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DEVELOPING KPIs AND MEASUREMENT PROCESSES TO ASSESS THE IMPACT OF INNOVATION IN THE CONSTRUCTION INDUSTRY: CURRENT PRACTICES AND CHALLENGES

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ABSTRACT: The construction industry's role as a key economic driver underscores the need for robust mechanisms to measure and manage innovation. While conventional metrics often emphasize cost, schedule, and immediate outputs, emerging trends highlight broader, long-term impacts—particularly those related to sustainability, social well-being, and organizational growth. This study examines current practices and challenges in performance measurement among five major public project owners in Quebec, selected due to their involvement in a digital transformation roadmap, drawing on semi-structured interviews with senior managers and technical teams. Our findings reveal a strong reliance on traditional Key Performance Indicators (KPIs), such as cost and schedule, complemented in some cases by environmental, safety, or innovation-oriented indicators. However, limited standardization, disparate data-collection methods, and fragmented systems impede consistent, real-time reporting. Moreover, long-term outcomes and intangible benefits frequently remain under-assessed, reflecting a gap between immediate project control and strategic, impact-focused goals.

Despite these challenges, a gradual shift is evident: several public owners express intentions to adopt more holistic KPI sets that address sustainability, resource productivity, and innovation. Efforts to streamline data gathering—through integrated software platforms and stakeholder collaboration—indicate a growing recognition of the need for accurate, forward-looking measurements. By pinpointing the limitations and emerging directions in current practices, this research contributes new insights into how performance management can evolve to capture both immediate project results and broader societal impacts in the construction industry.

1. INTRODUCTION

The construction industry is widely recognized as a cornerstone of economic development, reflecting societal progress and technological advancements across multiple domains, playing a crucial role in fostering economic growth, and significantly contributing to the global economic landscape(AlJaber et al., 2024; Barata & Fontainha, 2017; OECD & Eurostat, 2018). However, fragmented structures (Annunen & Haapasalo, 2023; Guimarães, 2024), a conservative culture, and reliance on traditional processes often hinder the adoption of innovative practices (Blayse & Manley, 2004).

Innovation is crucial to ensuring the long-term stability of organizations (Al-Hakim & Jin, 2010). In addition, a large number of studies in the construction sector emphasize that new technologies have a positive effect on overall productivity, efficiency, and safety (Klosova & Kozlovská, 2020). Effectively managing and advancing innovation requires a comprehensive understanding of the innovation process, the enhancement

of innovation capabilities, and the measurement of innovation outcomes (Gambatese & Hallowell, 2011). Quebec's public owners were chosen specifically for their involvement in a shared digital transformation roadmap, making them an ideal context for examining evolving performance metrics.

Impact and performance measurements are critical frameworks for capturing both the tangible and intangible benefits of innovation (OECD & Eurostat, 2018). Performance measurement often focuses on evaluating either the activities themselves or their immediate outputs (Schober & Rauscher, 2014; Simsa et al., 2014; O'Flynn, 2010). In contrast, impact measurement involves assessing the long-term, significant effects—whether positive or negative, intended or unintended. In this context, it becomes crucial to identify, measure, and, where possible, assign value to these outcomes (OECD & Eurostat, 2018).

Additionally, the concept of deadweight (Schober & Rauscher, 2014; Simsa et al., 2014) highlights the extent to which the outcomes would have happened anyway. This concept can be employed to adjust the measured outcomes, offering a more accurate picture of an initiative's net impact. These approaches collectively underscore the need for rigorous metrics and frameworks to reliably gauge innovation's contributions and guide better decision-making in the construction sector.

1.1 Problem Statement

The construction industry's emphasis on immediate economic gains often results in the neglect of long-term and indirect benefits. Conventional performance metrics, which prioritize operational aspects such as cost, schedule, and quality, typically emphasize the immediate outputs of innovative interventions. Consequently, these metrics frequently overlook long-term effects - such as sustainability improvements viewed through the Triple Bottom Line (TBL) perspective, encompassing social, economic, and environmental impacts (Kucukvar & Tatari, 2013; Wu et al., 2021). This gap can lead to incomplete decision-making, ultimately affecting stakeholders and limiting broader industry progress.

Moreover, it seems there is no single set of widely accepted performance indicators for evaluating the impact of new and innovative initiatives, and there is a recognized need for developing standardized indicators that can be applied across different innovation systems to facilitate better performance measurement and comparison (Alvarez & Jordan, 2024; Arshi et al., 2021; Nappi & Kelly, 2022). This standardization would help create a common language and framework for evaluating innovation initiatives, specifically in the construction industry, which is known as an industry lagging in the adoption of innovation.

