

PORTFOLIO CHANGE GOVERNANCE AND LEAN CONTROL CADENCE: EVIDENCE FROM 44 PROJECTS

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ABSTRACT

Construction change control is a key governance mechanism to manage deviations in cost and schedule, yet portfolio-level evidence linking change governance to Lean control cadence remains limited. This paper examines how centralized PMO change control relates to Lean control cadence, operationalized as biweekly reporting, using an anonymized portfolio dataset of 44 ongoing projects (reporting year 2025; data freeze 22 January 2026). Across 1,056 expected project–period rows, 569 reports were submitted (overall adherence 53.9%), indicating substantial variance in cadence and a non-trivial zero-adherence segment that creates portfolio blind spots for timely triage and escalation. The Change Register contains 195 change requests; cost impact is nearly complete, but lane assignment, decision timestamps, and time impact are sparse, constraining robust computation of decision-flow metrics (e.g., over-SLA share) and change-induced schedule-deviation analysis. As a design proposition, we introduce a Lean-friendly three-lane threshold policy aligned with Delegation of Authority and lane-specific SLAs to improve decision-flow efficiency and reduce waiting. The paper contributes a portfolio measurement framework for cadence adherence, governance readiness, and early cost-impact aggregation, and a roadmap to strengthen time-impact evidence aligned with contractual extension-of-time mechanisms.

KEYWORDS

Lean construction, flow, Last Planner® System, change control, control cadence.

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INTRODUCTION

Project changes and change orders are repeatedly linked to adverse performance outcomes—most notably cost growth and schedule delay—yet many organizations still struggle with slow or inconsistent change-control decisions across multiple concurrent projects. Prior studies report that change orders “generally have a negative impact on project performance” (Naji et al., 2022) and that inefficient change management can harm productivity and contribute to “schedule delays and cost overruns” (Anees et al., 2013). From a Lean perspective, these problems can be interpreted as flow and waiting wastes created by decision bottlenecks and unstable control cycles; Lean’s production view emphasizes stabilizing workflow through disciplined planning-and-control loops (Koskela, 1992). However, much of the evidence base remains project-centric, while large organizations require portfolio-level governance to compare, triage, and escalate changes consistently across many projects.

This problem is especially consequential at the portfolio level, where centralized governance depends on recurring, comparable, and timely project signals. When reporting cadence is weak or inconsistent, the PMO may lose visibility over emerging constraints, unresolved changes, and decision bottlenecks across multiple concurrent projects. In such settings, missing or delayed control signals are not merely an administrative inconvenience; they can impair timely triage, escalation, and intervention, thereby increasing waiting waste and reducing the organization’s ability to stabilize decision flow. For large project portfolios, the issue is therefore both managerial and analytical: without sufficient cadence discipline and governance-ready records, it becomes difficult to distinguish whether weak control outcomes arise from poor reporting, poor routing, or slow decision cycles.

This paper addresses that gap by examining how portfolio-level change governance relates to Lean control cadence in a portfolio of 44 ongoing projects. The study focuses on three linked questions: how reporting adherence is distributed across the portfolio, how governance readiness affects the measurability of decision-flow performance, and what early portfolio-level evidence can be observed regarding change-related cost effects. In addition, the paper proposes a Lean-friendly threshold-and-lane design to support more explicit and auditable decision routing in follow-up implementation.

THEORY AND BACKGROUND

In this paper, control cadence refers to the recurring reporting-and-review rhythm through which performance signals are captured, discussed, and translated into managerial decisions. Governance readiness refers to the completeness of the minimum data fields required to compute defensible portfolio control metrics, such as lane assignment, timestamps, status, and cost/time impact fields. Over-SLA share refers to the proportion of change requests whose decisions are completed later than the target time defined for their decision lane. Finally, the threshold-and-lane policy refers to a rule-based design in which each change request is routed according to impact tier and delegated authority, with a corresponding review lane and target decision time.

