IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

A SURVEY PAPER ON INDUSTRY 4.0 PROJECT

Dhaval GundechaAtharva Jaju Tejas Dawkar
Dept. of ENTCDept. of ENTC Dept. of ENTC
Pune Institute of Computer Technology Pune Institute of Computer Technology Pune Institute of Computer Technology

+

Abstract—
This is an industry 4.0 standards-based project implemented to solve current inefficiencies of industries dependent on forms and paper-based system to maintain records by automating it using MERN. Currently, handling dashboard maintenance of website and daily operations, product planning, statistics of machines and machine part verification process by different employees is done on paper. Analysis of machine statistics is done by senior management at the end of week in excel sheets or on paper manually. This is a time-consuming process, resulting in decreased efficiency of labour. To make this process more efficient, a progressive web portal which will automate these processes needs to be deployed. The hardware team is responsible for the PLCs and the data sent by the machine to the database which can later be processed and reviewed on the website which is developed by the software team who take care of the development of the user interface (front end) , the backend of the server where all the processes are taking place and last but not the least the cloud where the website would be hosted and all the data would be safely stored hence making the user experience much more effortless, virtual and cost efficient.

I. INTRODUCTION

Industry 3.0 was a huge upswing where the industries are administered by the computes, electronic systems, information systems, and automation. This era was known for robotic because human tasks are highly performed by robotics, but the involvement of humans was also there in automation. Industry 4.0 refers to a new phase in the Industrial Revolution that focuses heavily on interconnectivity, automation, machine learning, and real-time data. Industry 4.0, which encompasses IoT and smart manufacturing, marries physical production and operations with smart digital technology, machine learning, and big data to create a more holistic and better-connected ecosystem for companies that focus on manufacturing and supply chain management. While every company and organization operating today is different, they all face a common challenge—the need for connectedness and access to real-time insights across processes, partners, products, and people. That's where Industry 4.0 comes into play.

II. LITERATURE REVIEW

[1] Literature Review: The Impact of Digitalization and Industry 4.0 on Business: This review aims to clarify the concepts of digitalization and industry 4.0 and demonstrate the effectiveness of enterprise resource planning (ERP) systems for process automation. Technological advancements have significantly influenced the understanding of digitalization and industry 4.0 principles. This paper presents an overview of the four industrial revolutions, highlighting the advantages of industry 4.0 compared to its predecessors and emphasizing its practical applications.

[2] Cloud SaaS Framework for Multi-Tenant Applications: Design and Implementation: This research focuses on examining the fundamental aspects of cloud computing, including extensibility and multi-tenancy, in the context of developing a SaaS framework for multi-tenant applications. The proposed SaaS platform provides a suitable solution for accommodating multi-tenant services. The study suggests a comprehensive framework for application development and management, emphasizing the importance of cloud and clustering features. Additionally, the research explores various approaches to implementing the SaaS framework, offering a viable option for multi-tenant application deployment.

[3] Overview of Industry 4.0: This paper presents an overview of the Industry 4.0 concept, discussing its technologies, challenges, and outcomes. The primary objective is to foster further discussions and provide an in-depth understanding of Industry 4.0, highlighting how the integration of advanced technologies and the internet presents new opportunities for addressing existing industrial challenges.

[4] Critical Success Factors for Industry 4.0 in Automotive Manufacturing: This paper aims to identify the critical success factors (CSFs) essential for achieving Industry 4.0 objectives in the automotive manufacturing industry. It explores the key characteristics of CSFs and

their impact on the performance outcomes of Industry 4.0 implementation. The study also investigates the correlation between CSFs and operational, product, economic, and responsiveness performance. Regression analysis is utilized to examine these relationships. The findings indicate that data governance is the most crucial factor, influencing all four performance outcomes. Additionally, legal aspects and collaboration and teamwork are identified as critical factors. The study emphasizes the significance of these factors in successfully implementing Industry 4.0.