2. BACKGROUND

2.1 Performance Measurement

KPIs have long been recognized as pivotal to ensuring successful outcomes in construction projects. As Bassioni et al. (2004) note, the need for consistent performance measurement has grown with the construction industry's push for continuous improvement. In an increasingly competitive and globalized market, KPIs offer a systematic way to benchmark progress, highlight areas of underperformance, and support strategic decision-making (Sibiya et al., 2015). Beyond simply tracking whether a project is on time and on budget, KPIs help practitioners align objectives and coordinate resources across multiple stakeholders (Habibi et al., 2019). By objectively gauging how well a project meets defined metrics, KPIs enable project managers and clients to identify gaps early, implement remedial measures, and, ultimately, enhance the probability of meeting or surpassing targets.

Historically, the success of a construction project was often measured using a narrow "iron triangle" framework—focusing primarily on cost, time, and quality (Hussain et al., 2025). Over time, however, the concept of project success has expanded considerably. Early discussions (Chan & Chan, 2004; Cox et al., 2003) recognized that factors such as safety and scope changes also influence final outcomes, while Rankin et al. (2008) highlighted innovation and sustainability as essential dimensions of performance. Consequently, the body of literature now presents a broad set of KPIs spanning eight core categories: Cost, Time, Productivity, Quality, Safety, Scope, Innovation, and Sustainability (Poirier, 2015; Zhang et al., 2022). This extended range of metrics addresses both the traditional project-control indicators (e.g., cost/time

predictability) and progressive measures (e.g., energy consumption and carbon footprint) with implications for long-term impacts on the environment, society, and overall operational efficiency.

A closer look at these emerging trends confirms that the construction industry is shifting from short-term project performance—such as immediate cost control—to long-term, holistic considerations (Habibi et al., 2019). For example, a recent study by Liu et al. (Liu et al., 2024) identified five central KPIs for construction, emphasizing safety, technological advancement, and communication—indicators that notably diverge from the traditionally dominant focus on cost. This shift underscores how broader concerns, including stakeholder coordination, have risen to prominence in defining project success. Moreover, as the industry adopts a more future-oriented outlook, simply gauging short-term performance appears insufficient. Instead, long-term impact—encompassing aspects such as environmental stewardship, social well-being, and sustained operational efficiency—has become increasingly relevant. Consequently, an expanded KPI set not only addresses diverse and long-term metrics but also paves the way for more comprehensive impact measurement, moving beyond immediate project outputs toward far-reaching, enduring outcomes.

2.2 Impact Assessment

During the past few decades, the construction industry has been exposed to “sustainable construction” processes, addressing the environmental, economic, and social dimensions of (Kamali & Hewage, 2015). Building on the acknowledgment that performance metrics alone may be insufficient, it is essential to recognize broader impact dimensions, including cultural and psychological (Simsa et al., 2014; Stern, 2015). By encompassing short-, medium-, and long-term horizons at micro (project), meso (organizational), and macro (societal) levels, impact assessment provides a holistic view of how construction activities and outcomes affect not only immediate stakeholders but also the larger community and environment.

One prominent approach reflecting this expanded scope is the TBL, which encourages organizations to measure their economic, social, and environmental dimensions (Lim, 2014). Often summarized as “people, planet, and profits,” TBL goes beyond traditional financial metrics to account for broader responsibilities (Slaper et al., 2011). First popularized by John Elkington (Elkington & Rowlands, 1999), TBL has gained considerable traction as a framework for sustainable development (Said & Berger, 2014). Over the past few decades, the construction industry has been particularly exposed to sustainable construction processes that address TBL concerns throughout the entire life cycle of a building (Kamali & Hewage, 2015). Despite its popularity in many sectors, however, TBL adoption in construction remains limited (Goh et al., 2020; Zainul Abidin, 2009), partly due to the lack of a standardized method for measuring social, environmental, and economic dimensions comprehensively (Slaper et al., 2011).

