

Expert-Centered BPM for Knowledge-Intensive Organizations

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Abstract

In knowledge-intensive organizations, expert judgment is the primary source of value. Delivering it through BPM requires redesigning the conditions that enable expert work, not only optimizing flows. This paper reports a Canonical Action Research initiative at the Sao Paulo State Attorney General's Office, the largest litigant before the largest court in Brazil, combining over 40 interviews, BPMN modeling, root-cause analysis, and process mining over a 14.7-million-event log. The evidence converges: performance problems originate in the system surrounding attorney work, not in attorney competence. About 13% of recorded events are attributable to attorneys, a footprint of the core legal work rather than a measure of its cognitive effort, while the room for standardization lies in the administrative and procedural layer that surrounds it. From this, the paper derives the Expert-Centered BPM Framework, a guiding diagnostic instrument of five dimensions, each paired with a diagnostic question and example indicators, proposed as analytically transferable to other knowledge-intensive settings.

Keywords

Expert Work, Process Mining, Public Legal Organizations

1. Introduction

The most consequential decisions in organizations, such as legal interpretation, clinical diagnosis, research design, and strategic advice, depend on experts who interpret ambiguous situations and produce context-sensitive solutions that no rule fully specifies in advance. Artificial intelligence (AI), robotic process automation (RPA), process mining, and other digital technologies have expanded the possibilities for automating routines and increasing operational visibility around this expert work, yet they have not replaced it. Driving digital innovation through Business Process Management (BPM) is therefore not only about implementing technologies [1]; it requires building the organizational conditions under which experts apply judgment effectively, at scale, and in strategic alignment. Technology augments expert work, but value is ultimately shaped by professionals whose decisions affect quality, trust, risk, and performance.

Knowledge-intensive work is not a marginal phenomenon. In the European Union, knowledge-intensive services accounted for 41.7% of total employment in 2025 [2]. In the United States, professional, scientific and technical services generated US\$ 2.55 trillion in GDP in Q4 2025 [3], employing around 10.8 million workers in early 2026 [4]. In Canada, such services are formally defined as sectors in which human capital is the primary input [5]. In Brazil, professional, administrative and complementary services generated R\$ 285.3 billion (approx. US\$ 56.3 billion) in value added and accounted for 40.5% of occupied persons in the service segments surveyed [6]. How BPM is adapted to these contexts is thus a concern with broad practical relevance for the global BPM community.

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In knowledge-intensive organizations, expert work is embedded in an operational system that can amplify or degrade professional judgment, depending on information quality, prioritization, reliable systems, and coherent governance. The literature documents recurring constraints: documentation burden and burnout in healthcare [7], administrative burden in research [8], task switching in software development [9], and workload pressure among lawyers [10]. These confirm that the role of people and culture in BPM is constitutive, not peripheral. The Knowledge-Intensive Processes (KIP) stream has examined the flexibility and cognitive complexity of expert work [11], with recent evidence that deviations from standards undermine KIP performance unless initiated internally when standards are insufficient [12], while worker-centric perspectives emphasize participation [13]. To the best of our knowledge, however, a structured diagnostic framework for the conditions surrounding expert work is still missing. The gap lies in practical guidance that helps practitioners address root causes rather than symptoms [14], a challenge that intensifies as digital technologies expand what BPM is expected to achieve [15].

The case is situated in a five-year research program on the cost of judicial litigation in Brazil, a cost currently under study within the CeMEPI-PGE research program. It is examined from the perspective of the Sao Paulo State Attorney General's Office (Procuradoria Geral do Estado de Sao Paulo, PGE-SP), which represents the State of Sao Paulo, the largest single litigant before the largest court in Brazil and among the largest in the world by case volume. Comparable public legal institutions operate in other jurisdictions [16], making the lessons relevant beyond the national context. PGE-SP recovered more than R\$ 6.3 billion in active debt in 2025, and the Acordo Paulista program had renegotiated R\$ 64 billion since 2023 [17], with AI-supported systems analyzing more than 4 million notifications and producing 620,000 legal documents [18].

The case examined the primary process of Conducting General Litigation, involving roughly 20 thematic legal units, through direct observation, more than 40 in-depth interviews, and process mining over a multi-year event log. The project is conducted by CeMEPI-PGE, a research center established through a FAPESP-PGE-SP funded call and associated with the University of Sao Paulo, integrating 47 researchers across data science, legal, and public-management fronts, with the objective of determining litigation cost. The BPM workstream reported here, now in its twentieth month, was designed as a Canonical Action Research (CAR) initiative in which researchers and practitioners co-constructed diagnostic artifacts through successive cycles of fieldwork, reflection, and validation [19].

