COVER PAGE AND DECLARATION

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Action research topic: The different factors effect performance in manufacturing organizations

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Abstract

In this research we will study the impact of external and internal factors on the performance rate of manufacturing management in manufacturing companies, especially in the field of beverages in the Kingdom of Saudi Arabia and we will follow the latest studies and apply them to the group of departments in order to reach the best results aimed at raising the performance rate of manufacturing management, the study will include managers working in different departments, influencing factors, how the work environment, inventory management and senior management decisions affect the performance rate of manufacturing management, In the food industry, production is through patches, and for ease of tracking each patch, it has a distinctive number because there are differences that are almost minor or so-called deviation, and the less deviation between the products, the higher the rate of performance with which the operation was carried out is characterized by high accuracy and there are many factors that help in this, Measuring performance rates is very important for artificial processes to research the causes of deficiencies and weaknesses and work to treat them, and in this research we will look for influences and their relationship to improving performance rates or their negative impact on performance rates and various theories that aim to improve performance rates , And the analysis of various factors will reveal to us the factors with the greatest impact that must be taken care of to raise performance rates and achieve the best results.

Rationale for the research

Due to the competitive pressures facing manufacturing companies in recent times, attention has been paid to increasing competitiveness through the development of performance rates, and without the ability to understand and measure, there will be no room for improvement and development, In this study, we will study all the influences that affect manufacturing performance and different ways to improve performance rates and research through articles that have been written in that field, according to the literature on performance rates in the past, they were measured into two phases, the first phase was evaluated on the basis of calculating Operating costs from an accounting perspective, this assessment helps managers evaluate business performance, and the approach has been modified by adding some financial metrics such as return on investment, but it is not affected by this approach to measure performance rates takes less time and shorter than that, the second phase of the performance rate measurement literature began in 1980 and was linked to the growth in business and the changes caused by this growth due to the lost importance of management accounting and the search for better integrated performance for measurement, one of the disadvantages of measuring performance rates from a financial perspective is to ignore, for example, customer satisfaction and needs, the perspective of measuring the performance rate must be more comprehensive and broader according to modern theories, so it was agreed to measure the performance rate from a financial and non-financial perspective together to emphasize the importance of the non-financial perspective and attention to the human element of the institution, operational performance in manufacturing companies is an indicator to measure effectiveness, efficiency, and environmental responsibility, and this is represented in the production cycle time and waste reduction. These indicators in operations management are called the main performance indicators, and because we will specialize in studying water factories in the Kingdom of Saudi Arabia, the indicators can be specific to the

quantities of water used and production capacity. Energy use and water quality, there are many effects of op and in order to give a real performance rate, it is not possible to rely on one indicator and neglect the rest of the indicators. required to improve performance, for example, for a water factory, it is not possible to celebrate an increase in productivity in one hour without looking at the resources used in terms of machinery, human factor, and energy. All indicators are linked to each other, and the cost of maintenance required to improve performance, operational performance is the product of good planning and how to control the process, and it is the cycle of discovering the deviation that takes place and thus finding ways of how to treat the deviation, as all operations and operation management operate with the extent of the clouds. The move to the next stage is only in the case of the success of the previous stage and the search for development is always Where is the bottleneck in the manufacturing process, the role of bottlenecks is to disrupt the production process and also in the case of inventory leads to the accumulation of inventory, which disrupts the flow of events and thus to poor performance rate.

Research objectives

Measuring performance rates is the first way towards improvement, especially in the case of benchmarking and comparing the effectiveness of production lines and factors affecting the performance rate, whether internal or external, and comparing the performance rates of your company together competitors to know the company's ability to compete and we will target in this research how to achieve operational excellence through previous research and the opinions of leaders and executive managers, We will review the desired objectives that we aspire to achieve by looking at the following points:

- Measuring the performance of your organization and comparing it with direct competitors will show you the competitive advantages you possess and also the shortcomings that need to be addressed and the development that will occur as a result of this information will raise the rate of investment of you and your organization.
- Evaluates the performance of lines and units within the facility, which leads to making correct decisions and developing plans for development within the institution.
- Holding employees more responsible towards their performance, through the presence of internal and external performance rates, there is a target through which employees are evaluated and know whether they are on the right path to development or not.
- Work on the development of a unified method of measurement that aims to measure the performance rates of the institution such as OEE and that is the goal of the benchmarking.
- Work to better understand the success standards of the organization by measuring the performance rate by setting goals for a specific performance in the various management of the institution, especially the manufacturing department