Nonetheless, the construction industry is undeniably critical to society, the economy, and the environment (Agenda, 2016). Economically, it generates nearly $10 trillion in annual revenues—about 6% of global GDP—employing over 100 million people worldwide (Agenda, 2016). Environmentally, it accounts for significant resource use, including half of global steel consumption and nearly 40% of solid waste in the United States—making it a major contributor to carbon emissions (Agenda, 2016; Illankoon et al., 2017; Khoshnava et al., 2018). In response, various scholars have categorized the TBL dimensions in depth: economic indicators (cost, viability), environmental metrics (pollution, resource efficiency), and social measures (equity, stakeholder well-being) (Dobrovolskienė & Tamošiūnienė, 2016; Zainul Abidin, 2009). Although TBL is powerful, Pawłowski (2008) highlights moral, legal, and technical considerations as well (Illankoon et al., 2017), suggesting TBL alone may not capture the full complexity of responsible development.

Overall, by reframing construction through impact assessment rooted in TBL, stakeholders can move beyond short-term measures to address the long-term consequences of built environments (Habibi et al., 2019). This broader perspective underscores the need to evaluate economic, social, and environmental outcomes—along with moral, legal, or technical factors—across the entire life cycle of a construction project. In this research, we propose a framework that integrates these varied dimensions, offering a roadmap for practitioners and researchers who seek to align innovative construction practices with sustainable, multi-level project goals.

3. METHODOLOGY

This study began with a targeted literature review on construction project performance measurement, focusing on widely used KPIs and existing frameworks. Insights from academic journals and industry reports guided the development of a semi-structured interview guide, aimed at understanding how KPIs are currently selected, tracked, and utilized by public project owners in Quebec.

To capture real-world practices, five major public project owners in Quebec were selected through purposive sampling, as they are active participants in a regional digital transformation roadmap. Collectively, these organizations oversee projects in residential, industrial, infrastructure, and institutional sectors. Each interview featured a senior manager—often joined by a technical or engineering team member—reflecting roles that directly influence KPI choice and monitoring. The semi-structured interviews, each approximately 60 minutes in length, covered questions on KPI usage, selection criteria, data collection methods, perceived challenges, and strategies for measuring project impact. All sessions were recorded, transcribed, and analyzed via iterative thematic coding, using an initial set of analytical categories (e.g., KPI usage and data collection) and refining them as new themes emerged.

4. FINDINGS

Following transcription, interview responses were coded based on core analytical angles derived from the interview questions. These angles encompassed (1) the KPIs in use and how they are applied, (2) the underlying rationale for KPI selection, (3) approaches to data collection and analysis, (4) identification of particularly critical KPIs, (5) interest in additional or missing metrics, (6) barriers or difficulties in collecting and interpreting KPI data, (7) the influence of KPI findings on decision-making, and (8) emerging methods for measuring initiative impacts beyond immediate outputs. These thematic categories ultimately shaped the structure of the findings by illuminating how public project owners perceive, select, and leverage various construction KPIs.

4.1 Key Performance Indicators (KPIs) used

Although each organization used slightly different terminology, Table 1 presents a unified view of the main KPI categories identified. Checkmarks indicate that a Public Project Owner (PPO) monitors or applies that KPI theme; a dash (–) signifies the KPI was not explicitly mentioned.

Table 1: Consolidated KPIs used by PPOs

KPI / Theme	PPO 1	PPO 2	PPO 3	PPO 4	PPO 5	Key Observations
Cost / Financial	✓	✓	✓	✓	✓	Includes budget gaps, cost compliance, earned value (CPI/SPI), and disbursement tracking. All PPOs emphasize cost.
Schedule / Time	✓	✓	✓	✓	✓	All PPOs tracked (often with colour-coded “time control,” schedule gap/ compliance).
Visual Indicators	✓	–	✓	✓	✓	Red/yellow/green dashboards are common. Four PPOs employ color-coded signals to convey overall project status quickly.
Scope	✓	✓	✓	–	–	Focused on planned vs. actual scope (e.g., “scope gap,” change notices). Not explicitly mentioned by PPO 4 or 5.
Risk Management	✓	✓	✓	–	–	Colour-coded risk levels or risk tracking logs. Potential shift toward more proactive risk approaches.
Resource / Productivity	✓	✓	–	–	✓	Workforce capacity, labor attendance, or “workload” metrics. PPO 5 correlates on-site hours with planned tasks.
Supplier / Stakeholder	✓	✓	–	–	–	Supplier evaluation, social acceptability, or client feedback appear in PPO 1–2. Others rarely mention these.
Project Condition / Health	–	✓	–	✓	–	PPO 2 uses a “health index”; PPO 4 focuses on building condition (A–E rating) or HLM renovation progress.