Lean Construction literature has consistently emphasized workflow reliability, reduced variability, and disciplined control as preconditions for improved project performance. Within this tradition, the Last Planner System (LPS) and measures such as Planned Percent Complete (PPC) have been widely used to assess planning reliability and control performance at the project level. In parallel, construction change-order literature has shown that poorly governed changes contribute to cost growth, delay, rework, and claims, especially when approval processes are slow or weakly structured. However, these two streams have rarely been connected at the portfolio level. Existing studies largely explain planning reliability within projects or analyze change impacts within individual contracts, while much less evidence is

available on how recurring control cadence and change-governance readiness interact across a portfolio of concurrent projects under centralized PMO oversight. This study addresses that gap by linking Lean control cadence with portfolio-scale change-governance measurability and early cost-impact evidence.

LEAN PRODUCTION CONTROL, LPS–PPC, AND CONTROL CADENCE

Lean Construction frames project performance as an outcome of stable flow, reduced variability, and reliable commitments, maintained through disciplined control loops. Within the Last Planner System (LPS), plan reliability is supported not only by planning, but also by “make-ready” mechanisms that protect planned work from upstream variability; for example, an LPS study states that reliability is improved by “*shielding planned work from upstream variation by removing constraints*” (Mota et al., 2010, p. 488). In terms of measurement, Planned Percentage Completed (PPC) is widely used as an indicator of plan reliability; a quantitative review highlights the need for consistent interpretation across studies and contexts, noting that “*few reviews have focused solely on the planned percentage completed (PPC) value*” (Lappalainen et al., 2023, p. 1104). Building on this logic, this paper defines control cadence at the portfolio level as a scheduled rhythm to (i) capture performance signals (progress/constraints/changes), (ii) review and triage findings, and (iii) convert signals into decisions (approve/defer/escalate) at predictable intervals.

CHANGE CONTROL AS PORTFOLIO GOVERNANCE AND A DECISION SYSTEM

At the portfolio level, change control is not treated merely as recording change requests (CRs), but as a decision system that allocates authority (lane/threshold), sets decision lead times (e.g., SLA), and ensures traceability (auditability) and baseline integrity across scope–cost–time. From a Lean production control perspective, portfolio change governance functions as a “variability valve” that prevents change-induced deviation from escalating into rework, waiting, and decision waste (decision latency). Production control principles emphasize explicit monitor–compare–act loops to manage performance and enable organizational learning (Ballard et al., 2009). Consequently, a consistent cadence and timely approvals become prerequisites for “Lean-friendly” change control: decisions do not accumulate as waiting, and escalation follows impact and delegated authority rather than delayed information.

DIGITAL/VISUAL MANAGEMENT AS AN ENABLER OF CADENCE AND INFORMATION FLOW

Portfolio control cadence is strengthened by visual management and digital governance, which accelerate information flow and clarify decision status across levels. Digital shopfloor management research highlights a cross-level cascade and routines supported by digitization to maintain consistent, up-to-date information (Heller, 2023). Similarly, Lean in digital project delivery research argues that digital support for Lean practices (including LPS) can increase transparency and collaboration effectiveness; for instance, digital tools can provide “*near real time information ... [to] support multi stakeholder engagement*” (McHugh et al., 2023, p. 141). In this study, biweekly reporting is used as an operational proxy for portfolio control cadence: when reporting is inconsistent (missing/empty), performance signals become incomplete and change-control decisions risk being delayed—potentially increasing the over-SLA share and lowering cadence adherence.

(FUTURE STRENGTHENING AXIS) CONTRACTUAL BASIS FOR TIME IMPACT (EOT)

A key challenge in portfolio-level change analytics is standardizing time impact (Rahmawati, 2024). For subsequent revisions, time-impact definitions can be anchored to widely used

FIDIC-based EOT mechanisms, where timely notice (e.g., 28 days) is commonly emphasized in claims governance (Frics, 2004). Such contractual anchoring can make Time_Impact_Days more defensible in follow-up studies without disclosing project-specific contractual details.

OBJECTIVES, RESEARCH QUESTIONS, AND HYPOTHESES

This study evaluates how portfolio-level Lean control cadence, operationalized as biweekly reporting adherence, relates to (i) change-governance readiness, (ii) decision-flow performance, and (iii) early evidence of change-induced cost effects at the project-aggregated level. In addition, the study proposes a Lean-friendly threshold-and-lane policy aligned with delegated authority and service-level targets as a design contribution intended to improve decision-flow efficiency and strengthen subsequent time-impact analysis.

