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From Records to Evidence: A KPI System and Value Stream Map for Continuous Improvement in University Document Management

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Abstract: This paper designs and applies a measurement system for university document management that integrates Value Stream Mapping, Microsoft 365 logs, and continuous improvement. The corpus covers 155 days of provisioning observation and 17 days of migration logs. Time per site decreased from approximately 180 to 5 minutes (97.2%), while capacity increased from 10–15 to more than 150 sites per day. Nineteen CSV files contain 70 events: 37 SIMULATED, 19 COPIED, and 14 ERROR; this distribution is not interpreted as a failure rate due to mixing simulations and retries. Eighteen KPIs are defined, distinguishing between the two observed comparative indicators and the record-level indicators that remain NR (Not Reported). Measuring BPMN links capture, pseudonymization, analytics, and PDCA decision-making. The core contribution is a reproducible method that avoids attributing results to the system without a denominator or comparable time window.

Keywords: Key Performance Indicators; Value Stream Mapping; Continuous Improvement; Power BI; Document Management

Introduction

A document platform can be available and yet fail to improve service quality. Users may continue sending email attachments, omitting metadata, duplicating records, or waiting for approvals outside the system. The number of migrated documents is an output, not a measure of value. Evaluation must examine the complete end-to-end journey from the user's initial need to the verifiable evidence, incorporating dimensions of time, quality, risk, and user experience. Value Stream Mapping (VSM) makes it possible to visualize activities, wait times, handoffs, and the information required to deliver a service. Applying VSM to university administrative processes helps identify waste and leverage the benefits of Lean Office principles; empirical studies in public universities show that VSM serves as a practical starting point for sustainable improvements [11]. However, a value stream map loses relevance if treated as an isolated workshop exercise. The strategic opportunity presented by Microsoft 365 is to transform operational events into continuous measurement. The objective of this study is to design a KPI system and a continuous improvement protocol for document management at PUCE Esmeraldas. This research addresses three main questions: (Q1) Which indicators accurately represent value, flow, quality, adoption, and control? (Q2) How can these metrics be extracted without creating invasive surveillance or requiring manual calculations? and (Q3) How can they be effectively linked to continuous improvement decision-making? The primary contribution is a measurement artifact that integrates VSM, an operational event model, an analytical dashboard, and the Plan-Do-Check-Act (PDCA) cycle. Fundamentals Value and Flow Efficiency In a document service, value means that an authorized individual retrieves complete, current, and intelligible evidence precisely when needed. Activities that transform or verify the record add value; conversely, waiting periods, duplicate data entry, repeated searches, unnecessary transfers, over-approval, and error correction represent waste. Process Cycle Efficiency (PCE) measures the ratio of effective processing time to total elapsed time. A low PCE indicates that automating an isolated task will not resolve the overall operational bottleneck. Service quality encompasses key attributes valued in higher education: reliability, access, responsiveness, communication, and self-service convenience [13]. Consequently, management dashboards must look beyond speed alone, incorporating comprehensive indicators for completeness, security, user satisfaction, and record retention. From technical logs to indicators An indicator is reproducible when its definition specifies purpose, formula, unit, granularity, filters, source, frequency, responsible party, threshold, and action. Without these conditions, two analysts can produce different figures from the same system. The information systems success model distinguishes system quality, information quality, use, satisfaction, and impacts; this multidimensionality guides the dashboard [8]. Telemetry must be designed around the flow. Each record requires a stable identifier and each transition into an event with a timestamp, previous state, new state, result, and exception code. Personal names are not necessary for most analyses; a pseudonymous identifier and the responsible unit are usually sufficient.

