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Android Application for Analysis of Productivity of Precision Machine Shop

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Abstract: ***Overall Equipment Effectiveness (OEE) of a machine plays an important role within the present scenario, where right quality and right delivery at the proper time are the main factors influencing a customer. The aim of this project is to review the effectiveness and implementing of an independent maintenance system during a workshop for enhancing OEE with the assistance of Total Productive Maintenance (TPM) and 5S techniques employing a systematic approach. This has been focused to attenuate the breakdown, increase the performance and quality rate of machines so on improve the effectiveness. During this discussion of research, reviewing of documentation and sequential records and direct observations were used as data collection methods. during this case study, increase during analysis and productivity of machines in terms of OEE by implementing TPM in a workshop are discussed. This research work deals with the aspects of availability, performance and quality which are to calculate the OEE of a machine. The TPM techniques like 5S, preventive maintenance and cleaning were effectively applied on the machine. the ultimate result showed that the OEE improved by 5% in horizontal machining center and by 7% in vertical machining center.***

I. INTRODUCTION

An accurate record of all the machines and operators and displays their status and the jobs assigned and completed by them. Using this system, the administrator of a workshop/factory/machine shop can seamlessly monitor and supervise over the day-to-day operations. Machining is a form of subtractive manufacturing wherein a material is cut to a desired shape and size by a controlled-material removal process .Large machine shops have a wide variety of machining tools and equipment such as lathe machines, CNC machines etc. Such machine shops also employ multiple skilled workers to operate these machines. As a Machine shop, factory, or workshop expands its operations; the number of machines and the workers employed also inevitably increase as a by-product of growth. Managing the increasing employees and machines using conventional paper-based methods of management could cause chaos and confusion. This may also result in increased idle times of both machines as well as employees. This Machine Shop Project helps in automating and streamlining the process of management.

II. LITERATURE REVIEW

The concept of productivity developed within the 18th century, when it indicated the ratio between inputs (such as human and non-human resources) and manufacturing processes and outputs (products and services). The concept of productivity expanded over time to varied areas and subjects. the foremost frequently-used macro-economic concept of productivity consists of partial and total factor productivity, and for a few time it's been wont to measure the company competitiveness of certain countries and industries. Partial factor productivity indicates outputs and single inputs, especially the connection between labour and capital, while total factor productivity means the connection among multiple inputs and outputs, additionally, various sorts of productivity-related
Analyses are conducted through Malquist index and growth accounting analysis. Furthermore, Sharpe compared the concept of productivity with its measurement methods, issues, etc., and Syverson presented small-scale factors that affect productivity in operating 148 factories and corporations. Moreover, Porter proceeded with a series of studies on the consequences of commercial and regional clusters on the development of productivity. The consequences of such factors as economy, industry, companies, and factories on productivity were considered.
These past studies, on the other hand, were unduly focused on measuring and analysing productivity, resulting in constrained sets of knowledge such as TFP (total factor productivity). The longitudinal meaning of productivity was not taken into account in these investigations. To overcome this constraint, this study used an analysis strategy that was distinct from previous research and aimed to create novel findings as a result of this process.

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The goal of this research is to determine general trends in productivity-related studies in manufacturing and to draw conclusions from keyword analysis of productivity-related literature. Furthermore, the goal of this research is to uncover future trends in productivity studies. We expect that these tendencies may aid scholars in analysing the findings of previous investigations.

In [1] "This SLR introduces and categorises the assembly line problems handled by machine learning, specifies the targeted industrial domains, describes the machine learning methods employed, and explains the models' adopted independent and dependent variables. The analysis identifies open problems that need to be addressed and research avenues that should be pursued. An assembly line is a sequence of consecutive activities set up in a factory where ingredients are refined to produce a finished product that may be used again. Monitoring production lines is necessary to ensure that the assembly process and, as a result, the goods meet the desired quality. Many data can now be created throughout the overall assembly line process as a result of enhanced digitalization. In the meanwhile, the Machine learning techniques are used to analyse generated data sets in order to improve internal control, assess risks, and save money on the assembly line. This work seeks to identify, evaluate, and synthesise the reported studies on the use of machine learning in production lines in order to provide a comprehensive overview of the current state-of-the-art and, as a result, pave the way for future research. To this goal, we conducted a scholarly Literature Review (SLR) that yielded 271 papers, of which 39 primary investigations were chosen for further investigation.

motor stool, wind turbine parts. In order to implement method study and time study techniques to improve the work process to meet the customer demand.