The study is guided by four research questions:

RQ1. How is biweekly reporting adherence distributed across the portfolio, and what governance blind spots arise when reports are missing or empty over multiple periods?

RQ2. To what extent is the change-control dataset governance-ready in terms of lane classification, timestamps, status fields, and recorded cost/time impacts for computing defensible portfolio metrics?

RQ3. Is biweekly reporting adherence associated with decision-flow performance and with early project-level evidence of change-induced cost growth?

RQ4. How can a delegation-of-authority- and SLA-aligned threshold-and-lane policy be defined in a paper-safe manner to improve decision-flow efficiency and strengthen time-impact evidence in subsequent revisions?

Hypotheses. Two types of hypotheses are used. First, a diagnostic hypothesis summarizes the portfolio condition to be mapped (without causal claims). Second, empirically testable hypotheses address relationships that can be tested quantitatively (adherence versus decision-flow metrics and cost outcomes), with directional expectations derived from Lean production control and waiting/flow logic.

The diagnostic hypothesis for the portfolio is that biweekly reporting adherence is heterogeneous across projects and, at the portfolio level, this variability results in a subset of projects with missing or empty reports. As a consequence, these gaps are expected to create governance blind spots that limit effective PMO/CCB oversight.

The study advances four empirically testable hypotheses. First, it posits that higher governance readiness is associated with greater change-request (CR) coverage for computing key portfolio metrics—specifically the over-SLA share and approval cycle time—because lane classifications and timestamp fields are more complete. Second, it hypothesizes that higher biweekly reporting adherence is associated with a lower over-SLA share, reflecting fewer decisions that exceed lane-specific SLAs. Third, it expects higher reporting adherence to be associated with shorter approval cycle times. Fourth, it proposes that higher reporting adherence is associated with better cost control, reflected in more controlled change intensity and/or lower or more stable change-induced cost impact; for robustness, this relationship is assessed using p5/p95 winsorizing.

The threshold-and-lane policy is positioned as a design proposition (to be tested in subsequent data collections) expected to improve governance readiness and reduce over-SLA share by making decision routing explicit and auditable.

DATA AND METHOD

STUDY DESIGN AND SETTING

This is a portfolio-level empirical study using secondary administrative data from a large Indonesian construction group, where change governance is coordinated through a centralized

PMO overseeing multiple ongoing projects. The study examines the relationship between change control governance (via a Change Request/CR register) and Lean control cadence, operationalized as biweekly reporting adherence over the 2025 reporting year. All organizational, project, client, and location identifiers are masked to comply with double-blind anonymization, and results are reported only at aggregated and grouped levels.

Data freeze and analytical horizon. The dataset was frozen on 22 January 2026 for preliminary analysis, while the reporting period under study is calendar year 2025.

DATA SOURCES AND ENTITIES (DATA MODEL)

A structured dataset is constructed from four entities:

1. Project Master (one row per project; $n = 44$).
2. Lean Biweekly (one row per project–biweekly period; expected $n = 44 \times 24 = 1,056$).
3. Change Register (one row per CR; $n = 195$).
4. Project Outcomes (one row per project; 2025 annual summaries derived from the above entities, limited by completeness). A fixed biweekly calendar defines BW01–BW24 in 2025.

UNITS OF ANALYSIS

The study employs three linked units of analysis. At the project–biweekly level, the dataset is structured with one record per project for each biweekly reporting period to compute cadence and adherence. At the project level, the analysis uses project-specific aggregates for 2025 to capture portfolio outcomes. At the change-request (CR) level, the dataset contains one record per CR, including lane classification, status, relevant timestamps, and recorded cost and time impacts.

VARIABLE OPERATIONALIZATION AND PORTFOLIO METRICS

The study operationalizes key measures as follows. Cadence adherence (Reporting Adherence Rate) is calculated for each project as the number of submitted biweekly reports divided by 24, and portfolio-level adherence is then derived by aggregating across projects. The over-SLA share is defined as the proportion of change-request (CR) decisions that exceed the lane-specific SLA in days, and it is computed only for records where both submission and decision timestamps are complete. Approval cycle time is measured as the number of days between CR submission and decision and is summarized at the project level (for example, using the mean or median). Governance readiness captures the completeness of the critical governance fields required to produce defensible metrics, including lane, status, submission date, decision date, cost impact, and time impact. Finally, change-induced cost growth (as early evidence) is assessed through project-level aggregation of CR cost impacts and/or change intensity measured via CR counts, and it is interpreted as associative early evidence given that CR coverage is partial across projects.