Sustainability	–	✓	✓	–	–	PPOs 2 & 3 monitor environmental impact, energy performance, or compliance. Indications of growing interest.
Safety	–	✓	–	–	–	PPO 2 explicitly identifies safety metrics (health & safety). Others did not detail formal safety indicators.
Innovation	–	✓	–	–	–	PPO 2 explicitly labels “innovation initiatives.” One PPO references advanced “tactical/strategic” approaches but not as “innovation.”

As shown, Cost/Financial and Schedule/Time metrics dominate, with every PPO referencing some form of budget or timeline management. Scope and Risk appear in three of the five PPOs, often tied to “gap” analyses or logs indicating change notices or potential overruns. Resource/Productivity indicators vary, but at least two PPOs track workforce capacity or labor attendance in detail. Meanwhile, Safety is surprisingly under-represented (only one PPO references it explicitly), suggesting that formal safety KPIs may be embedded elsewhere or assumed.

Sustainability (environmental impacts, energy targets) is highlighted by two PPOs, reflecting a modest yet potentially growing priority. Only one PPO explicitly frames Innovation as a standalone KPI category, though other organizations mention advanced practices under different labels. Lastly, Visual Indicators (traffic-light colour-coding) feature prominently in four PPOs, showing a clear preference for quick, at-a-glance project health assessments.

This broad spectrum of KPIs—from cost and schedule fundamentals to more progressive metrics like energy performance —suggests a shift in the construction sector’s emphasis. Beyond immediate project outputs, public project owners are gradually exploring long-term or impact-focused measures, including innovation and environmental stewardship, albeit at varying degrees of adoption.

4.2 Determination, Critical Indicators, and Additional Metrics

Public project owners in Quebec reported varied strategies for selecting KPIs, commonly referencing project management fundamentals (e.g., cost–time–scope) and strategic alignment (PPOs 1, 2, 3, and 5). As shown in Table 2, some introduced official input from ministerial or auditor demands (PPOs 4 and 5), while others relied on portfolio approaches or gap analysis to refine or evolve their metrics. Nonetheless, interviews consistently revealed that cost and schedule remain “primary KPIs” across the board, though certain owners (e.g., PPO 2) elevate safety/environment to the same priority level. Beyond these staples, many PPOs aspire to expand into quality, earned value, resource/productivity, or environmental measures, illustrating a shift toward more holistic project assessment.

Table 2: KPI determination and criticality

KPI Focus	Selection	Criticality	Key Observations
Cost	PMI standards, board confirmations, annual planning	All PPOs	Cost remains universal. Some owners want more precise cost-tracking (CPI/SPI).
Schedule	Strategic alignment, official input, portfolio approach	All PPOs	Time synergy with cost. Some adopt milestone-based or “delivery speed” measures.
Scope	Gap/process improvement in some PPOs	Sometimes	Not universal, but certain owners see scope compliance or change notices as vital.
Safety/ Environment	Ministerial demand (PPO 2), occasional board endorsement	only PPO 2	One PPO elevates it to main priority, others approach environmental efforts incrementally.
Quality	Gap analysis, stakeholder input	Sometimes	Remains an optional add-on for deeper oversight, especially rework or on-site issues.
Resource/ Productivity	Evolving approach, not always formal	Rarely top-tier	Some owners see workforce capacity as important but have minimal formal tracking.
Innovation	Portfolio expansions or official impetus (BIM)	Rarely top-tier	Mandates, pilot programs, or advanced indicators suggest slow integration beyond the cost/time core.

All five public project owners cite cost and schedule as indispensable KPIs—often validated through PMI standards or strategic planning. While safety/environment is uniquely top-tier at PPO 2, other owners incorporate it more modestly or plan future expansions (e.g., GHG metrics). Scope and quality appear variably, yet interest in rework rates, non-conformities, or thorough scope compliance signals a desire for more granular oversight. Resource/productivity indicators also draw attention, though formalized approaches are still emerging. Lastly, innovation (BIM or advanced tools) is recognized but seldom top-tier, indicating a gradual broadening of KPI scope as new initiatives mature. Taken together, these findings reflect each owner's organizational mandates, ministerial priorities, and portfolio complexities, all contributing to distinct but overlapping KPI sets—most of which revolve around cost, schedule, and a growing set of impact-focused measures.

4.3 Data collection frequency, methods, and tools

Although each organization used its own terminology and combined various platforms, the interview data can be distilled into a few overarching categories of data entry methods, tools, and reporting cycles. Table 3 presents these broad approaches and indicates which PPOs adopt them.