Literature for measurement performance in manufacturing

As we mentioned earlier, we will discuss with interest and shed light on the performance measurement rates and the factors affecting them and the method of measuring performance rates. We will review the various theories of performance rates since 1988 until now. Electronic databases and literature have been used whose main goal is to measure performance rates, we will review the writings and articles related to the performance rate and the effects used for that through studies related to measuring performance rates for direct and indirect friction for measuring performance, Quoted from both the European Journal of Research and Technology, the International Journal of Operations and Production Management, and the Journal of Operations Management, from the articles and literature on performance rates, it is concluded that most of the articles have identified several influential factors and we will review them in the following sections.

- Performance is defined as the possibility of good implementation of the procedures set by the management and the development of various standards of measurement in a measurable manner in order to reach the goals and objective.
- Supply chains are established in manufacturing companies to give addition and increase performance rates and rely heavily on them to provide services to the customer according to the required quality and characteristics, which maximizes the profit of the institution.
- To raise performance rates according to OPM's etiquette, the main factors of operational performance should be highlighted and work to find strong and multiple sources to understand performance rates in a clearer way.
- The introduction of the fourth revolution of the industry aimed at using digital twin techniques that can create assumptions specific to the enterprise and help to make decisions and decisions and raise performance rate.

In the next lines we will review research in the twentieth century from a historical perspective that relates to measuring performance rates, especially for the management of operations and operation in all sectors, whether manufacturing or public service, and identify the factors that are reflected in the performance of operations, the results showed that most of the PMM specialized in OM that it derives from the study of labor and productivity and that was the general trend through the Industrial Revolution and recently the opinions of those interested in PMM have changed to three directions deepening performance measures and expanding the unit of analyzes and the increasing range to measure performance rates.

Operations management is an applied system for industry operations, and we must understand the evolution of the performance rate measurement of operations management from a historical perspective in order to follow the approach followed and the development of performance measurements evolve through the opinions of experts and literature on operations and operations, The analysis from a historical perspective to measure performance rates will aim to produce a vision of the framework within which critical thinking is carried out in order to develop who the historical perspective is. The historical perspective is divided into three main historical eras.

- In the early twentieth century, operations management was defined as manufacturing with the greatest efficiency, and thus the interest in the means of measuring the performance rate for managers was the extent of our effectiveness.
- The post-World War II years and the mid-eighties changed the concept of operations and operation from only concern to efficiency and cost to concern with flexibility, quality, and timing, and thus changed the required requirements of performance measurement rates for operations and operations.

- From the mid-1980s to the present, a revolution occurred in the measurement of performance rates, and it was called Neely (1999) that term.

Explaining the three eras that have been noted from the development of measurement rates in processes and management, we find that at the beginning of industrial wealth in the first era in the early twentieth century and the beginning of knowledge of manufacturing, Adam Smith stated in 1776 that the dependence in manufacturing on modern measuring machines enables the production of goods at rates unimaginable using individual crafts. Frederick Taylor is one of the founders of operations management that the innovation of the best ways to measure performance is done through management through observation and measurement, hence the methods of measurement were developed by other scientists of Taylor's theories by scientists such as Frank and Lillian Gilbreth through the development of the measurement of time and movement of the worker and the theory of measuring work was developed and merged together the methods of work and in that era the focus of management was on the efficiency of individual workers Taylor stressed in his writing the importance of the individual worker and the need to pay incentives to workers who can increase their productivity, which requires measuring the performance rate of individuals and linking it to production, a revolution in technology and the use of computers has led to a change in the thinking of measuring performance rates and theories have emerged that adopt that the worker increases his productivity if he gives a greater opinion in how they do work and this gives workers more autonomy in how they perform their job.

