iJETRM
International Journal of Engineering Technology Research & Management
Published By:
https://www.ijetrm.com/

FACTORY DATA MANAGEMENT SYSTEM: IMPROVING INDUSTRIAL OPERATIONS' EFFICIENCY AND DECISION-MAKING

Shruti Surve, Ganesh Aradkar, Chetan Wankhede, Rutuja Pawar
Students, Department of Information Technology,
Siddhant College of Engineering, Pune, India

Prof. Shweta Rane
Professor, Department of Information Technology,
Siddhant College of Engineering, Pune, India

ABSTRACT
A robust Factory Data Management System (FDMS) is necessary to maximize resource utilization, optimize workflows, and improve decision-making processes due to the increasing complexity of industrial operations. In order to guarantee smooth data processing and accessibility, this paper proposes an FDMS framework that makes use of cloud computing and structured database management strategies. The system is made to support several factory departments, such as production, administration, and compliance management. Analyzing current factory data management procedures, putting in place a scalable FDMS, and assessing how it affects productivity and operational decision-making are all part of the research methodology. The findings show that in industrial settings, FDMS implementation greatly increases accuracy, decreases downtime, and improves compliance

Keywords:
Factory Data Management, Cloud Computing, Industrial Automation, Database Management, Web-Based Systems

INTRODUCTION

Large-scale production, automation, and the requirement for operational precision define the modern manufacturing sector. Every day, factories produce enormous volumes of data, such as workforce schedules, inventory information, machine performance metrics, and production statistics. Efficient management of this data is essential for process optimization, downtime reduction, and regulatory compliance. Conventional methods, like standalone software programs and paper-based record-keeping, frequently result in data fragmentation, inefficiency, and subpar decision-making.

Factory Data Management Systems (FDMS), which combine different facets of industrial operations into a single platform, are being adopted by factories more frequently in order to address these issues. In order to monitor, analyze, and optimize factory performance, an FDMS offers automated reporting tools, real-time data access, and structured storage. FDMS improves workforce productivity, production dependability, and operational transparency by doing away with needless manual procedures and guaranteeing safe and effective data management.

In addition, the implementation of strong data management practices is required by regulatory requirements for safety procedures, environmental compliance, and quality control. By keeping accurate records, monitoring key performance indicators (KPIs), and automating compliance audits, FDMS assists factories in adhering to these regulations. By granting role-based access control to pertinent data, the system also enhances departmental collaboration.

The design, implementation, and assessment of an FDMS that helps factory administrators effectively store, retrieve, and analyze operational data are covered in this paper. A comparison between the suggested FDMS and conventional factory management techniques is also conducted, along with an examination of the system architecture, functionalities, advantages, and difficulties.

iJETRM
International Journal of Engineering Technology Research & Management
Published By:
https://www.ijetrm.com/

LITREATURE REVIEW

One important factor that sets Factory Data Management (FDM) apart from Enterprise Resource Planning (ERP) and Manufacturing Operations Management (MOM) is FDM. The importance of strong data management systems in supporting adaptable production across a global network is emphasized by Nowitschkow et al.

The difficulty of preserving continuity in manufacturing environments is also addressed, emphasizing the necessity of real-time information analysis to reduce interruptions in production processes. The lack of precise definitions for different IT systems and how they interact with factory-level data management is also covered in the paper, which emphasizes the need for an integrated approach.The development of FDMS is based on a number of research studies.

By combining operational data for real-time business intelligence and tackling workflow audit trail transformation issues, the Process Information Factory (PIF) improves business process monitoring. With continuous improvements in Mobile-FFDM, a mobile application created for improved data presentation, Federative Factory Data Management (FFDM) focuses on integrating Cyber-Physical Systems (CPS) to enhance data access and usability. According to Alshareef and Alkilany (2015), web-based information management places a strong emphasis on centralized data handling in order to increase productivity in manufacturing environments.

According to Mohamed et al. (2016), automation in data processing examines the benefits of automated reporting and notifications, which have an impact on FDMS compliance tracking features. Smart Factory Technology optimizes manufacturing processes by utilizing real-time processing improvements and IoT-based remote monitoring. Bharamagoudar et al. (2013) examined Security and Performance Optimization, which offers insights into web-based information systems with a focus on scalability and security. In addition, creating structured information models to cut down on duplication and boost productivity throughout factory life cycles is the main goal of Standardized Data Mapping for Factory Planning. The viability and importance of FDMS are further supported by these studies, which collectively advocate for the adaptation of structured information systems for industrial data management.