[5] Policy-based Adaptation of Workflow Processes using MVC Framework: This paper introduces a framework for policy-based adaptation of workflow processes, particularly in terms of confidentiality, utilizing the Model-View-Controller (MVC) architecture. Workflow tasks are modeled as aspects and selected from a library based on policy-driven adaptation logic. The framework automatically adapts workflow instances by analyzing surrounding and running models' properties.

[6] Evolution from Industry 3.0 to Industry 4.0: This paper explores the modernization of production and the development of innovative digital companies. It describes the mechanical and assembly production processes of existing companies in Industry 3.0 and potential companies in Industry 4.0. Furthermore, it defines the essential components of a smart factory and their interconnectedness to facilitate production using paperless and automated technologies. The paper presents a comparative analysis of the movement of parts and blanks in the manufacturing process of radio and electronic items between Industry 3.0 and Industry 4.0 companies. Additionally, it outlines the components of a digital item design company that could be established and implemented in the industry.

III. PROPOSED METHODOLOGY

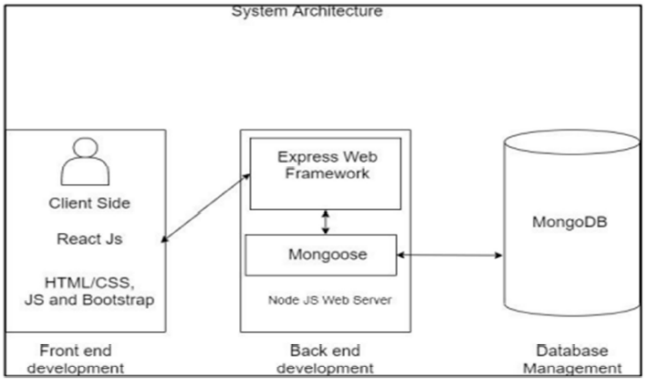

Fig. 1. System Architecture

Industry 3.0, also known as the Third Industrial Revolution, refers to the period of industrialization from the 1960s to the 2000s that was characterized by the widespread use of automation and computerization in manufacturing processes. The key approaches of Industry 3.0 include:

1. Automation: The use of automated machines and assembly lines to increase efficiency and productivity in manufacturing processes.
2. Computerization: The integration of computers and software into manufacturing processes, allowing for greater control and accuracy.
3. Mass production: The ability to produce large quantities of standardized products using efficient manufacturing techniques.
4. Globalization: The expansion of manufacturing to global markets, allowing companies to take advantage of lower labour costs and access new markets.
5. Lean manufacturing: A production approach that emphasizes minimizing waste and maximizing efficiency.

The industry consists of 4 departments within naming Moulding, Die casting, Assembly and Paint shop. Each section has their operators and management staff. The operators are provided with one tablet where he supposed to enter some data related to status of his working as well as he can report issue he is facing while working on respective machine, which is immediately sent message to respective authority and proper action will be taken. The higher authorities like general manager, managing director, supervisor, etc. will be provided with their respective dashboards which consist of past as well as live status of each machine of each section. Eventually it reduces most of pen and paperwork of industry also it can be accessible from anywhere and easy to maintain.

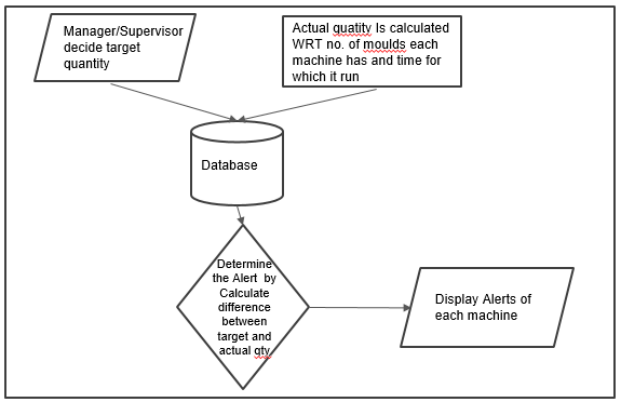

Fig. 2. Flowchart

The proposed system involves the participation of higher authorities such as General Managers, Managing Directors, and Supervisors who establish the initial planning for each machine department and machine in the industry. An autonomous system that is installed on the machines checks the actual production of each machine after a specific time interval. If there is a difference between the actual and planned production, the system creates color-coded alerts and sends them to the respective authority. Moreover, if any operator faces issues with the machine, such as material shortage, faulty production, or errors in handling the machine, they can raise alerts. These alerts are then forwarded to the appropriate industry authority, depending on the type and severity of the alert, enabling immediate action to be taken. This, in turn, indirectly improves the productivity of the industry.