As per [2] The work presented here was done in an industry that makes engine covers, motor stools, and turbine parts, with the goal of implementing method research and time and motion study approaches to improve the work process and meet client demand. Productivity is a tool for enhancing a product's quality. Productivity development is a critical aspect in surviving and breaking new ground in the work that is done in the Machining sector for continual improvement. A few unneeded job processes are done in the manufacturing department, assembly line, machining shop, material handling, and quality department, which take more time, effort, and increases merchandise expense while also causing worker fatigue. As a result, the industry's productivity suffers decreases, whereas the production cycle time increases. Internal control, quality assurance, statistical internal control, total quality management, and other instruments and approaches are the most beneficial factors for not only improving product quality but also improving merchandise activity and overall product efficiency. The standard checking technique, such as level, was introduced in this study. Digital measuring tools such as verniers, micro-metre, and gear tooth verniers, among others. The work exhibited here was done by a machining company that makes engine covers and other components.

As per [3] This study gives a theory on the design and manufacturing of special purpose machines that has aided corporate manufacturing sectors in meeting client demands. In this current circumstance, the company's ultimate purpose is to maximise profits. Productivity increase is one of the strategies to accomplish this goal. Companies employ a variety of techniques to address the challenge of increasing productivity. The root cause of the problem was investigated and determined, necessitating the design and manufacture of a special purpose machine capable of performing face milling and counter centring operations in less time while maintaining the required dimensional precision.

In [4] "A study of machine efficiency and its effects on line balancing has been introduced to the internet in this research." To aid in the investigation, the task time on the specified machine was used as an efficiency criterion. For a variety of reasons, machines are used to reduce the time required to do specific operations. It is not necessary to choose the highest machine efficiency as the optimum answer if the management has limited resources of varying efficiencies. Production Line Balancing (PLB) is a strategy for assigning processes to workstations in such a way that idle time between workstations is minimized, resulting in increased production. To ensure maximum production flow, PLB strives to equator the burden in each industry's workstation. One treatment that results in this levelling of effort is the use of a totalizer in specified setups. This study examines the various efficiencies of the added machine, as well as the impact of those efficiencies on line balance, in order to select the most efficient machine. This will result in a reduction in idle time between workstations and an increase in production flow. For this case study, the task is timed as the efficiency criteria. The research was carried out on a dumb truck production line and resulted in an increase of 81.7 percent in road efficiency.

As per [5] "This paper aims to provide a comprehensive review of recent advances in Machine Learning techniques widely applied to PdM for smart manufacturing in I4.0 by categorising the research according to the ML algorithms, ML category, machinery and equipment used, device used in data acquisition, classification of knowledge, size and sort, and highlighting the key contributions of the researchers, and then offering guidelines and a foundation for future research. Smart systems, machine learning (ML) inside AI (AI), and predictive maintenance (PdM) techniques are now widely used in industries to manage the health state of commercial equipment, thanks to the advent of Industry 4.0.

It is now feasible to collect huge amounts of operational and process data thanks to digital transformation towards I4.0, information techniques, computerised control, and communication networks created from various pieces of harvest data in order to create an autonomous failure detection and diagnosis with the goal of reducing downtime, increasing component utilisation, and extending their remaining usable lives. PdM is unavoidable for sustainable and smart manufacturing. Machine learning (ML) approaches have risen in popularity as a viable tool in PdM applications for smart manufacturing in I4.0, attracting more writers in recent years.

As per [6] “This article is about increasing productivity at the factory floor, such as at the station, cell, or line level." There are a variety of approaches to achieving these gains, and various people have varied sentiments and attitudes toward productivity gains. On a factory level, productivity can be defined as added value per employee, whereas on a cell or station level, a common productivity metric is the number of goods produced per hour of planned production time. Vora[3] investigated the economic impact of several productivity definitions at three different levels in manufacturing firms. Physical output per labour was found to be the most prevalent productivity measure employed at the beginning and middle management levels. The term "labour" is frequently used to refer to a group of people or a planned event working time.

