Optimizing Academic Document Requests: Manual to Automated Addressing Transparency with Work Study and Measurement

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***Abstract*: This study aimed to improve the manual document request and processing system of the College of Engineering and Architecture (CEA) at the University of the Assumption through the development of a Document Tracking System (DTS). The existing process relied on paper-based and manual procedures, resulting in delays, repetitive follow-ups, lack of transparency, and inefficient workflow management. The study sought to establish the standard processing time of the current system, identify workflow bottlenecks, and develop a digital solution to enhance operational efficiency and accountability. A mixed-methods design was utilized, applying Industrial Engineering tools such as Time and Motion Study, process mapping, DMAIC framework, and survey analysis. Data were collected through direct observation, interviews, and a survey involving 277 student respondents selected using Slovin's Formula. Findings showed an average cycle time of 12.07 seconds, with a computed Normal Time of 1.73 seconds and Standard Time of 1.94 seconds. Results also revealed that approximately 70% of the secretary's workload was consumed by manual follow-ups and status inquiries. Based on these findings, a web-based DTS featuring real-time tracking and automated notifications was proposed. The system is expected to reduce inquiries, improve transparency, minimize delays, and enhance overall efficiency and user satisfaction in document processing. Full implementation and continuous improvement are recommended for sustained operational gains.**

***Keywords*: Academic Institution, Automation, Document Tracking System, Digital Transformation, Work Study and Measurement.**

1. Introduction

Academic institutions handle a massive volume of physical documents daily, including student records, administrative communications, academic reports, procurement files, and internal memoranda. Despite rapid advancements in modern information technology and digital enterprise solutions, a significant number of educational facilities continue to operate using manual or semi-manual workflows. These traditional document processing models inherently suffer from significant administrative issues, including extensive turnaround delays, fragmented filing, high rates of human error, missing documentation, and a severe deficiency in operational transparency. Within the context of higher education, these operational inefficiencies frequently disrupt student service quality and undermine administrative accountability. In modern university management, addressing these issues is crucial for successful digital transformation.

At the University of the Assumption, the College of Engineering and Architecture (CEA) serves as a key academic department offering undergraduate degrees in Civil Engineering, Architecture, Industrial Engineering, and Computer Engineering. The operational core of this college relies heavily on the administrative office, where the CEA Department Secretary manages records, scheduling, accreditation paperwork, internship files, and student requests. Under the traditional "As-Is" system, students requiring academic records, such as Enrollment Assessment Forms (EAFs), shifting slips, add/drop slips, overload permits, and course descriptions, must physically visit the department office, fill out physical application forms, and coordinate across multiple campus locations.

Because the current process lacks a centralized digital interface, students have no visibility into the current queue, physical location, or processing status of their requested files. Consequently, students must perform repetitive physical and phone follow-ups to ascertain when their documents will be ready. This causes extensive office crowding, student anxiety, and long waiting times.

Furthermore, the existing operational workflow has created a major administrative imbalance for the department staff. The secretary's operational workload is currently unstandardized and unmeasured, lacking established baseline metrics or standard processing times. Without structured time standards, it is difficult to accurately measure staff productivity, balance workloads, or identify operational bottlenecks. Instead, the department operates under an ad-hoc system susceptible to operational drift and unpredictable processing backlogs. Initial interviews and exploratory evaluations revealed that

approximately 70% of the department secretary's daily office hours are lost to answering routine student inquiries and physical status follow-ups in peak seasons. This severely limits the time available for core clerical duties and strategic accreditation tasks.

This administrative situation highlights a clear research gap in institutional operations: the lack of an optimized, data-driven framework that integrates Industrial Engineering (IE) work study and measurement with modern software solutions within university departments. While large-scale institutional software often focuses on university-wide enrollment or high-level financial accounting, department-level workflows are frequently left dependent on manual paper records and basic spreadsheets. This research addresses this gap by applying Industrial Engineering principles, specifically process mapping, Time and Motion Studies, and the principles of Motion Economy, to evaluate the manual document request workflow at the CEA. By establishing precise baseline processing metrics, this study designs and implements a low-code web-based Document Tracking System (DTS) to automate tracking and optimize administrative tasks.

The main objective of this study is to modernize document processing within the CEA department by introducing a centralized digital tracking framework that enhances efficiency, operational transparency, and data security. The specific objectives include analyzing the existing manual document routing procedures to map structural inefficiencies; applying Motion Economy principles to design an optimized secretary dashboard that minimizes digital actions and cognitive load ; developing a digital Document Tracking System (DTS) that eliminates physical paper forms ; reducing waiting times and student follow-ups by implementing real-time status tracking ; and providing clear, automated instructions to manage office student traffic and eliminate congestion.