IV. Conclusion and Future Scope

A. Conclusion

The deployment of the Live Production Tracking and Color Identification Panel for Industrial Equipment using the MERN framework has delivered an automated resolution to a prevalent issue encountered by numerous sectors. The panel permits the streamlined monitoring of production volume and offers color-based notifications in real-time, thereby diminishing the requirement for manual work and enhancing overall effectiveness. The system has been effectively executed and exhibited its flawless operation, garnering commendations from the manager for its practicality and user-friendly interface.

B. Future Scope

Considering the numerous aspects that can be enhanced and extended, there are several key areas to focus on. Initially, there is room for additional enhancements in the system to optimize data handling and analysis, leading to heightened efficiency. This can be accomplished by integrating advanced artificial intelligence techniques that can forecast production patterns and enhance precision across the board. Moreover, integrating the system with other industrial infrastructures like inventory supervision, logistics management, and quality assurance would result in a holistic approach, addressing a wider range of industrial requirements and bolstering overall productivity. Lastly, scaling the system to accommodate larger enterprises and organizations would ensure a broader outreach, benefiting a greater number of individuals and fostering substantial growth.

Acknowledgment

We commence by expressing our sincere appreciation to our project mentor, Prof. P. B. Tathe, for their steadfast encouragement, timely guidance, and priceless input that significantly contributed to the accomplishment of our project. We would like to extend our gratitude to all individuals who played a significant role in the development of this project. We are particularly indebted to Prof. P. B. Tathe for their expert assistance in software architecture and connections. Additionally, we would like to acknowledge the faculty members of the laboratory for their provision of essential resources and equipment whenever required.

Our heartfelt thanks go out to our fellow classmates for their unwavering moral support and prompt aid, which proved vital throughout our journey. We would like to give a special recognition to our team members for their impeccable coordination, sincere endeavors, and dedication that ensured the successful completion of this project. Lastly, we express our gratitude to all those who contributed to our project in any capacity, for their invaluable backing and motivation throughout its execution.

References

[1] Laura-Eugenia-Lavinia BARNA, The Impact of Digitalization and Industry 4.0 on Business, The 4 th International Conference on Economics and Social Sciences Resilience and economic intelligence through digitalization and big data analytics June 10-11, 2021 Bucharest University of Economic Studies, Romania

[2] P. Morakos and A. Meliones, ”Design and implementation of a Cloud SaaS framework for Multi-Tenant applications,” IISA 2014, The 5th International Conference on Information, Intelligence, Systems and Applications, 2014, pp. 273-278, doi: 10.1109/IISA.2014.6878755

[3] Beatrice Santos, F. Charrua-Santos, T.M. Lima, Industry 4.0: an overview. at: https://www.researchgate.net/publication/326352993

[4] M. S. Bhatia and S. Kumar, ”Critical Success Factors of Industry 4.0 in Automotive Manufacturing Industry,” in IEEE Transactions on Engineering Management, vol. 69, no. 5, pp. 2439-2453, Oct. 2022, doi: 10.1109/TEM.2020.3017004

[5] K. Geebelen, E. Kulikowski, E. Truyen and W. Joosen, ”A MVC Framework for Policy-Based Adaptation of Workflow Processes: A Case Study on Confidentiality,” 2010 IEEE International Conference on Web Services, 2010, pp. 401-408, doi: 10.1109/ICWS.2010.81

[6] D A Zakoldaev, A V Shukalov and I O Zharinov, From Industry 3.0 to Industry 4.0: production modernization and creation of innovative digital companies.