EMERGING OPPORTUNITIES FOR INTEGRATING DIGITAL PRODUCT PASSPORT INTO LEAN CONSTRUCTION WORKFLOWS: A CONCEPTUAL PERSPECTIVE

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Abstract

Digital Product Passports (DPPs) are emerging as mandatory, standardised sources of product information under EU policy. Yet their implications for construction-phase Lean workflows remain underexplored. Current practices still suffer from late discovery of product-related constraints, missing documentation, and weak traceability, undermining task readiness and plan reliability. This study combines a scoping search with conceptual mapping of DPP data categories to digital Last Planner System (LPS) decision points. Results include a DPP-to-LPS integration framework and construction-oriented guidelines for make-ready, commitments, and receiving/QA. The contribution is a practical research agenda for operationalising DPPs in Lean execution and enabling data continuity (e.g., DBLs-related).

Introduction

Lean Construction aims to improve production reliability and workflow stability on construction sites by reducing variability and preventing tasks from starting without the necessary prerequisites. In practice, however, construction-phase planning and control often experience challenges related to product information availability, such as missing or outdated specifications, unclear compliance evidence, limited traceability across changes, and inconsistent access to installation and handling instructions. These shortcomings often surface late, during make-ready or even during execution, contributing to disruptions, rework, and “making-do” situations where crews proceed despite incomplete inputs (Amaral et al., 2023).

In parallel, European policy has moved towards mandating Digital Product Passports (DPPs) as structured, product-level information containers intended to support transparency, traceability, and circularity across value chains. Within the construction domain, recent work has discussed DPP information needs and adoption barriers, emphasising issues of stakeholder roles, data governance, and interoperability with existing information practices (Mêda et al., 2024; Mêda et al., 2023). Research on material and product passports has also highlighted that data availability is uneven and that explicit data templates are needed to operationalise passport concepts in real settings (Çetin et al., 2023). This aligns with findings from construction information systems, where the classification and standardization of item parameters within work breakdown structures are fundamental to enable integration and interoperability (Ribeiro et al., 2023b). Yet, despite the growing DPP discourse, relatively little has been published on how DPP data could be operationalised to support construction-phase production planning and control mechanisms, particularly Lean workflows on site.

While product-related information is typically generated during design and planning phases, it may become fragmented, outdated, or misaligned with site and product reality during construction execution. This disconnect undermines the effective use of information at the moment when it is most needed for decision-making. DPPs are an instrument to bridge this gap by making product information more available and accessible, while maintaining it structured, standardised, and traceable across project phases and stakeholders (Preamble 32, European Parliament, 2024).

In this context, the relevance of DPPs lies in their potential to improve process reliability and stability in construction workflows by enhancing the consistency and traceability of product information during execution. By supporting more reliable and usable information flows, DPPs can help reduce errors associated with information gaps and strengthen feedback loops within production control.

From this perspective, the DPP can be positioned as a practical enabler of Lean execution, not by “making construction lean” on its own, but by improving the timeliness, structure, and verifiability of product information at decision points where Lean depends on reliable inputs. Key DPP attributes, such as unique identifiers, technical specifications, and traceability events, can support earlier constraint detection, more robust make-ready screening, and more reliable decisions. These capabilities align with the requirements of Last Planner System (LPS) implementations, which increasingly act as centralised production control environments for coordinating commitments, constraints, and feedback loops (McHugh et al., 2025), and with emerging evidence that structured product data integration can improve site logistics and flow reliability (Berroir et al., 2023).

This paper makes three main contributions to the body of knowledge of computing in construction. First, it proposes a structured mapping between Digital Product Passport (DPP) data categories, construction-phase decision points in planning and control, and expected Lean mechanisms such as improved task readiness and reduced making-do, grounded in digital LPS workflows. Second, it introduces a conceptual integration framework that positions DPPs as an operational information layer supporting make-ready, commitment, and receiving decisions during execution. Third, it derives a set of actionable, system-oriented guidelines that translate DPP requirements into traceable and usable data needs for site-level decision-making. To support these contributions, the study adopts a targeted scoping search to confirm the scarcity and fragmentation of DPP–Lean Construction research and concludes by discussing implementation considerations (e.g., identifiers, access control, interoperability) and outlining a research agenda for empirical validation in project settings.