By achieving these objectives, this capstone research establishes a practical model for transition from manual to digital administration. This approach helps minimize administrative waste and optimizes service delivery in academic settings. It provides an actionable blueprint for university-wide digital transformation.

2. Literature Review

The modernization of academic administration requires integrating core Industrial Engineering (IE) concepts with modern digital solutions to streamline workflows and optimize resource allocation. Historically, higher education institutions have updated their administrative processes in response to global crises, such as the shifting modalities forced by the COVID-19 pandemic. However, sustainable progress requires a proactive approach that matches the digital communication expectations of modern student populations. Many international campuses have adopted "Smart Campus" strategies, utilizing web platforms, barcode tracking, and QR codes to eliminate redundant operations, minimize processing steps, and provide students with remote, real-time status tracking.

Optimizing document workflows is a central application of Lean Operations, which focuses on the efficient use of institutional resources to establish smooth service flows without administrative disruptions. Lean practices utilize tools such as process mapping, task simplification, and workload balancing to eliminate non-value-added activities and replace them with visual management indicators. To design these workflows efficiently, organizations rely on traditional Work Study techniques. Work study involves work simplification, method standardization, and precise task measurement to optimize the use of materials, equipment, manpower, and capital.

A core component of work study is Work Measurement, defined as the quantitative evaluation of an administrative task to determine the exact time required for a qualified worker to complete it. In system development, work measurement metrics help establish operational baselines, assess staff productivity, and set institutional performance standards.

At the core of any digital tracking solution is data structure and management. Data serves as the basic representation of specific attributes describing organizational entities, such as student identifiers, class schedules, or document statuses. Managing these data structures effectively requires a Database Management System (DBMS). A DBMS is a specialized software environment designed to create, maintain, update, and access large volumes of data while ensuring structural integrity, access control, and information security.

Traditional spreadsheets can store data but lack the relational architecture and complex querying capabilities needed for real-time tracking across multiple departments. A dedicated DTS leverages a relational DBMS to ensure information traceability, moving administrative operations from a person-dependent model to a system-driven framework.

Developing and deploying a DBMS-backed tracking platform requires a structured Software Development Life Cycle (SDLC). This process includes requirement analysis, architectural system design, frontend and backend implementation, system testing, deployment, and long-term user maintenance. System architecture is divided into the frontend interface and the backend server. The frontend comprises the client-side graphical user interface (GUI) that students and staff interact with via web browsers or mobile devices. The backend acts as the server-side architecture that manages data validation, routes tracking data, and processes security authentication.

During development, engineers define functional requirements, which outline how the software executes specific inputs (often recorded as user use cases). Non-functional requirements specify systemic quality attributes, including platform security, maintainability, reliability, scalability, and structural reusability.

To address transparency gaps in traditional systems, modern web platforms often incorporate a Linear Timeline User Interface. Timelines present chronological information along a

linear axis, making complex workflows easy for users to understand. Implementing a visual timeline directly addresses the information asymmetry that causes student anxiety and routine inquiries. By assigning a unique digital tracking ID to every submitted request, the system tracks document movement through major milestones: Verification, Processing, Claiming, and Completed.

[Stage 1: Verification] ➔ [Stage 2: Processing] ➔ [Stage 3: Claiming] ➔ [Stage 4: Completed]

Finally, security and access control are critical when handling sensitive student records. System security relies on structured authentication processes. Users enter credentials into an input device, which transfers the digital data to Random Access Memory (RAM) to compare against data stored within an authentication database. If the credentials match, access is granted.

To protect administrative systems against unauthorized entry and dictionary-based cyber threats, organizations enforce strong password policies. Security practices recommend constructing passwords from randomized letter phrases, numbers, and punctuation marks rather than simple dictionary terms. This ensures information security and complies with data privacy regulations.

3. Methodology

This study utilized a mixed-methods research design, combining quantitative-descriptive tools with qualitative insights to analyze and optimize the document request process at the CEA department. Mixed-methods research integrates numerical data with qualitative analysis within a single study to enhance the depth and validity of the findings. The quantitative component focused on measuring cycle times, computing standard labor times, and analyzing statistical survey feedback to assess operational efficiency. The qualitative component used interviews with administrative staff to document specific operational bottlenecks, user difficulties, and procedural constraints.

The conceptual foundation of this study is structured around the traditional Input-Process-Output (IPO) model.