Table 3: Consolidated data collection frequency, methods, and tools

Method / Tools	PPO 1	PPO 2	PPO 3	PPO 4	PPO 5	Key Observations
Manual Data Entry	✓	✓	✓	✓	✓	Commonly done or partially in Excel or in-house sheets. Causes potential data delays and manual errors.
Multiple Systems	–	✓	–	✓	✓	Integrated PM tools plus manual tables. System integration issues hamper real-time analysis.
Data Type: Mix (Actual & Self-Reported)	✓	✓	✓	–	–	Three PPOs rely on a mix data type. Encourages data validation but slows updates. Two others are self-reported data.
Data Frequency: Monthly	✓	✓	✓	–	✓	Many projects updated monthly. Some PPOs do weekly/daily (PPO 2) or bi-monthly (PPO 5). PPO 4 follows a no-strict interval, updating as projects move stages.
Excel-Based Dashboards	✓	✓	✓	✓	✓	All PPOs used for entry and visualization; forms the baseline for advanced tools.
Visualization	–	✓	✓	✓	✓	Four PPOs moving from Excel to power BI platforms for real-time or public transparency dashboards.
Software	–	✓	–	–	✓	PPO 2 and PPO 5 adopt specialized scheduling/cost control software. Facilitates advanced metrics (e.g., earned value) but integration remains a challenge.

All five PPOs rely at least partially on manual data entry, often through Excel sheets, which can slow updates and introduce potential errors. Three PPOs combine actual measurements (e.g., from contractors) with self-reported figures, leading to more thorough validation but longer processing times, while two others mention primarily self-reported data. Although monthly updates remain prevalent, PPO 2 occasionally uses weekly or daily check-ins, and PPO 5 conducts bi-monthly workshops to finalize KPI reporting; in contrast, PPO 4 updates data "on demand," linked to project milestones or program phases.

Excel-based dashboards dominate the landscape as a baseline, yet four PPOs are transitioning toward BI platforms—particularly Power BI—for improved real-time analysis or public-facing dashboards. PPO 2 and PPO 5 incorporate specialized software (e.g., scheduling/cost control tools) to track advanced metrics such as earned value, although system integration challenges persist. Collectively, these methods signal a gradual shift from purely manual, Excel-driven processes to more dynamic, fully integrated data environments, albeit at different stages of adoption among the five PPOs.

4.4 Challenges in Data Collection and Analysis

Interviews revealed a variety of obstacles when collecting, interpreting, and reporting KPI data. Table 4

condenses these issues into five main categories, indicating which Public Project Owner (PPO) reported each challenge. Additional context appears in the concluding observations.

Table 4: Consolidated challenges in data collection and analysis

Challenge Theme	PPO 1	PPO 2	PPO 3	PPO 4	PPO 5	Key Observations
System Integration	✓	✓	–	✓	✓	Reliance on Excel or lack of advanced tools, multiple disjointed systems, no single source of data, limited interoperability.
Data Quality	✓	✓	✓	✓	✓	Potential errors from manual entry, variable data formats, or "garbage in, garbage out." Discrepancies between different sources.
Human Factors	✓	–	✓	–	✓	High staff turnover, limited data-monitoring resources, varied reporting quality, cultural resistance to KPI scrutiny.
Data Analysis / Reporting	✓	–	✓	–	–	No baseline capability, delayed updates due to invoicing/payment, inconsistent methods across project managers.
Resource Constraints	–	–	–	✓	–	Inspector shortages (PPO 4) and similar limitations cause long delays (e.g., a five-year horizon for full building stock assessments).

All five PPOs report data quality concerns, most often tied to manual entry or multiple, unaligned systems. System integration stands out in four PPOs, citing Excel dependence, partial tool adoption, or no single data repository. Human factors also complicate KPI usage: some organizations face staff turnover, skill gaps, or reluctance among project managers to expose performance data. While delays and lack of advanced analysis affect at least two PPOs, PPO 4 deals specifically with limited resources for large-scale inspections, reflecting a strategic challenge beyond routine data tasks. Collectively, these challenges underscore the complexity of achieving consistent, real-time KPI reporting in public construction projects—despite a shared ambition for more transparent, data-driven decision-making.

4.5 Utilization of KPI data for decision-making

Participants described how they translate KPI results into concrete decisions, ranging from immediate interventions and escalation processes to more proactive or portfolio-level maneuvers. Table 5 consolidates these practices into core approaches, while the short paragraph below elaborates on distinctive methods at each PPO.