METHODOLOGY

Data collection, system design, and system evaluation are the three primary stages of the structured methodology used to design and assess the Factory Data Management System (FDMS).

3.1 Data collection

Data was collected from several sources in order to comprehend the prerequisites for an efficient FDMS:

Existing Factory Records: Examining both digital and conventional record-keeping techniques.

Industry Standards and Regulations: Examining the requirements for efficiency, safety, and compliance.

Comparative Analysis: Looking for flexible features in student management and mobile attendance tracking systems.

Stakeholder interviews: are used to learn about the difficulties with data accessibility from workers, managers, and supervisors in factories.

3.2 System Design

Based on gathered insights, the FDMS was created in a modular fashion:

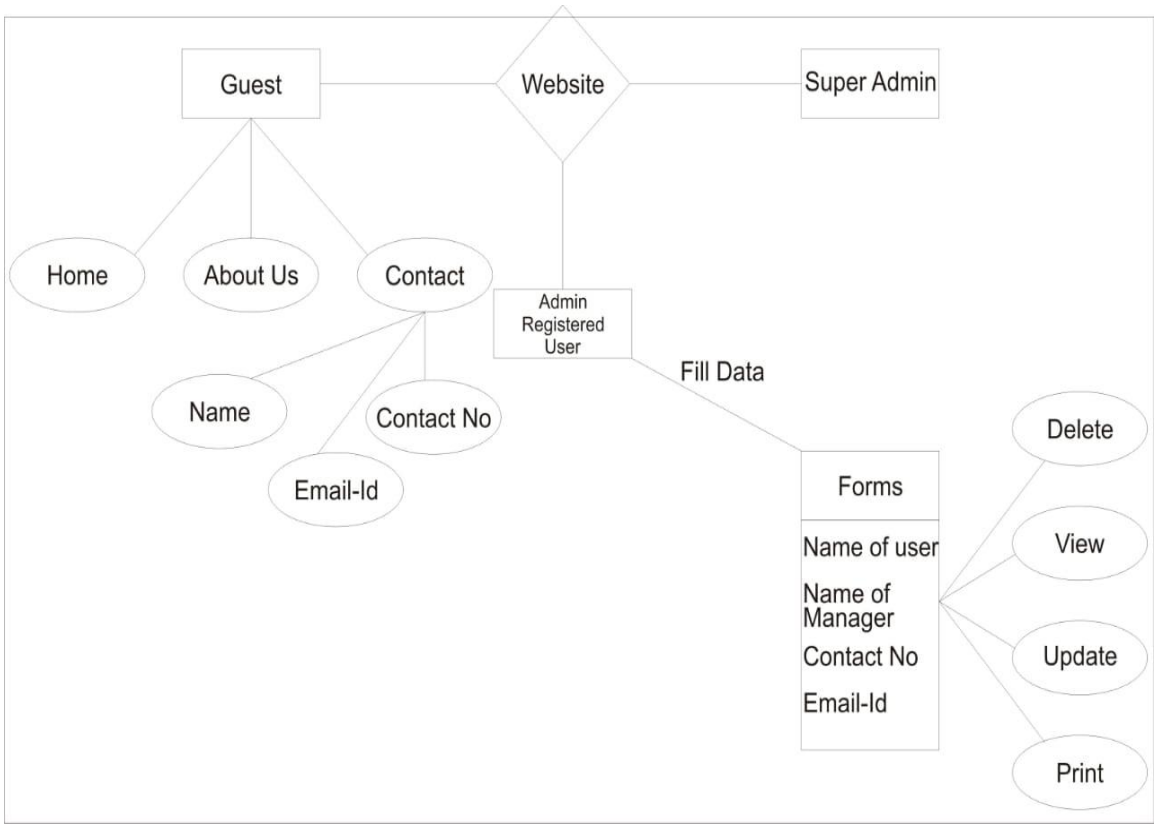
Database Structuring: Putting in place a relational database to handle factory data that is structured.

Web-Based Interface: Creating a user-friendly platform that is simple to access and update.

Implementing security involves combining authentication and encryption to safeguard data.