Methodology

Design science is employed across three iterations: relevance (problems and decisions), design (map, data, indicators, and dashboard), and evaluation (validity, usefulness, and sensitivity). The unit of analysis is the provisioning or migration event and, for the prospective phase, the record per document family. The provisioning observation covered 155 calendar days (March 4–August 5, 2026); detailed migration logs covered 17 days (July 20–August 5, 2026). The absence of a pre-intervention series per record prevents estimating PCE, FTR, or document SLA at this stage. For each family, a workshop is held with users, owners, and administrators. The start and end points are defined; handoffs are counted; processing time (T_p) is separated from wait time (T_q); defects and decisions are identified; and current and future states are mapped. The map is validated using a sample of records and log observations, not solely by workshop consensus. Impact evaluation must prespecify hypotheses and temporal units. If sufficient observations exist, an interrupted time series design is recommended; for comparable pairs, a t-test or Wilcoxon test according to distribution, absolute and relative differences, confidence intervals, and effect size. Changes in quality should not be hidden behind average time metrics: FTR, rework, and exceptions are reported simultaneously. 3.1 Periods, corpus, and evidence traceability The quantitative provisioning intervention was observed from March 4 to August 5, 2026 (155 calendar days). The migration log sub corpus covers July 20 to August 5, 2026, inclusive (17 days). For the governance analysis, the document review was extended until August 22, 2026 (172 days from the start). These windows are declared separately to avoid attributing metrics captured exclusively in the July–August logs to the entire project. Source traceability and pseudonymization were applied. The publishable corpus contains no administrative emails, application identifiers, usernames, secrets, private file paths, or tenant object identifiers. Data that do not appear in export files or verifiable logs are marked as not reported (NR), rather than being imputed.

Table 1. Technical Evidence Corpus and Traceability Matrix

ID	Verified evidence	Period / version	Scientific use
E01	Master provisioning script (950 lines; SHA-256 AAE76A1261608DA2...)	Aug 5, 2026	Architecture, objects, and implemented functions
E02	Migration engine (698 lines; SHA-256 BE078FBFA5F9A5CC...)	Jul 30, 2026	Simulation, execution, resumption, and reconciliation
E03	Technical README and local configuration	PowerShell 7.6.4; PnP.PowerShell 3.1.0	Operational requirements, parameters, and controls
E04	19 CSV files with 70 events	Jul 20 to Aug 5, 2026	State distribution and migration scope
E05	Provisioning measurement log	Mar 4 to Aug 5, 2026	180→5 min and 10–15→>150 sites/day
E06	Component replication evidence and hub association	2026	Pages, navigation, libraries, lists, backup, and validation
E07	Interactive authentication log with Entra registered app	2026	Workload identity with no embedded secrets
E08	Technical history of simulation, confirmation, and restoration	2026	WhatIf, explicit confirmation, backup, and logical rollback

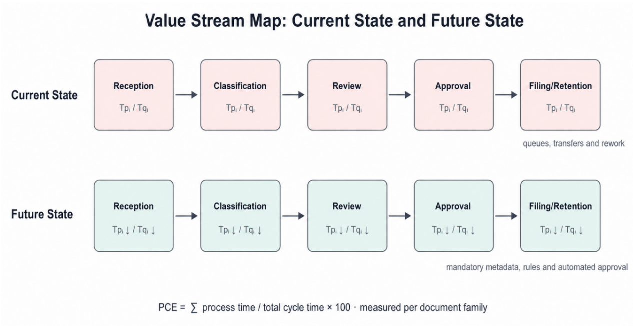

Figure 1. Parameterized value stream map for a document family

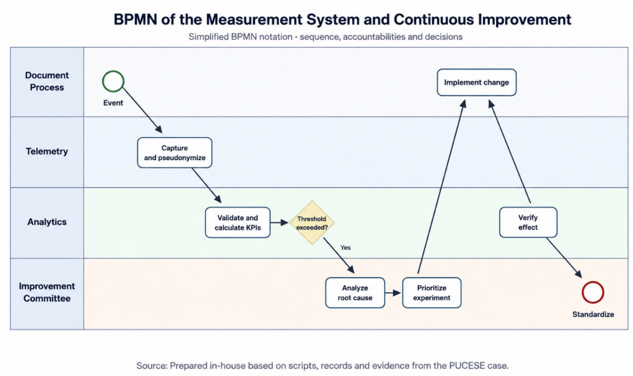

Figure 2. Simplified BPMN map of measurement, decision, and learning

Results: Measurement System Baseline

Table 2. Baseline and observed results

Metric	Baseline	Result	Change / Interpretation	Source
Provisioning time per site	≈180 min	≈5 min	−175 min; 97.2% reduction	E05
Documented daily capacity	10–15 sites/day	>150 sites/day	>10× compared to upper manual limit	E05
Declared structure	Non-standardized	18 hubs + 24 sites	42 governable nodes in the manifest	E01
Metric	Baseline	Result	Change / Interpretation	Source
Document pattern per site	Heterogeneous	6 libraries + 24 standard folders	Repeatable and idempotent structure	E01
Migration logs	No comparable corpus	19 CSVs; 70 events	37 SIMULATED, 19 COPIED, and 14 ERROR	E04
Recorded migration scope	NR	4 sources; 5 destinations	Observed coverage; does not represent the entire tenant	E04

