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Impact of Real Time Data in Manufacturing Operations

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Abstract - *For any manufacturer, the essential aspect of improving business performance and profitability is their manufacturing operations. In this era of ever-growing and competitive world, traditional and manual manufacturing operations are not enough for any business to sustain. This paper presents the operations involved in the manufacturing organization and the impact of real-time data and insights on the operations. The integration of real-time data system in manufacturing is developed in the form of architecture to enhance the flexibility and agility in operations. There is a strong need for technology experts, operations managers to understand the importance of real-time data in manufacturing. Through an extensive literature review, many areas are presented in the paper where real-time insight will improve the efficiency and transparency of operations. This research will work as a platform for manufacturing organizations planning to convert their traditional operations into real-time and digital operations.*

***Key Words*: Manufacturing Operations, Real time data, Internet of Things (IOT).**

1. INTRODUCTION

In all the supply chains and organizations, it is essential to work on operations. Efficient and transparent operations help the organization improve its business and financial performance, improve its work culture, reduce uncertainty, employee and staff management at all levels of the organization, and improve resource planning and inventory management. Any enterprise needs to plan and strategize its SOP (Standard Operating Procedure) for smooth running all the operations. In a manufacturing organization, there are a large number of operations involved. Some operations that manufacturers need to focus apart from all local operations are the quality assurance of the products manufactured, quality assurance of the products transported by logistics provider and supplier, maintenance of all the machinery, equipment involved in the manufacturing process, production process and supply planning to all the distributors as per requirements through logistics provider.

With advances in communication and information technology, industries worldwide are facing immense competition. As manufacturing is one of the traditional businesses with massive competition worldwide, it is essential for manufacturers to convert their traditional manufacturing operations into digital manufacturing operations to sustain themselves in the market and have an upper edge in the market compared to other competitors. The industry 4.0 revolution aims in automation, innovation, and digitalization for all the industries. For manufactures, the first step towards digitalization and innovation is the integration of real-time data and IoT in the operations. Implementing a real-time data system not only helps the manufacturers improve productivity and agility but also helps other supply chain members in their planning and management. Suppliers can get the demand forecast of a manufacturer regularly, and accordingly, the supplier can strategize the resources and plan in the distribution of orders. Real-time data in manufacturing also helps logistics providers in the assumption of their required services. The most significant advantage of real-time data in manufacturing operations is tracking and controlling all the activities going on in the factory daily. Real-time insights help to find the potential changes that need to be done in the processes regularly. Timely and accurate information related to work in process on the production floor becomes crucial, enabling managers to make decisions based on sound and reliable information, which in turn enables them to run the factory floor operation efficiently (N.S. Ong W.C. Foo, 2004).

2. Literature Review

Makers are accomplishing just 40% of their potential since they're investing a lot of important energy physically refreshing stock control, creation announcing, and valuing reports, when their rivals utilizing continuous information are occupied with winning arrangements and arranging cutting edge ongoing processing plants. More innovation suppliers, for example, Cisco, are moving into the assembling space with answers for taking care of a lot of unmanaged information, said David McPhail, CEO of Memex Inc. (Burlington, ON, Canada), designer of assembling execution frameworks (MES).

3. Research Objectives

Sample this paper presents conceptual work for the implementation of real-time data systems in traditional manufacturing operations and coming up with possibilities

by developing manufacturing architecture and its integration with data analytics models. The research considers all levels of operations, starting from raw materials of the product to the product lifecycle until it reaches the Consumer. Some objectives of the research are as follows:

(1) Identifying areas in which real-time data can revolutionize traditional manufacturing operations;

(2) Study the integration of real-time data system in manufacturing operations and understand how it can be used to make manufacturing operations more agile and transparent

(3) Development of integrated architecture implementing real-time data and manufacturing operations individually.

4. List of Operations and their integration with real time data

4.1. Production planning and control

Installing a real-time data system in manufacturing equipment and processes keeps track of production regularly. Raw material and usage of inventories can be tracked daily, which helps in planning and demand forecasting. All the upcoming requirements of inventories can be accurately planned. Real-time data reports measure the performance of machine operators and the efficiency of their work. Supply chain managers can get the complete visibility of all the processes starting from raw material usage until the final product gets ready. Real-time data allows you to understand what potential changes need to be done and which areas help reduce the time of uncertainty in production management. Calculated decisions can be taken through regular reports and updates. Regular updates increase the trust of all the stakeholders/members involved in the organization.