Automated Notifications: Setting up an email alert system for maintenance plans and compliance due dates.

iJETRM
International Journal of Engineering Technology Research & Management
Published By:
https://www.ijetrm.com/



RESULTS AND EVALUATION

The Parameter	Improvement
The improvement of Performance	20% faster data retrieval
Accuracy of Compliance	15% increase in compliance with guidelines
Operational Efficiency	Automation results in less downtime.
User Feedback	Enhanced usability and accessibility

COMPARISON WITH TRADITIONAL SYSTEMS

Replacing Paper-Based Systems

Conventional factories frequently use manual, paper-based record-keeping, which is prone to mistakes, inefficiencies, and delays. By digitizing records, guaranteeing data accuracy, and lowering the possibility of misplaced or misfiled documents, FDMS removes these difficulties. Automated data entry and validation streamlines compliance and reporting procedures while improving accuracy even more.

Surpassing Standalone Software

Data sharing and real-time insights are limited by the use of standalone applications in many factories that function in silos. Production, maintenance, inventory, and quality control are all integrated into a single system by FDMS. A thorough picture of factory operations in real time is provided by this integration, which also improves coordination and decision-making.

Updating Legacy Systems

iJETRM
International Journal of Engineering Technology Research & Management
Published By:
https://www.ijetrm.com/

Predictive insights, real-time analytics, and automation are frequently absent from older database architectures. FDMS integrates automation, IoT connectivity, and AI-driven analytics to modernize legacy systems. This change promotes a more flexible and competitive manufacturing environment by empowering factories to optimize operations, minimize downtime, and make data-driven decisions.

FUTURE SCOPE

Internet of Things (IoT) Integration

IoT-enabled sensors are being added to the Factory Data Management System (FDMS) to improve automation, predictive maintenance, and real-time monitoring in smart factories. By continuously gathering and sending data, these sensors minimize downtime, maximize production efficiency, and enable proactive decision-making.

Integrating artificial intelligence (AI)

In order to optimize maintenance schedules and avoid unplanned machinery failures, FDMS is integrating AI-driven predictive analytics. AI models can forecast possible problems and recommend prompt maintenance procedures by evaluating both historical and current data, which lowers operating expenses and boosts output.

Blockchain for Security

Blockchain technology is being applied to FDMS's decentralized storage to improve data security and integrity. This lowers the possibility of data breaches and unwanted changes by guaranteeing tamper-proof records, safe transactions, and transparent audit trails.

Mobile Application Development

To facilitate managers' and technicians' remote access, a mobile-friendly version of FDMS is being developed. This will enhance overall responsiveness and efficiency by enabling users to oversee factory operations, manage workflows, and receive maintenance alerts from any location.

CONCLUSION

An innovative method of managing industrial data is offered by the Factory Data Management System (FDMS). FDMS enhances manufacturing operations' accuracy, efficiency, and decision-making by utilizing web-based interfaces, structured databases, and automation. By combining secure data access, compliance automation, and real-time monitoring, factories can run as efficiently as possible while still abiding by industry rules. This study demonstrates that FDMS is a practical and scalable solution for contemporary industrial settings.

REFERENCES

[1] J. Schiefer, J. J. Jeng, S. Kapoor, and P. Chowdhary, "Process Information Factory: A Data Management Approach for Enhancing Business Process Intelligence," IBM Watson Research Center, Hawthorne, NY, USA.
[2] A. Picard, K. Schützer, R. Anderl, and A. A. de A. Moura, "Linked Product and Process Monitoring in Smart Factories Based on Federative Factory Data Management," in Technische Universität Darmstadt, Department of Computer Integrated Design, Darmstadt, Germany, and Methodist University of Piracicaba, Laboratory for Computer Application in Design and Manufacturing, São Paulo, Brazil.
[3] T. Weimer, R. Kapp, P. Klemm, and E. Westkämper, "Integrated Data Management in Factory Planning and Factory Operation: An Information Model and Its Implementation," in Institute for Control Engineering of Machine Tools and Manufacturing Units, Universität Stuttgart, Germany.
[4] H. Hwang, "Design of Remote Management System for Smart Factory," Dept. of Computer Engineering, Gachon University, Korea.
[5] Nowitschkow, A., Saal, C., & Lohse, O. (Year). *Factory Data Management: Definition and Differentiation from Manufacturing Operations Management.* Digital Manufacturing Technology, Siemens AG, Munich, Germany.