In Table 2, the reduction was calculated as (180 - 5) / 180 × 100 = 97.2%. The capacity increase is expressed conservatively as greater than ten times because >150 is compared to the upper bound of the baseline (15). The 14 ERROR records do not constitute a failure rate: the log mixes simulations, retries, and heterogeneous events, and lacks a denominator of independent executions. This limitation prevents unsupported causal inference. The master script declares six libraries per site—administrative management, processes and procedures, regulations, document management, tracking and control, and archiving—with 24 standard folders. The architecture separates provisioning, migration, component replication, inventory, validation, and logging; personal permissions are not copied by default. Of the eighteen designed KPIs, only two have observed comparative measurements in this version: provisioning time and daily capacity. Log counts describe operation but do not replace case metrics. PCE, FTR, SLA, search, adoption, satisfaction, direct permissions, access reviews, retention, unit cost, paper saved, and incidents remain NR until events and denominators are instrumented. This distinction protects the validity of the study.

4.1 KPI

Dictionary

Table 3. Document Management KPI Dictionary

Dimension / KPI	Operational Formula	Source	Associated Decision
Flow / Cycle time	; median, P75, and P90	Status events	Capacity, SLA, and bottleneck
Flow / PCE		Events + sampling	Eliminate wait time and handoffs
Quality / FTR		States and reason	Improve form, rules, or guidelines
Quality / Rework		Flow history	Root cause analysis
Service / SLA		Events + SLA catalog	Escalation and redesign
Automation / Coverage		Flows + sample	Prioritize automations
Automation / Success		Power Automate	Reliability and support
Automation / Exception		Exception log	Rules, data, or connectors
Information / Completeness		SharePoint	Capture quality
Information / Search	median from query to valid file open	Task testing / analytics	Taxonomy, views, and search
Dimension / KPI	Operational Formula	Source	Associated Decision
Adoption / Active usage		Aggregated analytics	Training and decommissioning of parallel channels
Adoption / Satisfaction	defined scale + response rate	Brief survey	User experience and support
Control / Direct permissions	unjustified individual assignments	SharePoint ACL	Remediation and groups
Control / Access review		Entra	Identity governance
Lifecycle / Coverage		Metadata / Purview	Compliance
Economics / Unit cost		Time and costs	Business case
Sustainability / Paper saved		Documented sampling	Environmental benefit, avoiding double counting
Risk / Incidents		Service desk	Controls and continuity

Indicators are interpreted as a cohesive system. Reducing cycle time at the expense of increasing returns is not an improvement; elevating automation while the exception queue grows is not one either. Dashboards must display volume and denominators, trends, distributions, and segmentation by category, rather than relying solely on a red or green figure. Targets are established only after defining a valid baseline and understanding system capacity. Arbitrary thresholds incentivize dysfunctional behavior. Every KPI must trigger a conversation and a specific action: investigate, experiment, standardize, or decommission Table 3.

4.2 Data Model

and Measurement Automation

Table 4. Measurement Data Model Architecture

Entity	Minimum Fields	Privacy Rule	Analytical Use	
Case / Record	id, family, unit, start_date, end_date, status	Do not store content or names unless necessary	Volume, cycle time, SLA, and segmentation	y
Event	case_id, timestamp, transition, result, exception	Pseudonymized actor or role	Wait times, rework, and path tracking	
Execution	flow_id, run_id, start_time, end_time, status, error_code	Exclude sensitive payload	Success rate, duration, and failures	
Quality	rule, field, result, date	Report aggregated data	Completeness and root causes	
Access	object, assignment_type, role, review, finding	Protected identifiers	Direct permissions and access closure	
Survey	task, score, optional_comment	Consent and anonymity	Satisfaction and operational barriers	

Measuring architecture extracts incremental data, applies validation rules, pseudonymizes records, persists an event model, and refreshes Power BI at a frequency aligned with decision-making needs. A daily refresh is generally sufficient for management reporting; critical operational alerts should be handled directly within the workflow rather than monitored via a dashboard. Microsoft Graph delta queries enable efficient tracking of item changes, provided permissions and throttling limits are thoroughly reviewed and tested [15]. Power Platform solutions must decouple business logic from configuration parameters by utilizing environment variables and connection references. Telemetry records should include standard metadata—such as correlation_id, document_family, outcome, and exception_code—logged to a dedicated, controlled store. Retention policies for these logs must be explicitly defined by business purpose rather than stored indefinitely for convenience Algorithm 1. Algorithm 1. Reproducible Calculation of Cycle Time and FTR (Pseudocode)

```
events = ordenar_por(expediente_id, timestamp) for expediente in events: inicio = primer_evento("recibido") fin = primer_evento("cerrado_valido")
```

4.3 Continuous Improvement Cycle

1. Plan

Select a document family based on value, risk, and feasibility; formulate a quantified hypothesis alongside a balancing metric.