DATA COMPLETENESS SNAPSHOT (AT FREEZE DATE)

Total biweekly reporting opportunities equal $44 \text{ projects} \times 24 \text{ periods} = 1,056 \text{ rows}$. Submitted reports total 569, yielding overall reporting adherence = 53.9%. Projects are grouped by adherence for comparative analysis: High ($>75\%$) = 21 projects, Partial ($0\text{--}75\%$) = 14 projects, and Zero (0%) = 9 projects.

The Change Register contains 195 CRs but covers only 24 projects (partial coverage). The lane field is populated for 34 CRs, cost impact for 194 CRs, and time impact for 1 CR, so time-impact-based schedule analyses are positioned as a follow-up strengthening axis.

The scarcity of time-related data materially limits the scope of inference in the present study. Because Time_Impact is recorded for only 1 of 195 change requests, the dataset does not

support a defensible portfolio-scale analysis of change-induced schedule deviation. It also prevents robust testing of whether weaker reporting cadence is associated with greater time-related disruption. Accordingly, the current results should be interpreted primarily as evidence on cadence adherence, governance readiness, and early cost-side patterns, rather than as a complete time–cost control model. Strengthening time-impact evidence is therefore a central priority for subsequent data collection and follow-up analysis.

DATA CLEANING AND QUALITY CONTROLS

The analysis applies several data-handling protocols. First, the scope is restricted to BW01–BW24 for 2025, and any records outside the defined calendar are treated as out of scope. If PPC is used as a biweekly Lean signal, its validity is enforced by bounding PPC to the [0, 100] range; values outside this interval are treated as data-entry errors and capped accordingly, consistent with the literature’s emphasis on maintaining a stable interpretation of PPC to support defensible cross-context comparisons (Lappalainen et al., 2023, p. 1104-1115). To address outliers, heavy-tailed continuous variables—such as cost impact and cycle time—are processed using p5/p95 winsorizing; central tendency is reported using the median and IQR, while the mean is provided as a sensitivity reference. Finally, the missingness protocol computes SLA exceedance and cycle time only for CRs with complete timestamps, and time-impact analytics are presented as preliminary because completeness is still insufficient at the freeze date.

ANALYTICAL STRATEGY

The analyses are conducted at the portfolio level using a non-causal approach. First, descriptive portfolio analytics are used to estimate overall reporting adherence and the distribution of adherence groups (High, Partial, and Zero) in order to characterize potential governance blind spots. Second, a governance readiness assessment evaluates the completeness of lane information, timestamps, status fields, and recorded cost/time impacts, as well as the dataset’s readiness to compute the over-SLA share. Third, robust group comparisons are performed by contrasting change intensity and cost-impact distributions across adherence groups and by comparing decision-flow metrics—namely the over-SLA share and approval cycle time—using robust summary statistics.

DATA GOVERNANCE & ANONYMIZATION PROTOCOL

All identifiers that could reveal the organization, projects, clients, locations, contract values, or commercially sensitive details are removed, masked, or generalized prior to analysis, and each project is assigned an anonymous Project_ID that is not traceable by readers. Results are reported only at aggregated or grouped levels (e.g., High/Partial/Zero *Reporting Adherence Rate*; Low/Medium/High threshold categories) without presenting case narratives or attribute combinations that could function as *quasi-identifiers*. The analysis uses a snapshot dataset with a stated Freeze_Date = 22-Jan-2026; any updates after this freeze date are treated as follow-up work and do not affect the double-blind results reported in this manuscript.