Method

Research design

This study adopts a conceptual and scoping-based research design (Arksey and O'Malley, 2005; Jaakkola, 2020). The research combines a targeted scoping search to assess the maturity and thematic focus of literature connecting Digital Product Passports (DPPs) with construction workflows and Lean production control, with a conceptual synthesis that develops an integration framework and operational guidelines for DPP-enabled digital Last Planner System (LPS) workflows.

The scoping component aims to identify the extent to which existing research addresses the operational use of product-level digital information within construction-phase planning and control. The conceptual component builds on this evidence to propose a structured mapping between DPP data categories, construction-phase decision points, and Lean execution mechanisms.

Targeted scoping search

A targeted and iterative scoping search was conducted to explore research at the intersection of Digital Product Passports (DPPs), construction workflows, and Lean production control. The purpose of this search was not to provide an exhaustive systematic review, but to identify the existence, maturity, and thematic characteristics of research connecting these domains.

Searches were conducted in the Scopus and Web of Science databases due to their extensive coverage of engineering, construction management, and digitalisation research. The search strategy followed an iterative logic, beginning with the focal research intersection and progressively expanding the terminology when limited or no results were retrieved.

The initial search string combined the central concepts of this study: "digital product passport" AND "lean construction". This search returned no results in either database, suggesting a potential research gap at the explicit intersection between DPPs and Lean Construction.

To verify whether conceptually related research existed under broader terminology, the search scope was expanded by relaxing the Lean Construction concept. The following query was applied: "digital product passport" AND "lean". This search returned two records in each database. Screening revealed that these studies addressed lean manufacturing or used the term "lean" in alternative contexts rather than Lean Construction workflows and were therefore treated as domain-drift results.

A third search aimed to map DPP research within the construction domain more broadly: "digital product passport" AND "construction". This search produced a broader set of records, enabling thematic screening and categorisation of existing research related to DPP implementation in construction.

Considering that Digital Product Passports are frequently operationalised through related constructs such as material passports and structured product data templates, additional searches were conducted using these proxy concepts. This decision was supported by prior research indicating that material passports and data template structures represent foundational building blocks for DPP implementation (Honic et al., 2024). Therefore, the following search strings were applied: "material passport" AND "lean"; "data template" AND "lean".

Across all searches, records were screened to assess their relevance to: (a) construction-phase planning and control workflows; and (b) Lean Construction mechanisms such as constraint management, make-ready processes, and Last Planner System routines. Studies addressing Lean concepts outside the construction domain were considered false positives and excluded from thematic synthesis.

Scoping results and evidence of scarcity

The targeted search "digital product passport" AND "lean construction" returned no results in either database. The expanded search "digital product passport" AND "lean" returned two results in Scopus and two in Web of Science; however, screening confirmed that these studies addressed lean manufacturing or used the term "lean" outside the Lean Construction domain.

The search "digital product passport" AND "construction" produced 32 results in Scopus and nine in Web of Science. After duplicate removal across databases, 32 unique publications were retained for thematic screening.

The retrieved publications were categorised inductively based on their dominant research contribution. Categories were defined to reflect the functional role of the research in enabling, structuring, governing, or operationalising DPP implementation within the construction sector, and are presented in Table 1.

The screening indicates that current research on DPP implementation in construction is predominantly focused on circularity, lifecycle management, interoperability, and enabling digital infrastructures. No studies were identified that explicitly address the operational use of DPP data within construction-phase Lean production control workflows. This observed gap motivates the conceptual framework and operational guidelines proposed in this study.

Table 1: Thematic distribution of DPP+Construction publications

Category	Count	Example references
Enabling digital and data infrastructures	6	Adu-Duodu et al., 2025; Byers et al., 2025
Data structuring, templates and interoperability	8	Aragón et al., 2025; Vangelova et al., 2025
Stakeholders, governance and adoption conditions	4	Mêda et al., 2024; Mêda et al., 2023; Ruismäki et al., 2025
Circularity, lifecycle and end-of-life applications	9	Çetin et al., 2023; Pedroso et al., 2025
Construction-phase and production control	0	-
Peripheral or indirect mentions of DPP	5	Cieślewicz et al., 2025; Mengyao Li, 2025

Complementary searches

To ensure that relevant contributions were not overlooked, broader sensitivity searches were conducted using combinations of synonyms and adjacent concepts related to product passports, data templates, circular economy, production planning, and construction workflows.

