ,2019). The synergy between traditional management techniques and advanced technologies like AI promises unprecedented levels of efficiency and quality in production processes. This evolution from a human-focused approach to a process-centric paradigm underscores the importance of continuous improvement and the adoption of innovative tools to meet modern production challenges (Tengtarto et al.,2022). The integration of Six Sigma, Lean methodologies, QC charts, and AI-driven prescriptive analytics represents a holistic approach to management that enhances operational efficiency, reduces waste, and maintains high-quality standards in production (Hill et al.,2018). This comprehensive strategy not only addresses current production needs but also anticipates future challenges, ensuring that organizations remain competitive and responsive in an increasingly complex industrial landscape (Ying,2015). In conclusion, the shift towards process optimization through advanced methodologies and technologies marks a significant milestone in the evolution of management practices, paving the way for more efficient, reliable, and high-quality production systems.

Conclusion

The evolution of several optimization techniques in the current scenario helps to identify the efficient and efficient method to manufacture products. On one side it keeps the check on supply so that it satisfy the demand of the society. Currently, management focuses on processes rather than human efficiency. A huge financial outlay is associated with production management setups. So both efficient and effective process needs to be employed in the management process. Several data analytical software are nowadays used to bring out the optimum and efficient process in management. Employees are also trained in using this software and also knowledge on these software have been made essential in job specification as prescribed by the talent acquisition department of human resources. In this way, human are getting up-skilled along with their career progression in the long run. Society is also getting educated and understanding as how to use natural resources in optimum effective and efficient ways.

Future Scope

Six Sigma methodology, coupled with control charts, presents a promising future scope for enhancing management processes. By utilizing Six Sigma quality control charts, such as the SSQC chart, practitioners can monitor processes effectively within specification limits, ensuring minimal variation (Malindzakova et al., 2023). Control charts, like Stewart control charts, aid in identifying random deviations and maintaining stable production processes, offering insights into process variability and reliability (Joghee et al., 2017). These tools help differentiate between common and special cause variations, enabling the eradication of special causes and enhancing process stability over time (Şengöz et al., 2018). Control charts serve as early warning systems for potential out-of-control processes, guiding corrective actions to maintain quality and maximize profits (Tesfay et al., 2021). The future development of Six Sigma, focusing on strategy, integration, and innovation, will further extend its effectiveness across various industries (He et al., 2015).

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