2. Do

Implement the change within a limited scope, recording the version, date, owner, rollback criteria, and user communications.

3. Check

Compare performance distributions and quality against the baseline; examine outliers, incidents, and feedback; distinguish true signal from common cause variation.

4. Act

Standardize if benefits are consistent, adjust if evidence is mixed, or revert if risk escalates; update process maps, procedures, test scripts, and training materials.

5. Learn

Log the decision, supporting evidence, limitations, and subsequent hypotheses in a prioritized backlog; quarterly review and retire indicators that no longer drive decisions.

Table 5. Hypothesis Validation Matri

Improvement Hypothesis	Primary KPI	Balancing Metric	Decision Criteria
Capturing metadata at source reduces returns	FTR	Data entry time	Set threshold after 30–60 days of baseline
Parallel approval reduces wait time	Cycle P90	Decision errors	Reduction achieved while maintaining stable quality and segregation of duties
Role-based groups reduce exposure	Direct permissions	Denied access requests	Zero unjustified access without degrading service
Early alerts prevent non-compliance	SLA	Notification fatigue	Higher SLA achieved with a sustainable alert volume

Discussion

The artifact transforms Value Stream Mapping (VSM) from a episodic snapshot into a continuous learning system. The map defines which events to ingest; events feed KPIs; KPIs prioritize experiments; and structural changes update the map. This circularity prevents dashboards from becoming disconnected from operational reality. The primary methodological risk lies in attributing every performance variance solely to the platform. Academic calendars, volume fluctuations, staff turnover, policy updates, and learning curves also impact outcomes. To mitigate this, the architecture specifies segmentation, comparable periods, balancing metrics, and a concurrent intervention log. When a reliable baseline is absent, it must be explicitly declared, and prospective statistical process control must be established first. Another risk is degrading analytics into surveillance. The governing principle is to measure the process rather than the individual: tracking roles, units, and workflow paths provides sufficient insight for most operational decisions. Individual-level data is strictly reserved for user support or authorized investigations, subject to explicit access controls, retention limits, and declared business purposes.

Conclusions

Continuous improvement in document management requires measuring flow, quality, adoption, and control using reproducible definitions. The eighteen-KPI system, the event model, and the parameterized VSM provide a structured framework to demonstrate clear operational benefits without reducing digital transformation to basic activity counts. The current version already incorporates the provisioning baseline, the 155-day and 17-day windows, and the available denominators. Record-level indicators explicitly remain NR (Not Reported); their longitudinal evaluation will require instrumenting comparable events over a 30–60 day period, reporting confidence intervals, and publishing the anonymized dictionary.

Declarations Data and Code Availability

The repository Repositorio_reproducibilidad_PUCESE.zip was prepared containing observed metrics, status dictionary, VSM, BPMN, and evidence inventory. It does not include document payloads or personal identifiers. The public repository deposit with a DOI will be completed upon acceptance in accordance with the journal's data policy.

Author Contributions (CRediT)

Luis Adrian Fernandez Tenelanda: Conceptualization, Methodology, Software, Investigation, Data Curation, Validation, Visualization, Writing – Original Draft, and Project Administration. Danna Yolanda Solis Espinoza: Investigation, Resources, Formal Analysis, Validation, and Writing – Review & Editing. This statement must be ratified by all authors upon manuscript submission.

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Conflicts of Interest

The authors declare no

conflicts of interest

This statement will be confirmed in the editorial submission form.

Ethics and Privacy

The analysis relies exclusively on necessary operational metadata, adhering to data minimization, pseudonymization, and institutional approval where applicable. No names, sensitive paths, object identifiers, or tenant secrets are published.

Use of AI Tools

Generative AI tools were used for structural formatting and editorial refinement of this manuscript version. The authors maintain full responsibility for the accuracy, originality, references, code, data, and conclusions, and will adapt this declaration to match the target journal's specific policy.

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