The searches combined DPP-related concepts, Lean production synonyms, product data approaches, circular economy–related concepts, and construction-related terms (e.g., digital product passport, material passport, product passport, data template, product data, circular economy, circularity, EPD, lean construction, last planner, production control, workflow, construction, site, building). Results retrieved from Scopus and Web of Science consistently showed that the identified studies either focused on adjacent domains or reflected domain drift, such as workflow digitalisation, lifecycle sustainability, data modelling, or Lean Manufacturing. Most records either overlapped with previously identified studies or addressed related research areas without explicitly linking Digital Product Passports to construction-phase Lean production control workflows.

Overall, the complementary searches did not reveal additional directly relevant studies beyond those identified in the primary search. Consequently, these results did not alter the thematic synthesis and were not included in further analysis. This approach is consistent with scoping-based research aimed at assessing the extent and boundaries of emerging research domains rather than exhaustively synthesising all available literature.

Conceptual synthesis and outputs

Given the limited availability of empirical evidence directly linking Digital Product Passports (DPPs) to Lean Construction execution, the study proceeds with a structured conceptual synthesis to operationalise the potential interaction between product-level digital information and construction-phase production control. The synthesis followed an iterative, multi-step process designed to ensure traceability between theoretical constructs and operational outcomes.

First, DPP data categories relevant to construction activities were derived through documentary analysis of emerging standardisation efforts and construction-focused DPP literature. Key sources included ISO 22057 data template frameworks (ISO, 2022) and research addressing data availability and structuring requirements for material and product passports in construction (Çetin et al., 2023; Vangelova et al., 2025). This step aimed to consolidate recurring product information attributes that are technically feasible and relevant to construction execution.

Second, operational decision points within Lean Construction production control were identified through review of canonical Last Planner System literature and recent developments in digital LPS implementations (Ballard and Howell, 2003; McHugh et al., 2025). This step focused on identifying planning and control moments where reliable product information is required to support workflow stability, including lookahead/make-ready planning, weekly work planning commitments, receiving and quality verification, and exception management.

Third, DPP data categories and LPS decision points were systematically mapped to identify potential interaction mechanisms between product information and Lean execution processes. The mapping aimed to establish how specific DPP attributes could support Lean objectives such as improved constraint removal, increased task readiness, and reduction of making-do and rework.

Fourth, operational system guidelines were derived from the conceptual mappings with emphasis on practical applicability within construction workflows and digital LPS environments. The guidelines were formulated to translate conceptual relationships into actionable information management practices for site-level planning and control.

The synthesis process resulted in two main research outputs: (1) a conceptual DPP-to-LPS integration framework linking product information categories to production control decision points, and (2) a set of construction-oriented system guidelines to support operational implementation.

DPP-to-LPS integration framework

This section presents the conceptual DPP-to-LPS integration framework, linking structured product-level information to construction-phase decision points within digital Last Planner System workflows. It focuses on how DPP data can support key Lean execution processes, including lookahead planning, weekly commitments, receiving/QA, and exception management, by improving the reliability and availability of product information at decision-making moments.

Lean Construction conceptualises production not as a sequence of isolated tasks, but as an integrated process oriented towards flow reliability and waste reduction, enabling more predictable planning and control (Garcés et al., 2025). Lean theoretical foundations further emphasise the coordination of value flows over mere task conversion, reflecting the conceptual arguments originally introduced by Koskela and consolidated in subsequent literature (Porras Díaz et al., 2014). These foundations provide the theoretical grounding for the proposed framework and guidelines.

Although Lean Construction may not necessarily suffer from a lack of information, its effectiveness is closely linked to the availability of reliable and timely information at key decision points. The Last Planner System, as a production control mechanism, is designed to improve planning reliability and manage workflow variability through collaborative commitment-making and continuous learning, relying on the availability of sound prerequisites for task execution (Ballard and Howell, 2003). In this context, research on lookahead planning shows that unresolved constraints, often related to missing or unclear product information, can affect the ability to anticipate and remove obstacles before execution (Hamzeh et al., 2015). At the operational level, such information gaps may result in making-do situations, contributing to variability and rework (Amaral et al., 2023).

Framework overview

The framework is organised around three elements: (i) DPP data categories relevant to construction execution, (ii) LPS decision points during construction-phase planning and control, and (iii) Lean execution mechanisms expected to benefit from improved product information reliability.

