PERFORMANCE INDEX MANAGEMENT SYSTEM FOR HYDROPOWER PLANTS

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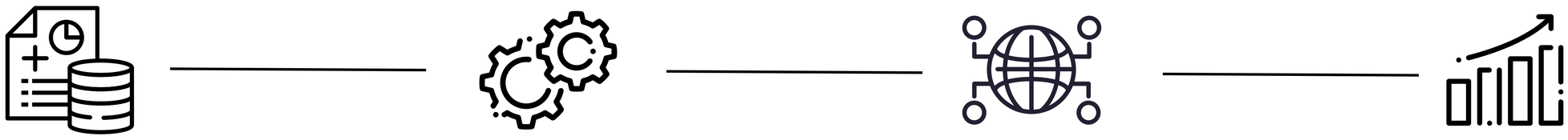
ABSTRACT

THIS PROJECT AIMS TO DEVELOP AND ENHANCE THE DATA VISUALIZATION SYSTEM FOR THE PERFORMANCE INDEX(PI) OF THE BHUMIBOL DAM HYDROPOWER PLANT, ELECTRICITY GENERATING AUTHORITY OF THAILAND (EGAT). THE EXISTING SYSTEM CODE HAS BEEN UPGRADED TO SUPPORT DATA PROVIDED BY THE OPERATION TEAM, ALONG WITH THE DESIGN AND DEVELOPMENT OF A DASHBOARD THAT PRESENTS INFORMATION IN GRAPHICAL FORMATS THAT ARE EASY FOR MANAGEMENT TO INTERPRET. IN ADDITION, AN A PERFORMANCE INDEX HAS BEENDESIGNED TO ENABLE DATA INTEGRATION ACROSS DIFFERENT DEPARTMENTS WITHIN THE ORGANIZATION, ENSURING SYSTEMATIC AND EFFICIENT DATA MANAGEMENT. THE OUTCOMES OF THE PROJECT CONTRIBUTE TO FASTER DATA ACCESSIBILITY, REDUCED WORKLOAD IN REPORT PREPARATION, AND MORE EFFECTIVE MANAGERIAL DECISION-MAKING.

INTRODUCTION

CURRENTLY, PERFORMANCE INDEX (PI) MANAGEMENT AT BHUMIBOL DAM FACES SIGNIFICANT CHALLENGES DUE TO FRAGMENTED DATA STORAGE IN EXCEL FILES AND ISOLATED INTERNAL DOCUMENTS, LEADING TO TIME-CONSUMING COLLECTION AND HIGH REDUNDANCY. FURTHERMORE, THE CALCULATION OF 22 KEY INDICES REMAINS SEMI-MANUAL, POSING A RISK OF HUMAN ERROR AND HINDERING EFFECTIVE MANAGERIAL INTERPRETATION. THIS PROJECT ADDRESSES THESE ISSUES BY IMPLEMENTING A CENTRALIZED DATABASE ARCHITECTURE, AN AUTOMATED PROCESSING ENGINE, AND INTER-DEPARTMENTAL API CONNECTIVITY . BY INTEGRATING THESE WITH AN INTERACTIVE DASHBOARD, THE SYSTEM TRANSFORMS COMPLEX TECHNICAL DATA INTO ACTIONABLE INSIGHTS, ENABLING REAL-TIME PERFORMANCE MONITORING AND MORE PRECISE STRATEGIC DECISION-MAKING.

METHODOLOGY



PHASE 1: DATA RESTRUCTURING
ANALYZED DATA FLOW TO ELIMINATE REDUNDANCY AND DESIGNED A RELATIONAL DATABASE FOR MONTHLY PERFORMANCE INDICES.

PHASE 2: PROCESSING ENGINE
AUTOMATED KPI CALCULATIONS VIA PHP AND OPTIMIZED HISTORICAL RETRIEVAL USING MYSQL STORED PROCEDURES.

PHASE 3: SYSTEM INTEGRATION
DEVELOPED RESTFUL APIS (JSON) FOR INTER-DEPARTMENTAL DATA EXCHANGE WITH TOKEN-BASED AUTHENTICATION.

PHASE 4: UX/UI DASHBOARD
DESIGNED A USER-CENTERED DASHBOARD FEATURING 4 INTERACTIVE CHART TYPES FOR 10-YEAR HISTORICAL ANALYSIS AND TREND FORECASTING.

TECHNOLOGY

FRONTEND DEVELOPMENT

HTML5 · Node.js · Chart.js

BACKEND DEVELOPMENT

PHP · jQuery

DATABASE MANAGEMENT

MySQL

TOOLS & INFRASTRUCTURE

POSTMAN · Docker · Visual Studio Code

CONCLUSION

THE DEVELOPMENT OF THE PERFORMANCE INDEX MANAGEMENT SYSTEM SUCCESSFULLY TRANSFORMS THE POWER PLANT'S DATA OPERATIONS BY ADDRESSING REDUNDANCY AND PROCESSING DELAYS. BY REPLACING MANUAL WORKFLOWS WITH A CENTRALIZED DATABASE AND AN AUTOMATED PROCESSING ENGINE, THE PROJECT ACHIEVED A SIGNIFICANT LEAP IN OPERATIONAL EFFICIENCY AND DATA INTEGRITY. THE INTEGRATION OF INTERACTIVE DASHBOARDS AND RESTFUL APIS PROVIDES MANAGEMENT WITH A POWERFUL TOOL FOR SYSTEMATIC MONITORING AND ENHANCED INTER-DEPARTMENTAL COORDINATION. DESIGNED WITH SCALABILITY IN MIND, THE SYSTEM ARCHITECTURE IS READY FOR FUTURE EXPANSIONS, INCLUDING THE INTEGRATION OF MACHINE LEARNING TO PREDICT EQUIPMENT BEHAVIOR AND PERFORMANCE TRENDS.