Table 1: Data entities & key variables

Data entity (Excel sheet)	Unit (row definition)	Key variables (Excel field names used)	Missingness / readiness notes
Project Master (PROJECT_MASTER)	1 row per project ($n = 44$)	Project_ID (anonymous), high-level descriptors used for grouping (e.g., sector/type as masked categories), baseline date fields where available (e.g., Start_Date, Planned_Finish_Date), Delivery_Method	Generally complete; used for anonymous indexing and coarse grouping only (no sensitive breakdowns reported).
Lean Biweekly (LEAN_BIWEKLY)	1 row per project–biweekly period (expected $44 \times 24 = 1,056$)	Biweekly_ID, Start_Date, End_Date (via calendar join), biweekly entry fields; derived BW_Entered_Count (calc), Reporting_Adherence_Rate (calc) in PROJECT_OUTCOMES	569/1,056 rows entered → overall Reporting_Adherence_Rate = 53.9% at portfolio level; missing/empty entries create governance blind spots (High/Partial/Zero group segmentation).
Change Register (CHANGE_REGISTER)	1 row per Change Request (CR) ($n = 195$)	CR_ID, Project_ID, Lane, Submitted_Date, Decision_Date, Status, Cost_Impact, Time_Impact, derived Approval_Cycle_Time_Days (calc), SLA_Days (calc), Over_SLA_Flag (calc)	Partial project coverage: CRs recorded for 24 projects; Lane populated for 34/195; Cost_Impact 194/195; Time_Impact 1/195 → time-impact analyses are preliminary; SLA/cycle time computed only for CRs with complete timestamps.
Project Outcomes (PROJECT_OUTCOMES)	1 row per project (derived 2025 annual summary)	BW_Entered_Count (calc), BW_Missing_Count (calc), Reporting_Adherence_Rate (calc), Total_CR_Count_2025 (calc), Approved_CR_Count_2025 (calc), Avg_Approval_Cycle_Time_Days (calc), Over_SLA_Share (calc)	Derived metrics are constrained by CHANGE_REGISTER completeness (especially Lane and timestamps); SLA-based metrics reflect “calculable” CRs only, consistent with the missingness protocol.

Note: Table Data Entities & Key Variables aligned to Excel sheet/field names).

RESULTS / FINDINGS (CURRENT FREEZE; PRELIMINARY)

Based on the current data freeze (22 January 2026) for reporting year 2025, the portfolio contains 1,056 expected biweekly reporting opportunities across 44 projects and 24 reporting periods. Of these, 569 reports were submitted, resulting in an overall reporting adherence rate of 53.9%. The 46.1% non-submission rate should not be interpreted merely as incomplete observation. At the portfolio level, it is also a substantive governance condition. Missing biweekly reports reduce visibility into project status precisely when timely escalation may be required. In addition, the missingness may be non-random: projects with weaker discipline or emerging performance problems may also be less likely to report consistently. If so, the blind spots created by missing reports may systematically affect the PMO’s ability to detect and respond to risk. For this reason, missingness in the present study is both an analytical limitation and an indicator of control weakness in the portfolio itself. This indicates that control cadence is uneven across the portfolio. Some projects reported consistently, while others reported only partially or not at all. Notably, 9 of the 44 projects had zero adherence, creating blind spots for timely portfolio-level triage and escalation.

It is important to distinguish the scope of inference across the dataset components. The cadence analysis covers the full portfolio of 44 projects because biweekly reporting opportunities are defined for all projects. By contrast, change-governance and cost-impact analyses are limited to the subset of 24 projects with recorded change requests in the current Change Register. These CR-based findings should therefore be interpreted as diagnostic evidence from the covered subset rather than as statistically representative estimates for all 44 projects. Their value lies in revealing the current state of governance readiness and the measurability of decision-flow performance under real portfolio conditions. On the change-governance side, the Change Register records 195 CRs, but covers only 24 projects (partial coverage). Governance readiness is also uneven by field: Cost_Impact is near-complete (194/195), while decision-flow fields remain immature (Lane populated for only 34/195, and decision timestamp completeness is insufficient to compute over-SLA share and approval cycle time robustly at portfolio scale). In addition, Time_Impact is populated for only 1/195, so change-driven schedule-deviation analysis based on time impacts is not defensible at this stage and is positioned as a primary data-strengthening priority.