Participants of the study

The participants in the research will be a group of water factories in the Kingdom of Saudi Arabia and study the impact of applying lean methods in improving performance rates, which are efficiency, quality, cost, reliability, and flexibility. We will study the impact of waste-free practices on the performance rates of manufacturing plants in Saudi Arabia. Through the basic lean methods of VSM, JIT, kaizen, TPM, and autonomation, there will be an analysis of the impact of each theory on performance rates, and department managers in different factories will share the necessary information to determine the ruling on affecting performance rates and thus focus on the factors that have the greatest impact on performance rates and use modern analysis methods. The purpose of this will be to increase the ability of industrial organizations to compete and give them an advantage. competitiveness that makes it able to meet various industry challenges, we will consider in the study the unification of the production lines applied to the study in order to be able to give accurate analyzes regarding the impact of external factors on performance rates, and since it is important to listen to the opinions of the executive managers of the various participating companies and to listen to their own experience to benefit from their previous experiences and what adds to their performance rates, it will be very important to develop methods for measuring efficiency and quality through the participants in the process, through the application of different theories of former and current scientists, and studying the extent of their impact on performance rates, The Saudi market for the PET bottled water industry is expected to grow by 9% by 2025, and due to the intense competition, our research field will focus on water companies with high production capacity and the competitive advantage owned by these companies due to the volume of production today, which ranges from one million and a half One million packages per day and up to 6 million packages per day from production lines. The study will focus on companies that use production lines manufactured by German KRONES because of their

advanced systems for measuring performance rates and locating problems with extreme accuracy, the presence of modern technology and tools for measurement is one of the most important participants in the research, as the more accurate the numbers used, the greater the reflection on the results. The correct readings are as close as possible to modifying weaknesses and adding competitive advantages that help institutions and from here adopting theories, including control charts and Gantt charts, Key performance rates (KPIs) are considered one of the most important tools that help measure performance rates in various manufacturing processes, and they are among the important indicators that we will rely on in studying the performance rates of different water plants, In order to be closer to production lines, product quality and preventive maintenance reports, we will listen to production, quality and maintenance supervisors in different factories to discuss the impact on performance rates.

Methodology

Description of participants of the study

The participants in our research will be a group of leading water bottling factories in the Kingdom of Saudi Arabia, and since water bottling is one of the most important industries in which the Kingdom of Saudi Arabia is concerned, and as the industry's goal is to manufacture a high-quality product in accordance with Gulf specifications and According to the International Organization for Standardization and Metrology ISO, the Saudi Organization for Standardization and Metrology (SASO), the Food and Drug Authority (SFDA) and the International Bottled Water Association (IBWA), we will review the size of the investment of the factories participating in the evaluation of operational performance rates and the influences affecting performance rates.

- NAQI Drinking Water Bottling Company started its work in 2014 with a production capacity of 24,000 units per hour. In 2017, production with a production capacity of 40,000 units per hour was added. In 2018, two production lines were added with a capacity of 80,000 units, and in 2019 a Zulal production line was added with a production capacity of 40,000 units, ەn 2020, a new water plant was operated and two production lines were added with a production capacity of 80,000 units. The total number of operating lines in 2021 reached 7 production lines, and the number of units sold in 2021 was 31 million units.
- Address First Water Factory VIEW The factory started in 2015 with a production capacity of 24,000 units per hour, and a new production line was added in 2016 with a production capacity of 24,000 units per hour, and a production line and a water station were added in 2019 with a production capacity of 81,000 units per hour, and the volume of units sold in 2021 The

number of 8 million units and the number of operating lines 3 production lines.