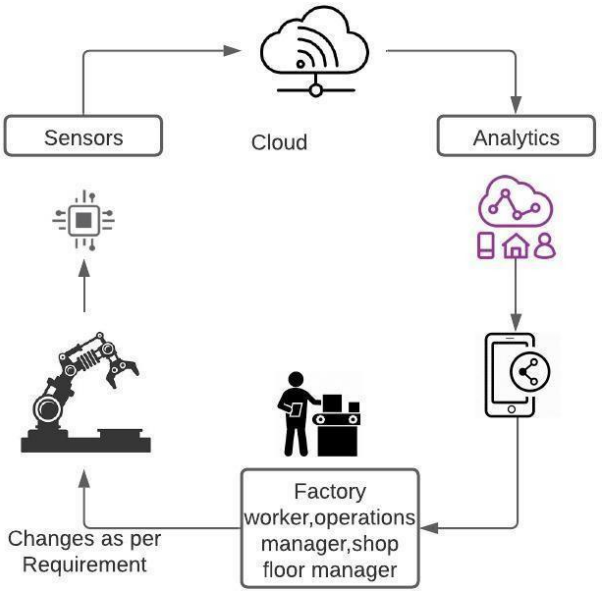


Chart-1: Integration of Production planning with real time data.

4.2. Supply Chain Linkage

IRJET Real-time insights can be benefitted to supply chain members linked to manufacturers such as suppliers, logistics providers, distributors, retailers, and Consumers. Blockchain technology and IoT integration make real-time data visible to all the stakeholders involved in the supply chain. The supplier can get the prediction of future orders that needs to be transported to the manufacturer by the real-time data of production of the manufacturer and its raw material usage regularly. Logistics Provider can assume the days on which service has to be given to the manufacturer as per his real-time data. A distributor can plan his goods allocation of that manufacturer by the manufacturer and logistics provider's real-time data. Retailers and Consumer can track the production stages in real-time at regular intervals. All the supply chain members can track the logistics provider, transportation of trucks.

4.3. Quality Assurance

In a manufacturing enterprise, the quality of products manufactured has to be maintained. Real-time quality reports of manufacturing are essential so that uncertain things can be immediately identified and resolved. This helps to reduce the time in aligning things at its place. Sensors should be used on manufacturing equipment to check the quality of manufactured products. Such sensors are directly connected to the internet gateways, transmitting data through the internet in real-time. Through data analytics, reports are made that are visible to the stakeholders involved in the operations that help to maintain the quality of manufacturing. Setting up alerts for when there is a dip in quality performance can quickly let management, production engineering, and scheduling know when there is a deviation in performance, which can help save you money due to lost production time. Forming KPI (Key Performance Indicator) and updating KPI results in real-time can be the best step that enterprises can take to maintain their quality assurance. Improving product quality and increasing Overall Equipment Effectiveness (OEE) by being able to better track machine utilization, scrap and downtime reporting is also a high priority.

4.4. Equipment Maintenance

The regular maintenance of machinery and manufacturing equipment is important for manufacturers because it ensures quality production and reduces maintenance costs. Machinery and other manufacturing equipment in an enterprise are huge, therefore the cost of repairing is extremely high, so manufacturers must keep the upkeep from time to time. Integrating real-time data systems in machinery allows the manufacturers to stay daily tracking of machinery performance. Sensors connected to the machinery and engine detect real-time conditions like temperature, usage, energy, quality, pressure, life cycle, etc. Regular data of these factors of the machine gives accurate condition reports that help in planning and strategizing maintenance activity. Regular updates of machinery make sure the trust of the standard assurance team, Stakeholders, and provide chain members. All of those factors contribute to raised business results, driving up Return on Invested Capital (ROIC) as machinery lasts longer. For fault diagnosis and prediction, sensors are embedded in production equipment to detect a variety of data, including variables such as location, weight, temperature, humidity, vibration, and flow rate.