Table 2: Data readiness & key metrics (Freeze: 22-Jan-2026; Reporting Year: 2025)

Area	Metric	Value (current dataset)	Readiness implication
Biweekly cadence	Expected biweekly rows	1,056 (44×24)	Basis for portfolio adherence (BW01–BW24)
Biweekly cadence	Submitted biweekly rows	569	Partial availability of control signals
Biweekly cadence	Overall Reporting Adherence Rate	53.9%	Moderate cadence; blind spots remain
Biweekly cadence	Zero-adherence projects	9/44	High blind-spot risk for this segment
Change Register coverage	Total CR recorded	195	Basis for change analysis (project coverage varies)
Change Register coverage	Projects with CR coverage	24/44	Cross-project comparisons must be bounded/flagged
Governance readiness (fields)	Cost_Impact completeness	194/195	Ready for cost-impact aggregation (coverage caveat)
Governance readiness (fields)	Lane completeness	34/195	Limits SLA / over-SLA computation (lane-specific)
Governance readiness (fields)	Time_Impact completeness	1/195	Not ready for change-induced schedule deviation
Early cost evidence	P75 cost-impact/contract (aggregate)	~2.1%	Upper tail indicates potential materiality
Early cost evidence	Max cost-impact/contract (aggregate)	~14.5%	Upper tail/outliers → apply p5/p95 winsorizing

Note: P75 and maximum values are preliminary and should be interpreted under CR coverage and decision-traceability limitations.

Nevertheless, the near-complete Cost_Impact for recorded CRs enables an initial portfolio view of change-induced cost growth for the subset of projects with CR data. The cost-impact distribution appears concentrated (many zeros) with a meaningful upper tail; in the current dataset, P75 cost-impact/contract is ~2.1% and the maximum is approximately ~14.5%

(aggregate). These findings indicate that strengthening governance readiness (lane + SLA + timestamps) is a prerequisite to linking cadence discipline (adherence) with decision discipline (over-SLA/cycle time) and, ultimately, to more robust control of change-induced cost and schedule deviation in the next revision. The preliminary findings indicate two primary barriers to portfolio-level control of change-induced deviation: (i) governance blind spots driven by heterogeneous reporting adherence (including a zero-adherence segment), and (ii) insufficient governance readiness in the Change Register—particularly incomplete lane assignment, decision timestamps, and time impact fields—thereby limiting defensible computation of decision-flow metrics (e.g., over-SLA share and approval cycle time) and any credible schedule analysis based on change time impacts. To address these gaps without disclosing sensitive information, this study proposes a *Lean-friendly* Threshold & Lane policy as a design proposition: each CR is classified into an impact tier (Low/Medium/High) that maps to decision authority (aligned with DoA), a process lane (Fast/Standard/Deep), and target SLAs (e.g., 37/14 days) to reduce *waiting waste* through explicit triage. The policy also specifies minimum evidence requirements for *time impact* by tier (ranging from baseline reference and 0-day impact justification, to detailed fragnet analyses and auditable EOT/claim narratives), enabling systematic strengthening of lane–timestamp–evidence completeness in follow-up data collection and supporting more robust tests of the cadence–decision–deviation link in the next revision.

THRESHOLD & LANE POLICY (DESIGN PROPOSITION)

Table 3: Threshold & lane policy for lean-friendly change control

Impact tier (threshold category)	Typical CR characteristics	Decision authority (aligned to DoA)	Lane	Target SLA (days)	Minimum evidence required (time impact)	Example decision outcomes
Low	Minor scope adjustment; limited cost/time effect; low risk; no material contract change; does not affect strategic milestones (e.g., COD/PC)	Project-level approval within project DoA	Fast	3	Baseline reference (no baseline change if 0-day impact); brief justification; supporting note/minutes	Approve / Defer
Medium	Noticeable cost/time effect; multi-discipline review; potential baseline update; moderate contractual considerations	Project-level (if within DoA) or Corporate PMO oversight for standardization	Standard	7	Baseline comparison (BLx vs BLy) or simple fragnet; quantified cost and time impact; traceable attachments	Approve + baseline update / Defer / Escalate
High	Major cost/time impact; high risk; material contract change/addendum; claim/dispute potential; affects strategic milestones or portfolio constraints	Corporate-level approval (Corporate CCB) beyond project DoA	Deep	14	Detailed fragnet or formal determination basis; contractual assessment (claim/EOT narrative); risk assessment; full audit trail	Escalate / Approve with conditions / Reject

Policy rationale (flow efficiency). Lane-based triage reduces waiting waste by routing low-impact CRs to faster decisions while reserving deeper reviews for high-impact CRs; SLA targets enable measurable decision-flow control (over-SLA share), and cadence adherence ensures recurring signals to support timely triage and escalation.