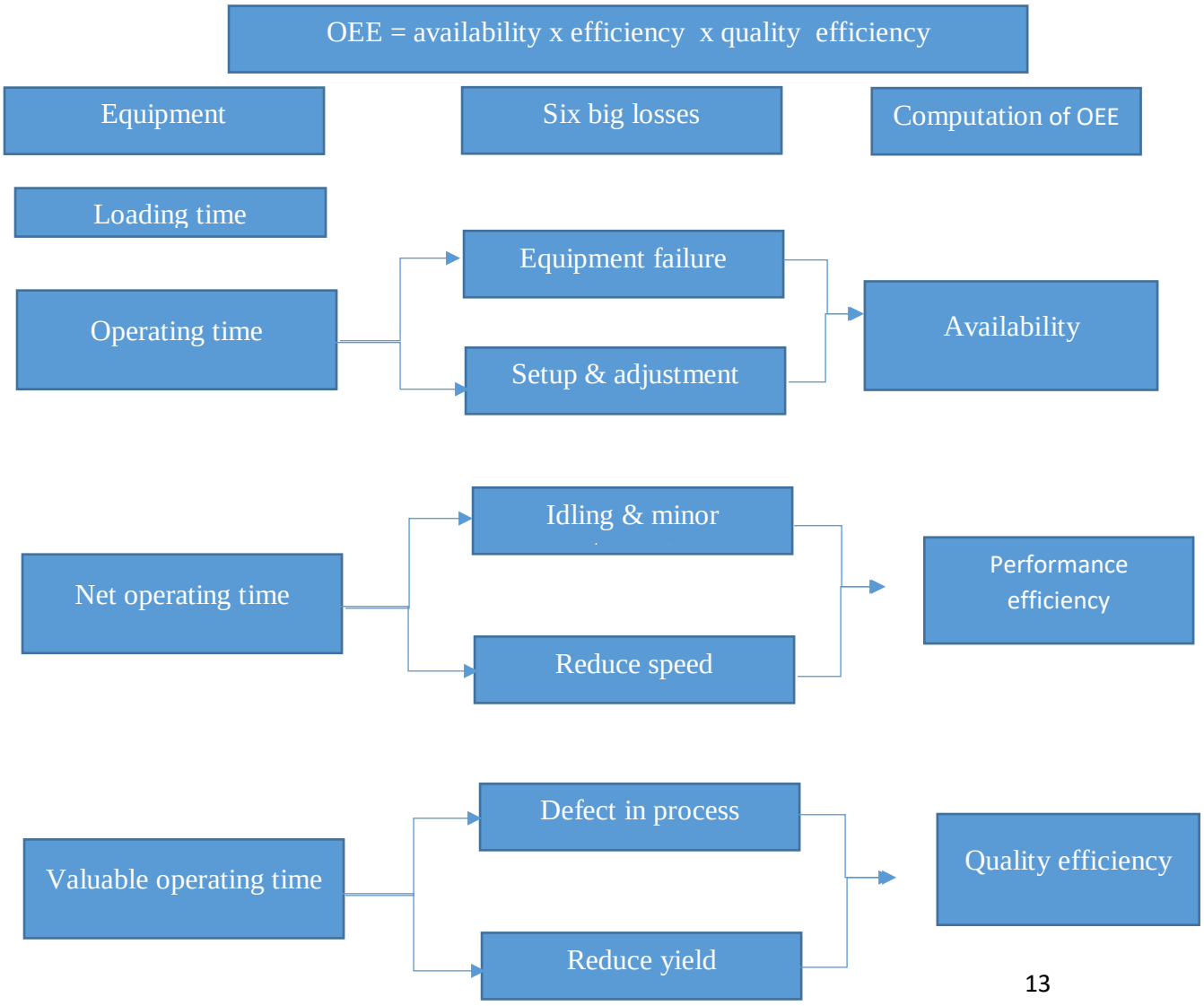
- Among the participants is the Al-Yasmeen factory for bottled water VIVI, where the factory started with two production lines with a capacity of 81,000 units per hour. Water is drawn from the wells directly to the desalination plant according to international standards for drinking water. The production line started operating in mid-2021 and the production lines used Ergo Bloc L is an advanced technology in packaging inspection system.
- SKAB Group Najran Bottled Water Factory is one of the leading factories in the field of bottled water with a production capacity of 500,000 liters per day of different sizes and containers.

Data collection tools

In order to develop performance rates in the manufacturing institutions to which we will apply the study and know the effects on performance rates, there must be tools to know the performance rates and what things affect performance rates and the goal is to improve the cost effectiveness of operations and reduce the waste of resources and there are many tools that help in this, including total productive maintenance (TPM) and also measuring the effectiveness of equipment (OEE) and also developing a way to measure the effectiveness of total resources (ORE)Those tools are the ones that prepare in Collection of data from factories involved in the research, These tools are concerned with finding opportunities for improvement that still exist and have not been exploited by the enterprise without the need to invest new amounts and since the work environment has become very competitive and global requires institutions to find competitive opportunities for them and to exploit all available resources in order to be able to compete and in the manufacturing scenario it is very important to measure cost, quality and productivity and to achieve this was invented

(Nachiappan and Anantharaman, 2006). The TPM paradigm quantitative gauge to measure individual output accelerators, we will explain the tools that help evaluate the performance rates of the production process in the following points:

- It is very important to measure and understand the disturbances that occur in the industrial process according to Tajiri and Gotoh (1992) are divided into the Department of Chronic Disorders and Sporadic Disorders Chronic disorders are small, hidden and complex, while sporadic disorders are more pronounced because deviations from the large medical condition Disorders lead to a decrease in the performance of equipment and must be minimized to reduce costs and the goal of the OEE is to measure disturbances regardless of cost reduction