As per [7] The research included an assessment of the effectiveness of machine use inside the chosen manufacturing organisation. The investigation was conducted using the OEE approach, which stands for Overall Equipment Effectiveness. The chosen firm specialises in tapered roller bearing assembly. Within the department of grinding rollers, 17 automatic grinding lines were completed for the effectiveness analysis. Machines with a low level of efficiency were suffering from problems with machine and device supply. On these lines, all of the causes of machine downtime were investigated. The absence of a kanban card, diamonding, and the absence of an operator were identified as the three most common reasons of downtime. There were suggestions for improving the utilisation of those equipment. The analysis takes under consideration the particular results from the assembly process and covers the amount of 1 civil year.

As per [8] Gears Manufacturing Company in dewas is conducting the project study. Its goal is to meet the expanding need for axle gear in the automobile, truck, and tractor markets. The arena software could be a simulation environment made up of module templates based on SIMAN language structures and other features, with a visual front. The major goal of this study is to improve the structure of a manufacturing unit with a clear focus on increasing productivity. After a thorough study of knowledge using software simulation techniques, an attempt is made to examine the entire layout design of the assembly line, from raw materials to finished product output, and revised layout.

As per [9] This work contributes to this field's research by methodically analysing literature and identifying research gaps. The major indicators of AI applications boosting resource efficiency are also provided to practitioners. Improvements in industrial output that are sustainable are critical for combating global climate change and the resulting ecological crises. In this setting, resource efficiency can immediately lead to major improvements in generating firms' environmental performance. AI (artificial intelligence) is becoming increasingly significant. The impact of AI applications on resource efficiency, on the other hand, has not been examined in this paper. This paper gives an overview of current AI applications and how they impact resource efficiency.

As per [10] The connection between factory management and, as a result, the operation of the limoncello assembly line is investigated in this study. Over the course of eight months, failure and repair data from the route were analysed. At both the machine and line levels, descriptive statistics were generated. The availability (A), performance efficiency (PE), and quality rate (QR) of the OEE components were also calculated. Failure and repair data analysis identifies important spots in the assembly process that need to be addressed right away to improve the road's functionality. The findings reveal that the components PE and QR should be enhanced quickly in order to maximise road production and efficiency. It can also be used by machinery makers and, as a result, bottled product manufacturers in the beverage industry to improve the planning and operation management of bottling production lines.

III. METHODOLOGY

A. System Overview

Machining is a form of subtractive manufacturing wherein a material is cut to a desired shape and size by a controlled-material removal process. Large machine shops have a wide variety of machining tools and equipment such as lathe machines, CNC machines etc. Such machine shops also employ multiple skilled workers to operate these machines. As a Machine shop, factory, or workshop expands its operations; the number of machines and the workers employed also inevitably increase as a byproduct of growth.

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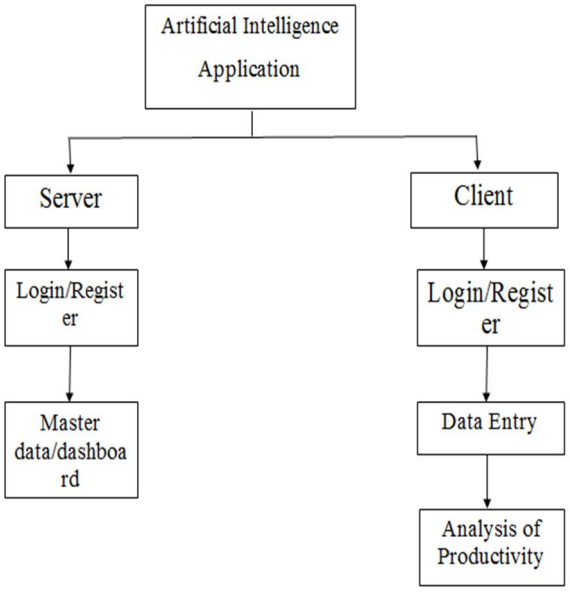


Fig 1. Flow Chart

The above figure shows the flow of the application.