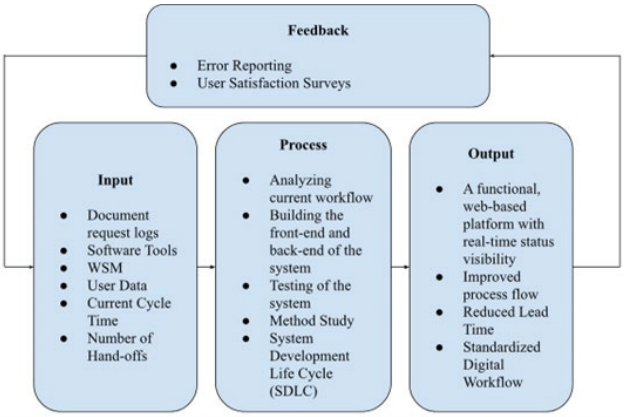


Fig. 1. IPO

This framework provides a systematic approach for transforming baseline manual metrics into an optimized digital architecture. The data collection and engineering optimization phases were structured using the DMAIC framework (Define, Measure, Analyze, Improve, Control), a core Industrial Engineering toolset for process improvement.

Define: The project began by defining the "Transparency Bottleneck" within the CEA office, where manual systems caused extensive delays and repeated status inquiries. The project scope was limited to document types handled directly at the departmental level, such as Class Schedules, Enrollment Assessment Forms (EAFs), Shifting Forms, Add/Drop Slips, Overload Permits, Course Descriptions, and OJT files.

Measure: To quantify the operational baseline, the researchers conducted direct observations and a Time and Motion Study of the department secretary's tasks. A digital stopwatch and standardized observation sheets were used over 10 direct trials to record the cycle times of core document handling tasks, including verification, record retrieval, printing, and file releasing.

Analyze: The collected time metrics were analyzed to calculate Normal Time (NT) and Standard Time (ST). The Normal Time was calculated by multiplying the observed average cycle time (ACT) by the worker performance rating (PR), determined using the Westinghouse Rating System to account for skill, effort, environmental conditions, and task consistency:

- $NT = ACT * (100 + PR /100)$

To ensure the calculated standard metrics match real-world working conditions, total allowances (A), comprising constant factors for fatigue, personal needs, standing requirements, and cognitive strain, were added to the Normal Time. The final Standard Time was determined using the following formula:

- $ST = NT/(1-A)$

Gap analysis was then performed to compare these baseline metrics against the processing capacity of an automated system.

Improve: This phase focused on designing and implementing the digital Document Tracking System (DTS) using a low-code software stack to ensure rapid development and deployment. Relational database tables were constructed using Airtable at the backend to handle student data and request logs. The frontend user interface was developed using Softr, creating a secure web portal split into a student interface and an administrative dashboard designed around Motion Economy principles.

Control: To sustain these operational improvements, the researchers developed a detailed Standard Operating Procedure (SOP). Student adoption and platform usability were evaluated using structural feedback surveys.

The study population consisted of 872 students enrolled within the CEA department. To determine a statistically representative sample size, Slovin's Formula was applied with a 95% confidence interval and a 5% margin of error (e = 0.05):

- $n = N / (1 + Ne^2)$

To account for potential survey non-response, a total of 277 student respondents were surveyed using a 5-point Likert-scale research instrument. The gathered survey data were compiled and evaluated using descriptive statistical tools to measure user satisfaction and systemic bottlenecks.

4. Result

Time and Motion Studies, secretary workflow interviews, and student usability surveys. These findings are supported by structured tables and visual data figures.

Table 1

EAF (As-is)							
		Elements	Cycle Time (Sec.)	NCT List	Data Clean Up		
Westinghouse		1	2.41				
Rating System	(Skills)	2	1.72		0.61	above 50	12.68
Rating Category	C1=0.06	3	1.28		0.30	below 25	11.77
Allowances:		4	2.23				
Constant	9	5	2.42			12.07x0.05	0.61
Standing	0	6	1.01			12.07x0.025	0.30
Abnormal Position	0	7	1.0				
Use of Force	0					12.07 + 0.61	12.68
Bad Light	2					12.07 - 0.30	11.77
Atmospheric Conditions	0	Total	12.07				
Close Attention	0						
Noise Level	0	MOT	1.7243				
Mental Strain	0		1.73	NT=	1.73*(100+0.06/100)		
Monotony	0				1.73 sec		
Tediousness	0			ST=	1.73/(1-0.11)		
Total	11				1.94 sec		

A. *Baseline Work Measurement and Time Analysis*

The initial Time and Motion Study evaluated the elemental task cycles of the manual document request process over 10 controlled trials.