In the measurement of the performance rates of the factories participating in the research, we will depend on the key performance indicators (KPIS), as they are the methodological methods for comparing companies and institutions in the same industry, and they give a real indicator of performance rates to make sound business decisions and allow the institution to better monitor its progress, In order for industrial facilities to be able to compete, we must develop performance rates to give a competitive advantage, and in order to maintain high performance rates, we must provide the necessary tools for that, in order to build a strong system to control the performance rates, a good analysis of the data and their collection in an accurate and orderly manner must be done. The goal of the system is three main points: performance measure, performance analysis, and performance improvement, In order to be more accurate in collecting information, we need to divide the key performance rates (KPIs) into main groups of factories participating in the research as follows:

- Strategic KPIs: the strategic key performance measurement rates are of a high level, as they refer to the performance of the company and the institution, and although they do not provide much evidence, but they are very important for executive managers and include return on investment, profit margin and the company’s total revenue.
- Operational KPIs: the operational KPIs focus on a time frame that is much less than the strategic KPIs and measure how the company performs monthly across the company's various sectors, thus taking care of the production lines and the efficiency of the overall production lines of production lines and equipment and aims to improve the path as soon as there is a deviation.
- Functional KPIs: the functional performance indicators are considered different from one department to another within the organization. Each department has its own functional performance rates, and they are set by the

department manager according to the needs that the department manager requires from the employees under his management. For example, the production manager is concerned with increasing productivity and the quality of work performance. The number of new customers that are added per month on the system.

- Leading KPIs: Leading or lagging performance indicators are very important indicators and give you important data, as it is possible to analyze the production need for more hours, in completing a specific order that needs less manufacturing time, there will be an indication of poor manufacturing quality.

We will collect data for the main performance rates of the companies participating in the research to examine the performance and impact of various factors on the performance rates from company to company with the aim of developing and improving the performance rates of the various industrial establishments, and based on the numbers that will be collected, there will be strong evidence of the impact of each of the various factors affecting the performance rates on the growth of companies' prosperity or the decline of those companies as a result of poor performance rates and only the ability to compete in a large way that the institution cannot resist.

Data analysis and results find

In this part of the research, we will use data analysis, reduction to smaller parts, interpretation, and explanation in a simplified manner to be able to benefit from practical experiences on the ground that we have studied with performance rates in different manufacturing places. We will collect data and then analyze it and then summarize the results in a simplified form with advantages and disadvantages.

Data analysis for different factories participate		
industrial enterprise	Methods &tools	Impact
NAQI	• Overall equipment effectiveness • Maintenance autonomous • Use of quick changeover techniques • Quality improvement	• Increase OEE • Reduce setup time • Increase productivity
SKAB	• Planned maintenance • Use of error proofing techniques (Poka-yoke) • Set up time reduction	• Reduce down time • Reduce human error • Increase efficiency • No control on OEE
VIVI	• Internal control before starting production • Focus in single supplier • Waste reduction	• Reduce defect • Lack in raw material • OEE not utilized
VIEW	• Total quality management • Total preventive maintenance • JIT • Overall equipment effectiveness	• High quality • Increase in OEE • Reduce down time • High productivity

From the previous table, we note the impact of performance rates that concern manufacturing based on the work policy and method of work, as we see the policy of relying on one supplier lead to shortage in raw materials and also a high risk, which leads to a decrease in the performance of the institution in general and its cumulative impact on the performance rates in all departments, As we note, institutions that have a clear policy for measuring OEE have a good vision of the extent of resource exploitation and thus knowledge of the size of the exploited production capacity and thus directing the institution's resources in the right direction, each of the different main operating departments represented in production management, quality management, maintenance management and supply chain management is affected by many factors and there are requirements to measure performance rates for each department separately, and there may be some influences that affect the performance rates of only one department or a group of departments, each of the different main operating departments represented in production management, quality management, maintenance management and supply chain management is affected by many factors. This is in a simplified form based on actual experience in the different factories from which we collected information.