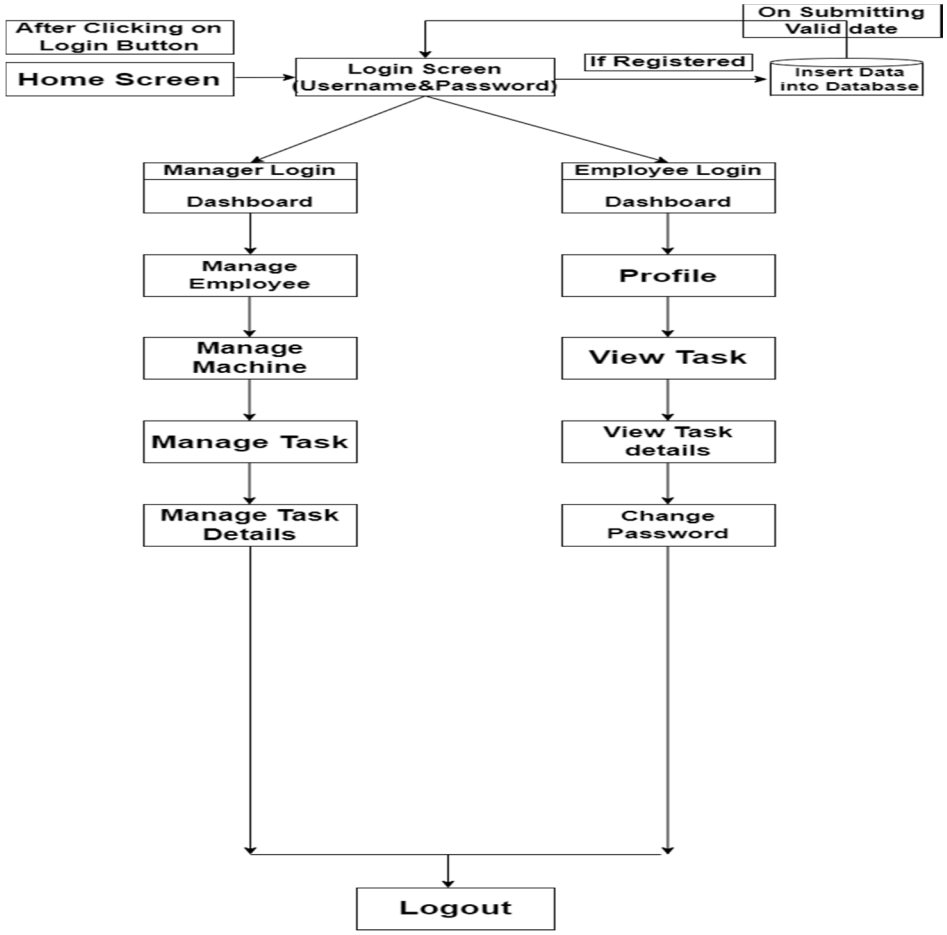


Fig 2. Architecture of Application

Above mentioned figure shows the architecture of the application and the actual work flow of application.

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B. Software Modules

1) Manager

- Login: Only registered managers can only login the application.
- Dashboard: It has Manage Employee, Manage Machine, Manage Task
- Manage Employee: In it manager can add, update, delete employee basic info like name, email Id, contact, password for login employee app.
- Manage machine: In it manager can add, update, delete machine related like machine number, name, status.
- Manage task: In it manager can assign task for employee with task details like task name, employee name, date, start time, end time. Manger can sort the data according to date, employee name, and machine name for individual employee details.
- Add Details: Once manager assign task to employee then he/she have to add task related details like cycler time, idle time, machine hours, no load, power failure, machine breakdown, others.
- Logout: For logout the application.

2) Employee

- Login: Only those employee can login who's added by manager.
- Task: It shows list of tasks according to date with task details like cycle time, idle time, machine hours, etc. If he/she started their task on machine they have to change status Start. if he/ she finished their task on machine they have to change status End. according to status Actual Start time, Actual end time update automatically.
- Change Password: If employee want to their password which is provide by manager so, he/ she can change it from here.
- Logout: For logout the application.

IV. ADVANTAGES

Manage Employee, Machine, Task Related details which is accessible from anywhere, because the data has been stored online.
Only those employees can use the app who's added by manager himself.
All the data related to app only manage by manager.

