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**Pengembangan Sistem Manajemen Plant Factory Berbasis Enterprise Resource Planning Untuk Mendukung
Efisiensi Operasional dan Pengambilan Keputusan**
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PENGEMBANGAN SISTEM MANAJEMEN *PLANT FACTORY* BERBASIS *ENTERPRISE RESOURCE PLANNING* (ERP) UNTUK MENINGKATKAN EFISIENSI OPERASIONAL DAN DUKUNGAN KEPUTUSAN

INTISARI

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Pengelolaan data operasional pada Laboratorium *Plant Factory SmartAgri*, Fakultas Teknologi Pertanian, Universitas Gadjah Mada, sebelumnya masih dilakukan secara manual dan terpisah-pisah menggunakan pencatatan manual, lembar kerja lokal, serta aplikasi pesan instan, sehingga menimbulkan duplikasi data, kesulitan penelusuran riwayat produksi, serta lambatnya penyusunan laporan dan pengambilan keputusan. Penelitian ini bertujuan merancang dan membangun sistem manajemen *Plant Factory* berbasis *Enterprise Resource Planning* (ERP) yang terintegrasi menggunakan Google Spreadsheets, serta menguji fungsionalitas dan mengevaluasi kinerja sistem yang dikembangkan. Penelitian menggunakan pendekatan *Research and Development* (R&D) yang diadaptasi ke dalam model pengembangan sistem informasi, meliputi identifikasi masalah, pengumpulan data, analisis kebutuhan, perancangan sistem (*Entity Relationship Diagram* serta basis data dengan mekanisme *primary key* dan *foreign key*), implementasi, dan pengujian. Sistem yang dihasilkan terdiri atas delapan modul yang saling terintegrasi, yaitu *pf_activity*, *Order*, *Customers*, *Visit*, *Visitors*, *Human Resource*, *Financial Summary*, dan *Dashboard*, yang dihubungkan secara dinamis melalui kombinasi fungsi bawaan Google Spreadsheets seperti *XLOOKUP*, *FILTER*, *QUERY*, *SUMIFS*, dan *COUNTIFS* yang dipadukan dengan fitur *Data Validation*, *Conditional Formatting*, dan *Protected Range*. Pengujian fungsionalitas menggunakan metode *Blackbox testing* dengan teknik *Equivalence Partitioning* menunjukkan bahwa seluruh skenario uji pada kedelapan modul berstatus sesuai dengan hasil yang diharapkan (*test pass rate* 100%). Hasil tersebut menunjukkan bahwa sistem ERP berbasis Google Spreadsheets mampu mengintegrasikan seluruh data operasional dalam satu platform berbasis *cloud* sehingga meningkatkan efisiensi pengelolaan data, mengurangi risiko kesalahan pencatatan, dan mendukung pengambilan keputusan operasional maupun ilmiah pada *Plant Factory* secara lebih cepat dan akurat.

Kata kunci: *Blackbox testing*; *Enterprise Resource Planning* (ERP); *Google Spreadsheets*; *Plant Factory*; sistem informasi manajemen

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DEVELOPMENT OF AN ENTERPRISE RESOURCE PLANNING (ERP) BASED PLANT FACTORY MANAGEMENT TO IMPROVE OPERATIONAL EFFICIENCY AND SUPPORT DECISION MAKING

ABSTRACT

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Operational data management at the SmartAgri Plant Factory Laboratory, Faculty of Agricultural Technology, Universitas Gadjah Mada, was previously carried out manually and in a fragmented manner using manual records, local spreadsheets, and instant-messaging applications, resulting in data duplication, difficulty in tracing production records, and slow report preparation and decision-making. This study aims to design and develop an integrated Plant Factory management system based on Enterprise Resource Planning (ERP) using Google Spreadsheets, and to test its functionality and evaluate its performance. The study applied a Research and Development (R&D) approach adapted into an information-system development model, comprising problem identification, data collection, requirements analysis, system design (an Entity Relationship Diagram and a database using a primary key and foreign key mechanism), implementation, and testing. The resulting system consists of eight integrated modules, namely pf_activity, Order, Customers, Visit, Visitors, Human Resource, Financial Summary, and Dashboard, which are dynamically linked through a combination of built-in Google Spreadsheets functions such as XLOOKUP, FILTER, QUERY, SUMIFS, and COUNTIFS, combined with Data Validation, Conditional Formatting, and Protected Range features. Functional testing using the Blackbox testing method with an Equivalence Partitioningg technique showed that all test scenarios across the eight modules conformed to the expected results (100% test pass rate). These results indicate that the Google Spreadsheets-based ERP system is able to integrate all operational data into a single cloud-based platform, thereby improving data-management efficiency, reducing recording errors, and supporting faster and more accurate operational and scientific decision-making at the Plant Factory.

Keywords: Blackbox testing; Enterprise Resource Planning; Google Spreadsheets; management information system; Plant Factory.