Table 5: Consolidated approaches to KPI-based decision-making

Decision-Making Approach	PPO 1	PPO 2	PPO 3	PPO 4	PPO 5	Key Observations
Immediate Action	✓	✓	✓	–	✓	When KPI signals (e.g., red/yellow) appear, teams intervene quickly to prevent larger overruns or schedule slips.
Corrective Steps (Action Plans / Realigning)	✓	✓	–	–	✓	PPOs 1, 2, and 5 implement formal action plans (e.g., "Realigning Projects," "Action-Oriented Reports") to address cost/time anomalies.
Escalation Process (Committees / Raising Flags)	✓	–	✓	–	✓	Certain issues—budget crises, critical delays—are escalated to higher-level boards or committees for prioritization, rebalancing, or strategic decisions.
Proactive / Performance Support	–	✓	–	✓	–	PPO 2 uses "Proactive Support" in reviews; PPO 4 uses "Proactive Measures" to accelerate delivery. Both stress anticipating problems before they grow.
Ministerial / Organizational Targets	–	–	–	✓	–	PPO 4 cites "Delivery Accountability" (minister monitors KPI data for timely housing). May link to broader political/board-level directives.
Portfolio / Renovation Prioritization	✓	–	–	✓	–	PPO 1 "rebalances" entire portfolios; PPO 4 channels resources based on building condition data.

Cultural / Behavioral Change	–	✓	–	–	–	PPO 2 notes that transparency from KPI dashboards fosters "positive impact," leading to better team behaviors and more accountability.

Overall, cost and schedule deviations typically trigger immediate or corrective measures, sometimes escalating to higher management. A few owners go further, employing proactive or portfolio-level strategies to preempt issues. Even more specialized processes—like PPO 4's ministerial accountability or PPO 5's systematic "continuous monitoring"—underscore the variety of ways in which public project owners turn KPI data into actionable decisions, whether through swift interventions or broader cultural changes.

4.6 Measurement of Initiative Impacts and Future Plans

The interviews revealed how each public project owner looks beyond immediate performance, exploring new initiatives (e.g., BIM) or longer-term sustainability goals. Table 6 consolidates these recurring ideas.

Table 6: Key initiative impacts and future plans

Initiative / Future Plan	PPO 1	PPO 2	PPO 3	PPO 4	PPO 5	Key Observations
Earned Value (CPI/SPI)	✓	–	–	–	✓	PPOs 1 & 5 want more precise performance tracking (cost/schedule).
Quality / Non-Conformities	✓	✓	–	–	–	PPOs 1 & 2 hope to track changes, addenda, or complaints for deeper quality metrics.
Proactive / Predictive	–	✓	–	–	–	PPO 2 wants to identify major milestones, supply chain issues in advance.
Resource / Productivity	✓	–	–	–	✓	PPOs 1 & 5 mention resource utilization or standardized productivity rates (labor attendance, consistent tracking).
Environmental / Sustainability	–	–	–	✓	✓	PPO 4 & 5 aim to measure carbon footprint, GHG reductions, or community impacts more systematically.
Portfolio-Level Monitoring	–	–	✓	–	–	PPO 3 seeks centralized tools, potential to add more KPIs as the portfolio approach evolves.

5. CONCLUSION

This paper underscores the evolution of KPIs within Quebec's public construction sector, highlighting the continued dominance of cost and schedule metrics alongside an emerging interest in sustainability, safety, and innovation. Despite their significance in project oversight, traditional KPIs alone do not sufficiently account for the long-term societal, environmental, and economic outcomes of construction projects. The interviews confirm that many public project owners seek more integrated systems and standardized frameworks to address these broader dimensions. They also reveal persistent challenges related to data quality, system interoperability, and organizational culture, which constrain the effective use of performance data in decision-making.

Future research may focus on developing a comprehensive framework that captures both immediate and longer-term impacts of innovative initiatives in the construction industry. Such a framework would encompass commonly recognized KPIs—such as cost—while also incorporating sustainability, social well-being, and strategic innovation measures, linked to life cycle considerations and multi-level impact assessments. By integrating short-term performance tracking with long-range impact monitoring, the construction sector can better align project execution with economic, environmental, and social objectives, ultimately facilitating more responsible and future-oriented development. This study has certain limitations, including the relatively small number of interviewees, which may affect the generalizability of the findings.

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