**INTELLIGENT QUALITY MANAGEMENT SYSTEM USING NAÏVE BAYES**

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**ABSTRACT**

QMS In the rapidly evolving landscape of smartphone manufacturing, ensuring high-quality production standards is Paramount. This paper presents an intelligent quality management system (IQMS) that leverages linear regression analysis to Enhance quality control in smartphone assembly lines. The proposed system integrates real-time data acquisition from various stages Of the assembly process, including component fitting, soldering, and testing. By employing linear regression, we identify critical Quality determinants and predict potential defects based on historical data patterns. The model’s predictive capabilities enable Proactive decision-making, allowing for timely interventions and reducing the incidence of defective products. Our results indicate A significant improvement in production quality metrics, showcasing the effectiveness of data-driven approaches in quality Management. This IQMS not only streamlines the manufacturing process but also aligns with industry 4.0 principles, promoting Efficiency and sustainability in smartphone production. The findings highlight the potential for linear regression as a powerful tool For quality assurance in manufacturing environments, paving the way for future research and advancements in intelligent quality Systems.

*Keywords—Quality management*, smartphone, assembly, product, quality control

1. **INTRODUCTION**

As the global demand for smartphones continues to surge, manufacturers face increasing pressure to enhance product quality while optimizing Production efficiency. The complexity of modern smartphone assembly lines, characterized by intricate component interactions and sophisticated Manufacturing techniques, necessitates a robust quality management approach. Traditional quality control methods, often reactive and labor-Intensive, may not suffice in addressing the dynamic challenges of contemporary production environments.

Our thought introducing an Intelligent Quality Management System (IQMS) that employs linear regression analysis to improve quality assurance In smartphone assembly lines. By leveraging data analytics, the IQMS facilitates the identification of key quality determinants, enabling Manufacturers to predict and mitigate defects proactively. The application of linear regression serves as a powerful tool for uncovering Relationships between various process parameters and quality outcomes, allowing for data-driven decision-making that enhances overall Production standards.

1. **METHODOLOGY**

The proposed Intelligent Quality Management System (IQMS) will employ a combination of data integration, predictive modeling, and real-time Analytics to enhance quality management in smartphone assembly lines. The method begins with the integration of data from multiple sources, Including machine sensors, operator performance metrics, and environmental conditions, which will be collected and stored in a centralized Database. This data will then be pre-processed to eliminate noise and ensure consistency. The core algorithm used will be linear regression, which Will analyze historical data to identify key quality determinants and their relationships with assembly parameters. By developing predictive models, The system will forecast potential defects in real-time, allowing for timely interventions. Additionally, the IQMS will implement a continuous Feedback loop to refine these predictive models based on new data inputs, ensuring that the system adapts to changes in the production Environment. This iterative process will enable the identification of trends and patterns, leading to ongoing improvements in the assembly process And enhanced overall product quality. Overall, the combination of these methods and algorithms will create a robust framework for effective Quality management in the rapidly evolving smartphone manufacturing landscape.

1. **MODELING AND ANALYSIS**

The proposed Intelligent Quality Management System (IQMS) for smartphone assembly lines aims to revolutionize the quality control process by Integrating advanced data analytics, predictive modeling, and real-time monitoring capabilities. This system addresses the limitations of existing Quality management practices by providing a comprehensive framework that enhances defect prediction, optimizes processes, and fosters a culture Of quality within the manufacturing environment. The IQMS will integrate data from various sources, such as machine sensors, environmental Conditions, and operator performance metrics, facilitating real-time monitoring of the assembly process to allow for immediate detection of Anomalies and quality deviations. By employing linear regression analysis, the system will develop predictive models that identify key quality Determinants and their relationships with assembly parameters, enabling manufacturers to forecast potential defects based on historical data Patterns and real-time inputs.

1. **RESULTS AND DISCUSSION**

The implementation of the Intelligent Quality Management System (IQMS) in smartphone assembly lines has yielded promising results, Significantly enhancing defect prediction and overall product quality. Preliminary analysis indicates that the use of linear regression for predictive Modeling has effectively identified key quality determinants, allowing manufacturers to forecast potential defects with a high degree of accuracy. Real-time data integration has enabled immediate detection of anomalies, resulting in a marked reduction in defective products and associated Rework costs. The continuous feedback loop established within the system has further refined the predictive models, ensuring they adapt to Evolving production conditions and maintain their effectiveness over time. Additionally, the training programs implemented alongside the IQMS Have fostered a culture of quality awareness among employees, leading to increased engagement and proactive participation in quality management Initiatives. Stakeholders have reported improved efficiency in assembly processes, with a notable decrease in production downtime and waste. Discussions with management highlight the system’s alignment with Industry 4.0 principles, showcasing its potential to revolutionize traditional Quality management practices by integrating advanced analytics and fostering a data-driven manufacturing environment. Overall, the results Demonstrate that the IQMS not only addresses existing quality challenges but also positions manufacturers for sustained competitive advantage in The dynamic smartphone market.

1. **CONCLUSION**

In conclusion, this intelligent quality management system, grounded in linear regression, proves highly effective in predicting, monitoring, and maintaining smartphone assembly quality. By continuously analyzing critical production variables, such as temperature, pressure, and assembly speed, the model forecasts quality metrics with significant accuracy, allowing for proactive adjustments to keep processes within desired quality thresholds. This capability not only reduces the frequency and severity of defects but also minimizes material waste, production downtime, and the reliance on manual quality inspections, leading to substantial cost savings.

Additionally, the system’s data-driven approach supports real-time, adaptive decision-making and promotes continuous improvement, creating a robust framework for responding to any shifts in production conditions. By ensuring consistent product quality and optimizing operational efficiency, this model aligns with the growing industry need for scalable, intelligent solutions in quality control. Ultimately, it showcases the transformative potential of machine learning applications in modern manufacturing, setting a new standard for quality management in high-precision assembly lines like smartphone production.

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