DPP data categories for construction execution

Based on the construction-focused DPP literature, product/passport data templates, and interoperability discussions, we define the following DPP data categories as most relevant to the construction phase:

- Identification and versioning
- Technical specifications and performance
- Compliance and documentation
- Traceability and chain-of-custody events
- Installation, handling, and safety information

These categories reflect recurring needs reported for construction products, including harmonisation challenges across passport terminologies and the requirement for machine-interpretable and interoperable product data (Aragón et al., 2025; Çetin et al., 2023; Vangelova et al., 2025). They are also consistent with stakeholder expectations and barriers such as balancing transparency with intellectual property concerns (Ruismäki et al., 2025).

Construction-phase decision points in digital LPS workflows

Digital LPS systems provide a natural integration point for DPP data because they coordinate commitments, constraint management, and feedback loops across planning horizons. In particular, DPP information can support decision-making at:

- **Lookahead planning and make-ready screening:** verifying prerequisite availability and identifying product-related constraints early
- **Weekly Work Planning commitments:** supporting reliable "can" decisions by providing verified product requirements and documentation
- **Receiving and quality checks:** confirming that delivered products match specified versions/batches and that required documentation is available
- **Exception management:** handling substitutions, non-conformities, and late changes with controlled traceability and version awareness.

Digital LPS implementations emphasise centralised information management and situational awareness for coordination, making them suitable entry points for structured product data (McHugh et al., 2025).

Mapping DPP data to Lean execution mechanisms

Table 2 summarises the mapping between DPP data categories, LPS decision points, and the primary operational purpose supporting Lean execution. For example, reliable identifiers and versioning can reduce planning failures caused by incorrect substitutions; traceability events can strengthen logistics reliability and receiving controls; and compliance documentation can prevent work starting without required approvals, thereby reducing making-do situations. Prior Lean research has linked missing prerequisites and product-related issues to waste and rework, reinforcing the importance of timely and reliable product information in production control (Amaral et al., 2023). Related work on product data integration for lean site logistics further supports the relevance of structured product information to improve flow reliability (Berroir et al., 2023).

Table 2: Mapping DPP data categories to LPS decision points and expected Lean effects

DPP category	Lookahead	WWP	Receiving/QA	Exceptions
ID & versioning	Right item/version	Reliable "can"	Delivery match	Substitution control
Technical specs	Prerequisites/compatibility	Task readiness	Properties confirmed	Equivalence check
Compliance & docs	Approvals available	Commit with evidence	Acceptance gate	Ncr re-approval
Traceability	Logistics status	Availability certainty	Batch/serial verify	Rca & targeted fix
Install/handling/safety	Handling constraints	Safe method prereqs	Prevent damage/ncr	Corrective guidance

System guidelines for DPP-enabled digital LPS workflows

This section translates the proposed framework into practical guidelines for construction teams and for digital LPS implementations that aim to incorporate DPP information during the construction phase. The guidelines are written from a production planning and control perspective, focusing on how DPP information should be used to support make-ready, commitments, logistics reliability, and quality assurance.

These guidelines describe how project teams can use DPP information within LPS routines (lookahead/make-ready, weekly commitments, receiving/QA, and learning) to increase task readiness and reduce avoidable variability. When a digital LPS platform is used, these guidelines translate into practical requirements for what the platform should make visible, record, and enforce during planning and control.

Guideline 1 — Define a "minimum DPP dataset" per product group for construction execution

For each relevant product group (e.g., façade elements, MEP equipment, firestopping products), define a minimum set of DPP data categories that must be available before work can be made ready. This minimum should prioritise identification/version, technical requirements affecting installation, and mandatory compliance documentation, avoiding information overload while ensuring decision usability (Cetin et al., 2023; Ruismäki et al., 2025).

Guideline 2 — Treat DPP-based checks as explicit make-ready constraints

In lookahead planning, create a dedicated constraint type for "product information readiness" and link it to DPP evidence (e.g., verified documentation available, correct version identified). A task should only move to "can" when these DPP-related constraints are removed.

Guideline 3 — Use DPP identifiers to control substitutions and protect plan reliability

When changes happen (due to availability, lead times, or design late decisions), record the product replacement using its DPP identifier/version and require an explicit check of: (i) equivalence/compatibility with the intended design intent, and (ii) compliance implications. This makes change a managed, informed and compliance-checked decision rather than an informal field workaround.

