

WORKFLOW OPTIMIZATION IN ENGINEERING DOCUMENT MANAGEMENT USING MTC DIGITAL TRANSMITTAL SYSTEM

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Abstract: Document transmittal plays a critical role in engineering projects, ensuring that drawings and technical documents are formally submitted and reviewed. However, many organizations still rely on email and shared folders, leading to revision confusion, scattered records, delayed approvals, and limited traceability. To address these issues, this project develops the MTC Engineering Transmittal System, a web-based platform that centralizes document submission and approval workflows. The system supports file upload, revision tracking, QC checking, approval routing, audit logging, and reporting, with clearly defined user roles. Developed using a structured methodology and supported by system modelling and testing, the platform enhances document visibility, reduces approval delays, and improves accountability in engineering document control processes.

Keywords: Document Transmittal, Document Management System, Workflow Automation, Revision Control, Engineering Projects, Web-Based System, Information Systems

Introduction

System Background and Context

Engineering organizations manage large volumes of technical documents such as drawings, specifications, reports, and correspondence that must be formally submitted and reviewed through a document transmittal process (Sprague Jr, 1995). A transmittal provides an official record of what document was sent, by whom, to whom, at which revision, and for what purpose, ensuring accountability and clear communication. At MTC Engineering Sdn. Bhd., transmittals are currently managed through email and shared folders. While functional at a basic level, this method lacks centralized tracking and structured workflow control. Revision history, approval

decisions, and submission timelines are often scattered, making monitoring and auditing difficult as project complexity increases. To address these challenges, this project proposes the MTC Engineering Transmittal System, a web-based platform that centralizes and automates the document transmittal lifecycle. The system incorporates structured databases, workflow automation, role-based access control, and audit logging to improve document control efficiency and transparency. This project also aligns with the objectives of the Information Systems Management program by applying academic system development principles to solve a real-world organizational problem.

Problem Statements

MTC Engineering currently manages document transmittals through email communication and manual recordkeeping, which creates operational inefficiencies and risks (Waugh, 2022). The absence of a centralized system results in fragmented workflows, limited document tracking, poor visibility of submission status, version conflicts, record duplication, and delayed approvals (Hagström et al., 2023; Olakotan et al., 2025). Since approval decisions and revision histories are not systematically recorded, the process becomes time-consuming, error-prone, and difficult to audit. These challenges highlight the need for a digitized and automated transmittal system to improve efficiency, accuracy, and traceability throughout the document lifecycle.

System Objectives

The overall objective of this project is to develop a web-based transmittal management system that facilitates efficient submissions, tracking, and approvals of documents within MTC Engineering Sdn. Bhd.

1. To design and implement a digital transmittal management system
2. To automate the entire process of document submission, review, approval, and tracking, enhancing operational efficiency and data accuracy
3. To integrate role-based access control for different user categories such as administrators, engineers, and document controllers
4. To enhance interdepartmental communication and accountability through a centralized, transparent digital workflow

Scope

This project focuses on developing a web-based internal transmittal management system for MTC Engineering that supports the complete document transmittal lifecycle, including submission, revision control, QC checking, approval workflow, audit logging, and reporting. The system operates within an internal organizational environment and is limited to system design, development, and functional testing, without integration with external enterprise or cloud systems.

System Scope

The system covers core modules such as user authentication, role management, project setup, document upload, revision tracking, approval routing, audit logging, and report generation. It is designed as a centralized platform to structure and automate document control processes within the organization.

User Scope

The system supports four main user roles: administrators, document controllers, engineers, and clients. Administrators manage users and projects, document controllers handle transmittals and

QC checks, engineers submit and revise documents, and clients review approved transmittals. Each role is assigned specific access rights based on operational responsibilities. To ensure the acceptance of all stakeholders, data was also collected from each stakeholder before the actual system development process; and this technique enables the project team to get an accurate overview of the system users and stakeholders and eliminating resistance to change.

Literature Review

Document Management Systems (DMS) and digital records platforms have become essential as organizations manage increasing volumes of documents, particularly in engineering environments where accuracy, revision control, and approval traceability are critical (Oladejo & Hadžidedić, 2021). Traditional paper-based and email-driven approaches are widely regarded as inefficient and prone to errors compared to centralized digital systems (Shonubi, 2025; Szedmak et al., 2025; Tate & Smallwood, 2021). Research shows that electronic document systems improve accessibility, reduce duplication, enhance audit readiness, and strengthen operational transparency through structured databases and workflow automation (Manek & Mosweu, 2022; Mosweu & Bwalya, 2023; Ngoepe et al., 2021).

Workflow automation further improves efficiency by embedding approval routing, status tracking, and notification mechanisms directly into the system, reducing delays and increasing accountability through logged and time-stamped actions (Georgakopoulos et al., 1995; Rosman et al., 2020; Stohr & Zhao, 2001; Zayas-Cabán et al., 2021). In engineering and construction sectors, structured transmittal workflows, revision control, and audit trails are considered critical success factors (Dubey & Dubey, 2025; Gavinelli, 2024; Mohamad Rosman & Abdul Aziz, 2018; Rosman, 2020a, 2020b; Van Wormer & Larkin, 2017). Studies also emphasize that usability and role-focused interfaces are key to successful system adoption (Islam et al., 2024; Mazzotti et al., 2022; Winarno et al., 2025). Overall, the literature strongly supports transitioning from fragmented email-based document handling to centralized, workflow-managed systems—an approach reflected in the design of the MTC Engineering Transmittal System. Moreover, system adoption is also a topic that has been previously discussed in the literature of information systems, and it certainly contributed to the success of an organization.

Benchmarking

Table 1 shows the benchmarking analysis of the proposed system against the established application in the market. It can be deduced that the new proposed system is capable to fulfil the needs of the general enterprise user, while offering a similar performance to the existing software.

Table 1: Benchmarking Analysis

Features	Aconex (Oracle)	SharePoint DMS	Proposed MTC Transmittal System
Target Users	Engineering & Construction Firms	General Enterprise Users	General Enterprise Users
Features	Transmittal management, workflow automation, approval routing	File versioning, document sharing, workflow integration	Digital transmittal creation, approval workflow, centralized storage

Document Tracking & Version Control	Advanced revision control with audit trail	Version history and restore points	Integrated tracking by status, revision number, and submission date
Customizability	Limited (predefined templates)	High (customizable sites)	High (database-driven fields and user roles)
Offline Access	No	Yes (via sync client)	No (web-based)
User Interface	Professional but complex	Familiar Microsoft UI	Streamlined and focused for internal use
Ease of Setup	Difficult (requires training)	Moderate	Easy (local web server setup)
Security	Enterprise-grade SSL, audit logs	Strong (Active Directory auth)	Secure (login-based access)
Performance	High (cloud-optimized)	Moderate	High (lightweight and responsive)
Usability	Moderate (steep learning curve)	High	High (minimal training required)

Discussion and Conclusion

This paper is intended to establish a new transmittal system in an attempt to improve operational efficiency and encourage collaborative work among the employees. A design artefact was established, operated, and evaluated as a result of the rigorous development process. The new system was able to prevent duplication and confusion of engineering revisions, streamline the workflow, and enable better coordination between different departments.

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