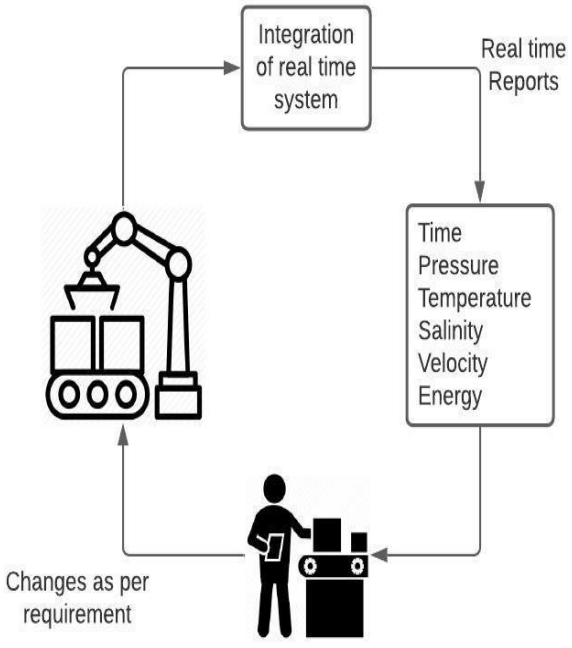
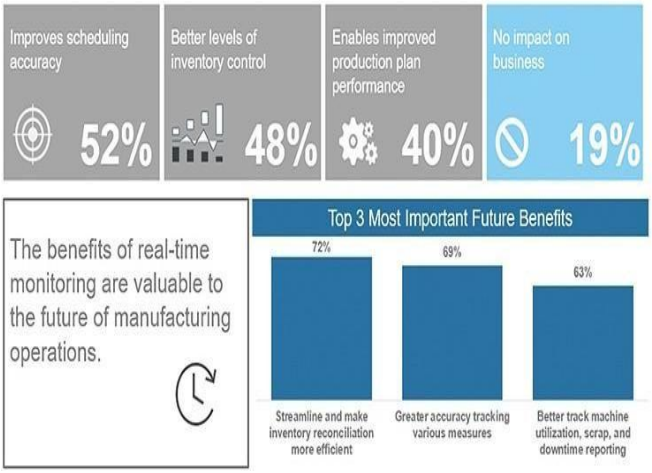


Chart 2. Equipment maintenance integration with real time data system

4.5. Inventory Management

All the inventories that are received by various suppliers and their quantities should be regularly tracked. Daily quantity usage of different raw materials can be tracked through real-time data systems through IOT sensors. Such regular data helps in demand and supply forecasting; regular forecasting helps the financial team plan the finances for their future orders and future inventories. It also helps the planning team in accommodating raw material and warehousing as per the daily usage. Real-time data of manufacturing helps the distributor in planning and optimization of products regularly. As per real-time data, it helps them to make space for upcoming products. Manufacturers are also reducing inventory holding costs and safety stocks while optimizing inventory levels for their most in-demand products. Stakeholders at all levels can enable tracking and controlling of inventory at all production locations. It helps supply chain managers, members, and stakeholders in taking calculated decisions as per real-time reports.



5. Strategies and Discussion

Adopting all modern technology, such as integrating real-time data in manufacturing operations, can increase the Efficiency of operations, employees, and organizations. It also brings many responsibilities and guidelines to be followed by the organization and all the participants. Some of the guidelines that need to be followed by members of the supply chain in their organization are:

1. All the manufacturing enterprises have different operational strategies with a unique way of tracking operations and workflow. It is advised to research all the company processes first and then make an execution plan to get the advantages of real-time data in their manufacturing operations.

2. Adopting new modern technology in manufacturing operations is an expensive, accurate financial plan must be ready before selecting any technology integration in the organization. A manufacturing enterprise needs to plan for the long term in terms of investment in technology and its returns.

3. Real-time data integration can enhance flexibility and transparency in traditional manufacturing operations, but getting a grasp of such technology for an old employee is difficult. The manufacturing enterprise has to plan training sessions for the employees, laborers, managers, and stakeholders involved in the operations to use real-time data

accurately.

4. As data is the base of integrating real-time data systems in manufacturing, manufacturing enterprises must evaluate all the legal aspects and compliances as per requirement.

6. Conclusion

This paper powerfully describes the impact of real-time data in manufacturing operations. All the applications and advantages of real-time data propose the necessity for manufacturing enterprises to integrate cloud and real-time data-driven manufacturing. Real-time Data-driven manufacturing can help enterprises in improving their business, financial, and operational performance. This paper indicates the use of real-time data from the raw material used to the final product reaching the customer. Real-time data helps the manufacturer track, manage, and control the resources, Efficiency of employees, and operations regularly. Data acquisition, data processing, data analytics, and real-time reports are essential aspects of real-time data. Predictive analysis and Data-driven decisions help to reduce the uncertainty in the manufacturing operations. Blockchain and IOT technology integration can be the best in storing all the real-time data securely, which can be visible to all the stakeholders involved that helps in planning and strategizing. This paper describes some strategies and discussions that will help enterprises integrate real-time data systems into their traditional manufacturing operations.

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