Guideline 4 — Link receiving to plan: confirm "right product, right version, right evidence"

At receiving, confirm that delivered items match the planned product identity (and, when relevant, batch/serial) and that required evidence is available (e.g., declarations/certificates, handling instructions). If not, open a constraint immediately and block release to installation until resolved. This creates a direct bridge between logistics and LPS make-ready.

Guideline 5 — Make installation prerequisites explicit at the moment of commitment

When a task is proposed for the Weekly Work Plan, make the key product-specific prerequisites visible and confirm them explicitly (e.g., substrate readiness, environmental limits, curing times, required tools, safety prerequisites). The aim is not to add bureaucracy, but to reduce tacit assumptions that frequently trigger making-do.

Guideline 6 — Classify failures so learning becomes actionable

When tasks are not completed as planned, classify reasons for variance using categories that isolate "product information" problems (e.g., missing documentation, unclear requirements, wrong version/substitution, traceability uncertainty). Over time, this helps quantify how much unreliability is driven by product information and where DPP use would prevent recurrence.

Guideline 7 — Establish responsibility for DPP information completeness in the supply chain

Assign clear responsibilities for ensuring that required DPP fields are available and validated before delivery and installation (e.g., supplier/manufacturer provides documentation; contractor verifies readiness; trade confirms prerequisites). This is essential to avoid shifting the burden to site crews at the last minute.

Guideline 8 — Use DPP to support work packaging and logistics planning

For work packages and kitting/logistics plans, use DPP identifiers to define package contents (correct items, versions, and quantities) and to confirm completeness at handoff points. This guideline supports more reliable material flow to the workface and reduces making-do triggered by missing components (Amaral et al., 2023; Berroir et al., 2023).

Guideline 9 — Roll out incrementally: start where constraints are most frequent and costly

Do not attempt full DPP integration across all products at once. Start with product groups that are (i) high-cost, (ii) high-risk for rework or non-compliance, or (iii) recurrent sources of constraints in lookahead planning. An incremental strategy is consistent with observed implementation priorities in construction contexts (Mêda et al., 2024).

Guideline 10 — Maintain an auditable decision trail for DPP-based readiness

At key points (task made ready, weekly commitment, receiving acceptance, installation completion), record which product identity/version and which evidence supported the decision. This should be lightweight (not a full dossier), but sufficient to answer later: what was installed, where, when, and under which requirements/evidence? This guideline supports accountability, reduces dispute ambiguity, and enables structured downstream information continuity.

Link to Digital Building Logbooks (DBL)

The evidence trail in Guideline 10 also creates a straightforward pathway to future Digital Building Logbook (DBL) use. A DBL can only function reliably if product-level information is connected to where products were installed and which version/batch and documentation applied. If LPS routines already require teams to confirm readiness and record product identities at natural control points, extending this practice to populate DBL-relevant records becomes a small, non-disruptive additional step rather than a separate documentation effort. In this sense, making DPP use operational in construction-phase control is a prerequisite for credible DBL data continuity across the asset lifecycle.

Discussion and research agenda

The proposed framework and guidelines position the DPP as an operational information layer that can reduce construction-phase variability driven by product uncertainty. The scoping results suggest that most DPP-in-construction research has prioritised circularity and end-of-life use cases, interoperability with BIM/EPDs, and enabling infrastructures, while giving limited attention to how DPP data can support production planning and control on site. By focusing on digital LPS routines (lookahead/make-ready, weekly commitments, receiving/QA, and learning cycles), this paper highlights a practical pathway to translate product information into earlier constraint removal and more reliable commitments.

A key implication is that the value of DPPs in construction depends less on the mere existence of product data and more on whether such data is effectively used at critical decision points within planning and control workflows. Existing approaches to managing product information, including conventional documentation and BIM-based systems, are often limited to the design phase and not consistently maintained during execution, which limits their effectiveness in supporting real-time decision-making (Çetin et al., 2023; Ribeiro et al., 2023b).

If DPP information remains disconnected from planning and control processes, it risks becoming a compliance-oriented repository that is consulted too late to influence workflow reliability. In contrast, integrating minimum product information checks into make-ready processes and linking receiving/QA activities to planning commitments can shift the identification of issues upstream. This contributes to reducing making-do, rework, and informal substitutions, reinforcing flow reliability.

These observations are consistent with prior findings that structured product data integration can support lean site logistics and improve production stability (Berroir et al., 2023), as well as with research highlighting the importance of actionable data templates and stakeholder-aligned information requirements for operationalising passport-based approaches (Çetin et al., 2023; Ruismäki et al., 2025).