The time study established an average physical processing cycle time of 12.07 seconds per basic task element once a document is actively processed. Incorporating the performance ratings and allowances resulted in a computed Normal Time of 1.73 seconds and a final Standard Time of 1.94 seconds for direct computer logging actions.

However, gap analysis revealed that the actual operational lead time for students ranges from 10 to 30 minutes per request due to non-value-added activities, including physical travel and frequent interruptions.

Data from staff interviews confirmed that 70% of the department secretary's office hours during peak seasons are consumed solely by managing repetitive physical inquiries and status follow-ups. This represents a significant bottleneck that reduces core administrative productivity.

B. *Analysis of Student Survey Data*

The survey evaluated the experiences of 272 student respondents regarding the performance, clarity, and transparency of the traditional document request system.

The survey data indicates a clear transparency gap: 75.3% of the student body reported a complete lack of operational visibility regarding their document requests. Additionally, 55.9% noted they are never informed of their document's

Table 2
Administrative interruptions and workload bottlenecks

Category of Operational Disturbance	Measured Frequency of Occurrence
Student Status Follow-up Inquiries	20+ occurrences per hour
Faculty & Staff Supply Requisitions	8 interactions per hour
Telephone Inquiries & Coordination	8-10 phone calls per hour
Signature Delays (Document Idle Time)	Varies from 2 mins to 24 hours

Table 3
Previous student request activity

Student Experience Metric Description	Sample Count (n=272)	Percentage Distribution (%)
Have previously requested academic documents from the office	269	98.9%
Have never requested documents from the office	3	1.1%

Table 4
Perceived inefficiencies and delays in manual processing

Perceived Experience Metric	Strongly Agree/ Agree (%)	Neutral (%)	Disagree (%)
Regularly experience significant operational delays	75.0%	15.4%	9.6%
Required to perform multiple physical follow-ups	35.7%	42.1%	22.2%
Process causes significant physical office overcrowding	91.9%	6.1%	2.0%

Table 5
Perceived risk of document loss and data

Perceived Likelihood of Administrative Errors	Total Response Count	Percentage Value (%)
High Perceived Risk of Human Error or Loss	224	82.3%
Neutral / Undecided	36	13.2%
Low Perceived Risk of Human Error or Loss	12	4.5%

Table 6
Evaluation of current system transparency levels

Transparency Level Rating (Scale 1–5)	Respondent Count	Percentage Value (%)
Rating 1 & 2 (Extremely Poor Transparency)	30	11.0%
Rating 3 (Moderate Transparency)	26	9.6%
Rating 4 & 5 (Severe Deficiency in Visibility)	216	79.4%

specific physical or administrative location during the processing cycle.

Overall, 96.3% of the student population agreed that transitioning to an automated web-based Document Tracking System would significantly enhance their academic experience and improve service delivery.

Table 7
Student support for automated routing

Perceived Benefit of Automated Digital Routing	Respondent Count	Percentage Value (%)
Strongly Agrees Routing Will Streamline Process	130	47.8%
Agrees Routing Will Streamline Process	80	29.4%
Neutral	48	17.6%
Disagree / Strongly Disagree	14	5.2%

Table 8
Perceived utility of a digital document tracking system

Level of Agreement on Implementing a DTS Platform	Student Count	Statistical Percentage (%)
Strongly Agree that DTS is highly advantageous	178	65.4%
Agree that DTS is highly advantageous	84	30.9%
Neutral	9	3.3%
Disagree	1	0.4%

5. Discussion

The empirical findings of this research confirm that traditional manual document workflows create significant operational friction, leading to a "Transparency Bottleneck" that negatively affects both student satisfaction and staff productivity. The Time and Motion Study established an elemental Standard Time of 1.94 seconds for core computer logging activities. However, the actual total turnaround time for document completion ranges from 10 to 30 minutes under normal operating conditions. This substantial difference indicates that operational delays are driven by administrative overhead, physical movement waste, and information silos rather than the core tasks themselves.

The data shows that a major cause of this inefficiency is physical movement waste. Under the manual system, the department secretary must physically leave the desk 2 to 3 times per document request to coordinate across campus offices, including the Dean's Office, Registrar, Finance Office, and the Records Management System (RMS). This physical movement creates a fragmented workflow.

Furthermore, because requests are recorded using a mix of physical paper logbooks and basic Google Sheets, students have no remote access to status information. This lack of transparency causes high volumes of status inquiries, with the secretary handling over 20 walk-in follow-ups and 8 to 10 phone calls per hour during peak academic periods. Answering these routine inquiries consumes approximately 70% of the secretary's daily office hours, creating a major operational bottleneck.