DISCUSSION

The findings indicate that portfolio-level *control cadence* is not uniformly institutionalized, reflected by a moderate overall Reporting_Adherence_Rate and a non-trivial zero-adherence segment that creates governance blind spots. Under Lean logic, this means the production/decision control loop receives insufficient periodic signals for timely triage and escalation, increasing the likelihood of waiting in decision flow. LPS emphasizes protecting plan reliability from upstream variability by removing constraints; at the portfolio level, disciplined cadence functions as a “metronome” that converts field signals into recurrent, predictable decisions.

On change governance, the dataset reveals asymmetric readiness: Cost_Impact is near-complete among recorded CRs, while Lane, decision timestamps, and especially Time_Impact remain sparse, limiting defensible computation of Over_SLA_Share (a proxy for decision waiting) and any credible schedule-deviation analysis driven by change time impacts. This aligns with change-order literature emphasizing that the key risk is not merely the existence of change, but delayed responses and weak formal processes that contribute to rework, claims, and *cost/time overruns*. Accordingly, missing governance fields should be interpreted as a governance readiness signal—i.e., the system’s ability to measure and control deviation—rather than a minor data-quality footnote.

Theoretically, this study positions cadence adherence as a portfolio governance capability linking Lean flow/waiting logic with centralized change control (PMO/CCB). To strengthen the time dimension in the next revision, Time_Impact_Days should be standardized through auditable evidence (e.g., baseline comparisons or fragnets) aligned with contractual EOT/claims logic to improve cross-project comparability. The premise that change impacts can be assessed at proposal time (before full implementation) provides a methodological basis to improve evidence discipline and decision traceability in follow-up data collection.

PRACTICE IMPLICATIONS DERIVED FROM THE FINDINGS

The findings suggest three evidence-based practical implications. First, the moderate portfolio-wide reporting adherence and the existence of a zero-adherence segment indicate that cadence enforcement should be treated as a control priority, because missing reports reduce visibility for timely triage and escalation. Second, the low completeness of lane and timestamp fields shows that decision-flow metrics such as over-SLA share cannot function reliably unless minimum governance fields are made mandatory. Third, the asymmetry between near-complete cost-impact data and almost absent time-impact data suggests that current portfolio governance is more ready for early cost-side monitoring than for defensible schedule-impact analysis. Taken together, these findings indicate that improvements in cadence discipline and minimum governance field completeness are necessary preconditions for stronger portfolio-scale control of change outcomes.

CONCLUSION

This study shows that portfolio-level change control governance depends strongly on a consistent Lean control cadence, operationalized as biweekly Reporting_Adherence_Rate. Across 44 ongoing projects (reporting year 2025), the 53.9% overall adherence indicates uneven discipline in the control rhythm and creates governance blind spots for a subset of projects, meaning periodic signals for triage/escalation (progress–constraints–changes) are not consistently available. In Lean/LPS logic, reliable control requires protecting plan reliability from upstream variability by removing constraints (“shielding planned work from upstream variation”).

The findings should be interpreted in light of several limitations. First, the study uses secondary administrative data collected for operational rather than research purposes. Second, biweekly reporting completeness is moderate, with 46.1% of expected reporting rows not submitted, which creates both analytical limitations and portfolio blind spots. Third, the Change Register covers only 24 of the 44 projects, so CR-based findings are diagnostic for the covered subset rather than statistically generalizable to the full portfolio. Fourth, time-impact data are almost entirely absent at the current freeze date, which prevents robust analysis of change-induced schedule deviation. Finally, the study is diagnostic and non-causal; it identifies patterns and readiness conditions but does not test whether observed associations are causal.

Future research should therefore extend this work in at least four ways. First, it should evaluate a portfolio with fuller CR coverage and mandatory governance fields to improve measurability. Second, it should standardize Time_Impact_Days using auditable contractual evidence, such as approved extension-of-time records, baseline comparisons, or fragnet-based assessments. Third, it should test longitudinally whether the proposed threshold-and-lane policy reduces over-SLA share and improves decision-flow performance after implementation. Fourth, it should examine whether stronger cadence discipline and governance readiness lead to better control of change-induced cost and schedule outcomes across different project types and portfolio contexts.

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