The guidelines also clarify governance and adoption challenges. Construction stakeholders highlight intellectual property concerns, unclear ownership of data, and the need to tailor DPP content by product group (Ruismäki et al., 2025). From a site perspective, overly complex or excessive product information can create friction and be ignored under time pressure, particularly when it exceeds what is operationally necessary for task readiness and decision-making. Insights from Lean Information Management (LIM) suggest that the success of such systems hinges on ensuring information flows are reliable, timely, and waste-free. Case studies of construction information systems designed as Lean enablers show that benefits are realized when the system reduces the eight wastes of information (e.g., waiting, overprocessing, defects), thereby increasing the reliability and usability of data for decision-makers (Ribeiro et al., 2023a). The “minimum dataset” approach proposed here is intended to balance usability with compliance and reliability by prioritising a core set of essential attributes that support effective and traceable decisions without overburdening site actors (Elkhidir et al., 2025).

Finally, the evidence trail created at LPS decision points can support lifecycle continuity beyond construction. If product identities and versions are recorded where they are installed and under which evidence they were accepted, the transition to building-level information structures such as Digital Building Logbooks becomes substantially less disruptive. In this view, operational DPP use during construction is not only a Lean enabler but also a prerequisite for credible downstream information management.

Limitations and practical barriers to implementation

It is important to acknowledge the limitations of this conceptual study, and the practical barriers to implementing the proposed framework. First, the framework assumes a level of digital maturity (e.g., use of digital LPS, connectivity on site) and supply chain readiness (e.g., DPP data provision by manufacturers) that is not yet universal. Second, the guidelines introduce new responsibilities and checks; their adoption may face cultural resistance or be perceived as adding bureaucratic overhead, especially if not seamlessly integrated into existing workflows. Third, issues of data ownership, intellectual property, and the cost of implementing the required technological infrastructure are significant real-world hurdles highlighted in stakeholder studies (Ruismäki et al., 2025; Mêda et al., 2024). These barriers underscore the need for the incremental, pilot-based rollout suggested in Guideline 9, and highlight that technological and procedural solutions must be accompanied by aligned contractual and incentive structures.

Research agenda

Future work should focus on empirical validation of the proposed framework through case-based and longitudinal studies in live construction projects. Priority directions include:

- **Pilot implementations in digital LPS environments:** implement a limited set of DPP-based readiness checks for selected product groups and assess effects on planning reliability and constraint removal practices.
- **Measurement using Lean-compatible indicators:** track changes in task readiness, Percent Plan Complete (PPC), and "reasons for variance" categories related to materials/product information, as well as non-conformance and rework events attributable to product documentation or substitutions.
- **Product group tailoring and minimum dataset definition:** test how the "minimum dataset" varies across trades and products, and identify thresholds where information becomes either insufficient for risk control or excessive for site usability.
- **Data governance and responsibility allocation:** study contractual and organisational arrangements that ensure product information is available when needed without shifting the burden to site crews.
- **Continuity to DBL and asset information:** investigate how construction-phase evidence trails can be structured to support handover and operations, including links from installed locations to DPP references.

Conclusions

This paper explored how Digital Product Passports (DPPs) can support Lean Construction execution by strengthening the availability, structure, and verifiability of product information at construction-phase decision points. A targeted scoping search indicates that DPP-in-construction research is currently concentrated on circularity, interoperability, and enabling infrastructures, with limited explicit attention to on-site production planning and control. In response, we proposed a DPP-to-LPS integration framework that maps DPP data categories to digital Last Planner System workflows and expected Lean mechanisms such as improved constraint removal and task readiness.

The paper also provided construction-oriented guidelines for operationalising DPP information in lookahead/make-ready, weekly commitments, receiving/QA, and learning cycles. Beyond near-term Lean benefits, the proposed "evidence trail" approach offers a practical pathway to support future lifecycle continuity, including the population of building-level records such as Digital Building Logbooks. Future research should validate the framework through project pilots and assess impacts using planning reliability, variance reasons, and rework/non-conformance indicators.

As DPP become the norm, a new paradigm emerges in which the challenge shifts from data availability to its effective use. As a philosophy grounded in continuous improvement, Lean Construction cannot disregard this valuable source of structured information, which can support increasingly reliable decision-making in construction execution.

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