To resolve these inefficiencies, this study developed an automated web-based Document Tracking System (DTS) designed around the principles of Motion Economy and visual management. The platform integrates a relational backend database with a secure frontend interface, standardizing data input and eliminating physical paperwork.

Table 9
System integration architecture and functional software stack

Architectural System Component	Low-Code Technology Platform	Core Applied Industrial Engineering (IE) Design Logic
Backend Relational Database	Airtable Environment	Centralizes data storage to eliminate information silos and physical logbooks.
Frontend User Interface	Softr Development	Implements specific Student and Admin interfaces designed around Motion Economy.
Visual Progress Monitoring	Linear Timeline UI	Closes the Transparency Gap by providing real-time visibility into document status.
Error-Proofi ng Station	Poka-Yoke Automation	Monitors daily queue capacity and hides the input form once thresholds are reached.
Rapid Collection Interface	Integrated QR Scanning	Minimizes manual data retrieval times during physical document collection.

Table 10
Gap analysis matrix of manual vs. automated processing performance

Measured Operational Performanc e Metric	Traditional Manual Workflow Baseline	Optimized Digital DTS Framework	Net Operational Gain / Improvement
Average Total Request Lead Time	10 to 30 minutes per file	5 to 15 minutes per file	50% Reduction in Lead Time
Weekly Staff Time Consumed by Inquiries	28.0 Hours / Week	2.8 Hours / Week	25.2 Hours Saved / Week

The implementation of the DTS significantly improves operational performance, as shown by the comparative metrics in Table 10.

By replacing manual tracking with a digital timeline interface, the DTS provides complete visibility into document processing stages: Verification, Processing, Claiming, and Completed. This visual system directly addresses the information gaps identified by 75.3% of students, reducing the need for physical office visits by up to 83.8%. Automated status updates via email and SMS reduce routine student inquiries by

90%, lowering weekly inquiry management time from 28 hours down to 2.8 hours. This saves 25.2 hours per week, allowing department staff to reallocate time to core clerical work and quality accreditation tasks.

Additionally, the system acts as a digital Standard Operating Procedure (SOP), reducing process variation and mitigating the risk of document loss reported by 82.3% of respondents. Automated features, such as QR-code scanning and First-In, First-Out (FIFO) scheduling, reduce administrative decision-making time and speed up collection workflows.

From an institutional perspective, the DTS aligns the university with modern digital administrative standards, improving document security, workflow consistency, and data governance. The successful deployment of this low-code platform shows that department-level inefficiencies can be effectively resolved using targeted, data-driven software solutions.

6. Conclusion

This study successfully evaluated, mapped, and optimized the manual document request and processing system within the College of Engineering and Architecture (CEA) at the University of the Assumption. By combining traditional Industrial Engineering work measurement with low-code software development, the researchers addressed a clear operational gap in department-level academic administration. The baseline Time and Motion Study quantified a task Standard Time of 1.94 seconds, while confirming that manual tracking methods and physical movement waste caused significant delays, ranging from 10 to 30 minutes per request. These manual processes left approximately 70% of the department secretary's daily office hours consumed by routine status inquiries, creating a major operational bottleneck and causing physical office overcrowding. Survey data from 277 students confirmed a substantial transparency gap, with 75.3% of respondents reporting a complete lack of visibility into the status of their requests.

The development and implementation of the web-based Document Tracking System (DTS) effectively resolved these operational inefficiencies. By providing a linear timeline interface and automated email/SMS status notifications, the platform eliminated information silos and reduced routine inquiries by up to 90%. This digital transformation reduced total process lead times by 50% and saved 25.2 hours of administrative work per week, allowing staff to focus on core clerical duties and institutional quality assurance tasks. Furthermore, the system acts as an enforced digital Standard Operating Procedure (SOP), ensuring consistent processing times, reducing human error, and improving document security and compliance. Ultimately, the project achieved its objectives, transforming a high-friction, manual process into an efficient, transparent, and data-driven digital workflow.

Based onthese findings, the following recommendations are proposed to ensure continuous operational improvement and system sustainability:

Centralized Institutional Policy: The CEA administration should establish clear regulations requiring all students to use the digital portal for document requests, supported by user guides to ensure consistent system adoption.

Institutional Scaling: The university should expand this digital framework from the departmental level to the institutional level (CEA to UA), integrating the system with the University Registrar and the Finance Office to establish a unified document processing network.

Advanced Notification Systems: Future system updates should incorporate direct transactional SMS gateways into the automated routing workflow to ensure real-time updates regardless of internet connectivity.

Long-Term Usability Evaluations: Future researchers should conduct post-implementation studies to assess long-term user satisfaction, platform scalability under high workloads, and system usability.

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