- Quality management the use of non-waste policies and lean manufacturing aims to eliminate the defects of the product related to quality and through experimentation, autonomy is the largest measure of product quality development, By analyzing the data for the participating factories, the most effective method and impact on quality is the JIT policy, as it has the greatest role in influencing the quality of the product, especially in the field of bottled beverages, especially bottled drinking water, which aims to reduce inventory, The effect of TPM is not as strong as JIT on the quality of the product, but the quality and defective percentage are affected by maintaining the condition of

the machines through the optimal application of TPM, The level of operation will be at the required level in terms of quality and efficiency, and the percentage of defective will decrease, and thus increase the quality performance rates.

- Production management the effect of JIT policy compared to the rest of the tools used to improve manufacturing performance rates on increasing productivity shows that JIT's policy has the greatest impact where the measurement speed is always related to the time limit placed for measurement and achieving higher numbers and since it is a principle of JIT is to reduce cycle time when applied effectively and thus its impact is clear and influential on increasing production and shows the impact of TPM as it appears in its impact on quality management where the more machines are in a good form the more productivity.
- Finance management the impact of the tools used in manufacturing through OEE, JIT, and TPM on financial management and their performance rates is shown by reducing costs and we find that a tool such as JIT to reduce inventory and raise capacity for productivity gives great flexibility exploited by financial management in controlling costs and increasing the liquidity of the company and it is certain based on manufacturing studies that all manufacturing methods aimed at reducing waste and increasing performance rates have an impact on increasing profitability.

Data analysis for different factories participate to improve human performance		
industrial enterprise	Company human performance details	Recommendation
NAQI	• Employee retention rate 88% • Skilled operators & leaders • Personal problems	• Develop special programs to help employees
SKAB	• Employee retention rate 86% • Skilled technicians • Lack of motivation	• Giving courses on a regular basis
VIVI	• Employee retention rate 75% • Skilled leaders • Lack of knowledge	• Giving online training courses
VIEW	• Employee retention rate 80% • Skilled operators & quality team • Problems with attitude	• Intensifying training and giving advice

The human element has an important and effective role in increasing performance rates, and there are two main directions: at the beginning, how to choose the right person for the available job, and the second direction is how to train him well. Together are the goals of the institution, and The higher the rate of retaining qualified employees by creating a new competitive advantage, giving higher responsibilities, this helps in raising performance rates, and we must know that with the highest possible capabilities, if you have unskilled people, you will not be able to make a difference, but on the contrary, in an environment that has lower capabilities with skilled people, you can make a difference.

Conclusion &Implications and Recommendations

Conclusion

We aim in this research to show the extent of the impact of various factors and measurement methods and focus on raising the efficiency of performance equations in manufacturing companies, especially on the progress and prosperity of the institution, and given that the competitiveness of companies is one of the most important features that give a competitive advantage to companies and help them spread, as the research shows, the reliance on different methods in measuring and developing performance rates has a major role in the direction of institutions and affects their performance significantly and affects the performance rates of the organization, doing a field study in bottled water factories and collecting information from executive managers and department managers greatly helps in forming a big picture of the benefits of applying modern methods in operations management and operation, comparisons are also made to find the advantages and disadvantages of all innovative modern methods, such as ways to prevent waste and methods that work on optimal utilization of the established equipment and available resources, as studies in the field of manufacturing show the political importance of JIT in more than one site and the benefit that benefits more than one of the various departments of the institution and raise performance, especially in the quality department, it builds a solid ground for institutions by reducing the defective rate and gaining customer satisfaction.

Implications and Recommendations

In order to improve the performance rates of the industry in general, we must always keep abreast of the trends. The world of industry does not remain static. By knowing everything new in the industry and innovative modern technologies from scientists, you will save yourself and your organization a lot of effort, so the need remains the basis of any new technology, by knowing what other companies are doing, it will be easy to know the type of investment required to increase performance rates in general, attention should be paid to the maintenance of equipment, as it greatly affects the performance rates of operation and also the quality of the product. It is necessary to pay attention to the dates of the overhauls of the machines, as well as to pay attention to the daily schedule of lubrication and lubrication, especially the moving parts of the machines, the necessity of providing the human capital necessary for the performance of the media, as in the event of a shortage, the performance of the institution is affected as a result of not providing the necessary need. It must also work to train the employees well to raise their performance rates and train them in how to do business with high efficiency without wasting time, we must research deeply how the business is managed, especially productivity. Without knowing the method and steps of work in detail, we will not be able to develop the work and collecting information from all operators and workers helps greatly in improving performance rates, working to reduce the steps that do not add value to the work and that would disrupt the work will help to raise the performance rates significantly.

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