V. CONCLUSION

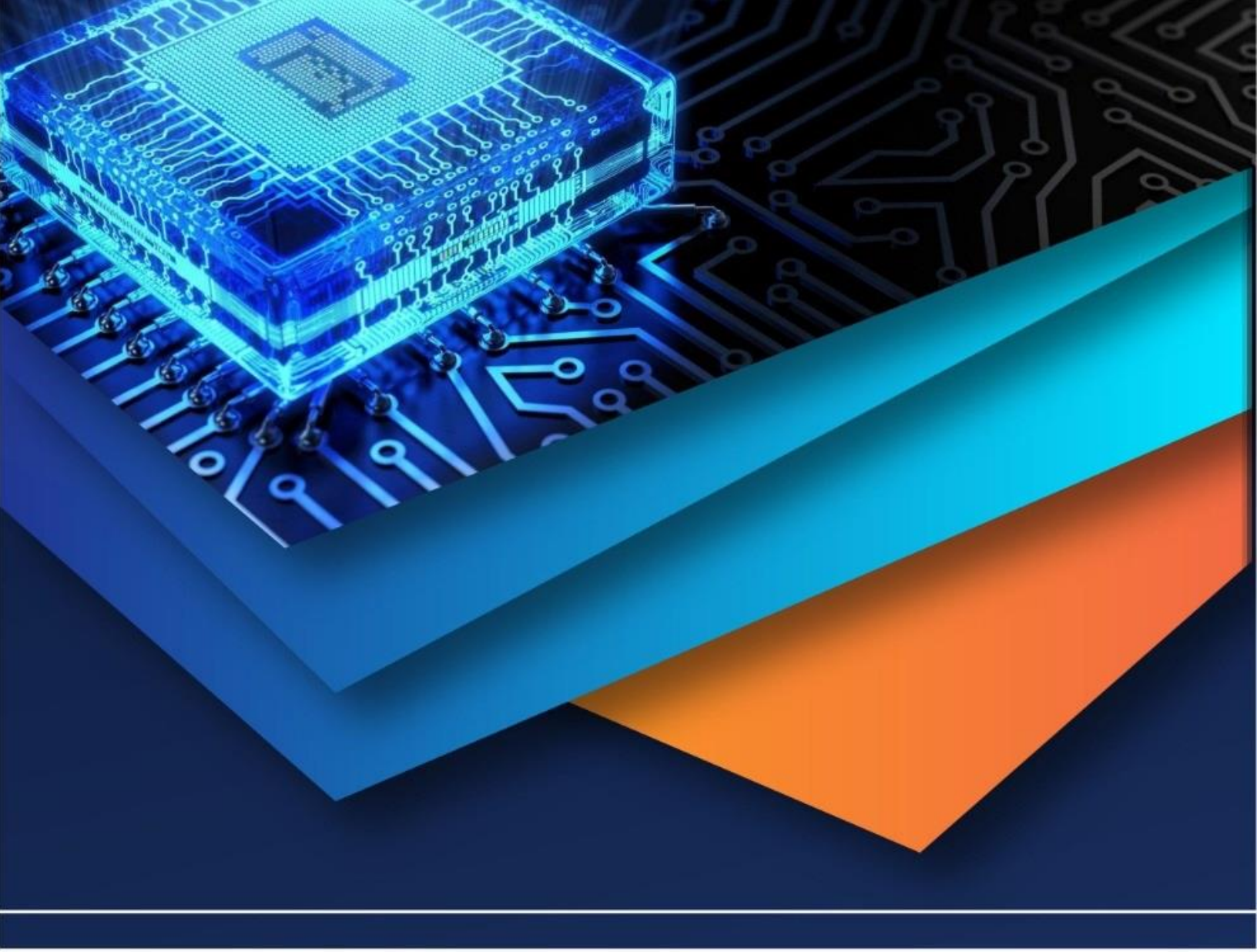
As we know, large scale manufacturing industries have large amount of machines which makes hard to record the info of machine and to stay the track of productivity and dealing of workers schedules. Hence, to assist the manufacturing industries to research the assembly machines time-to-time and ease the paperwork with technology.
This study helps you find out how we will increase the efficiency of the manufacturing machine industries.

VI. FUTURE ENHANCEMENT

This Android Machine System has been designed keeping in mind the problems faced by large factories and machine shops and helps with automating and streamlining the process the management to machines and operators and enabling administrators to easily supervise over the operations and maintain the maximum levels of efficiency possible.

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