2. Problem Statement

In organizations whose performance depends on knowledge-intensive workers, process problems rarely originate in expert activities themselves. They originate in the conditions surrounding them: poorly classified inputs, fragmented technologies, unclear priorities, weak coordination, and indicators that capture visible outputs while missing quality, risk, and strategic value. Existing BPM guidance reflects two limitations. The first, *flow reductionism*, treats improvement as activity sequencing and automation, leaving the conditions that shape expert judgment outside the diagnostic frame. The second, *expert exceptionalism*, treats experts as too autonomous to be supported by process governance. Both lead organizations to invest in technology and BPM without redesigning the governance and strategic alignment that determine whether expert work can scale. This motivates the research question: *What diagnostic dimensions should orient BPM practitioners redesigning the organizational conditions under which knowledge-intensive professionals produce value, and how can evidence from a real-life transformation case support the derivation of such a diagnostic framework?* The response is an Expert-Centered BPM Framework of five diagnostic dimensions, derived from the PGE-SP case through a full diagnostic cycle validated with institutional leadership.

3. Research and Methodological Background

BPM provides the conceptual foundation for this case because it understands organizational performance as the outcome of end-to-end processes connecting strategy, activities, roles, technologies, information flows, and governance [20]. Here BPM is treated as a transformation approach capable of redesigning the organizational conditions under which value is created, not merely as a technique for modeling workflows. This framing engages the six BPM capability areas identified in the literature, namely strategic alignment, governance, methods, information technology, people and culture, and process improvement [21], all of which are activated when the primary source of value is expert judgment rather than task execution.

This study adopts CAR as its research design. Generating actionable diagnostic guidance requires understanding how BPM methods operate in a complex, real-world context, a setting in which sustained researcher-practitioner collaboration is both necessary and epistemically productive [22]. Knowledge is generated through iterative cycles of diagnosing, planning, acting, evaluating, and specifying learning [19]. Eight academic researchers worked alongside PGE-SP practitioners through planning, fieldwork, artifact construction, validation, and reflection, within a broader FAPESP-funded program of 47 researchers spanning transformation, cost management, legal analysis, and data analytics. Together, they co-constructed the diagnostic artifacts, namely the process architecture, prioritization matrices, Business Process Model and Notation (BPMN) models, and root-cause structures, that both served the organization and provided the empirical basis for the framework.

In Brazil, State Attorney General's Offices represent the State judicially and extrajudicially and manage active debt recovery [23]. Litigation cost is understood here in a broad sense: beyond the monetary cost of lawsuits, it covers the organizational burden of disputes, rework, delays, weak information quality, and inefficient allocation of legal expertise.

The first action research cycle developed a process architecture organizing PGE-SP activities into primary, support, and managerial processes [20]. A Pain x Gain prioritization, informed by Burlton's strategy-through-process logic [24], led a leadership workshop to select Conducting General Litigation as the first diagnostic focus. The second cycle conducted more than 40 in-depth interviews with attorneys in coordination roles, complemented by direct observation and screen-sharing. AS-IS modeling in BPMN 2.0 [25] exposed interfaces, decision points, handoffs, and exceptions, and a Current Reality Tree (CRT) organized undesirable effects into a causal structure distinguishing symptoms from root causes, a diagnosis technique well established in BPM change management [26].

In parallel, the data analytics front conducted process mining [27] over an event log of approximately 14.7 million recorded events across more than 450,000 case instances spanning 2022-2026. Because this log is a sample rather than the full population, findings are reported as proportions, medians, and dispersion patterns rather than absolute totals. Two scoping decisions apply. First, cycle time approximates the interval from citation to at least a first-instance judgment, not to a final, unappealable one. Second, the thematic workload analysis excludes labels mapped as outside the managerial unit list, such as regional and support structures (the Brasilia office, regional prosecution offices, and the judicial cabinet, accounting for roughly 22% of events), concentrating on units genuinely belonging to Conducting General Litigation.

Process mining served a dual purpose: it grounded quantitatively identified patterns in qualitative evidence, and it located steps that are candidates for automation, an integration between process mining and RPA that the literature identifies as a growing area of practice [28]. Confidence in the findings rests on triangulation across interview evidence, direct observation, and iteratively validated BPMN, CRT, and process mining artifacts.

4. Key Findings and Framework

The diagnostic cycle generated extensive evidence: more than 40 interviews, direct observations, a BPMN AS-IS model, a CRT, and a process mining analysis. This evidence is used here to derive an

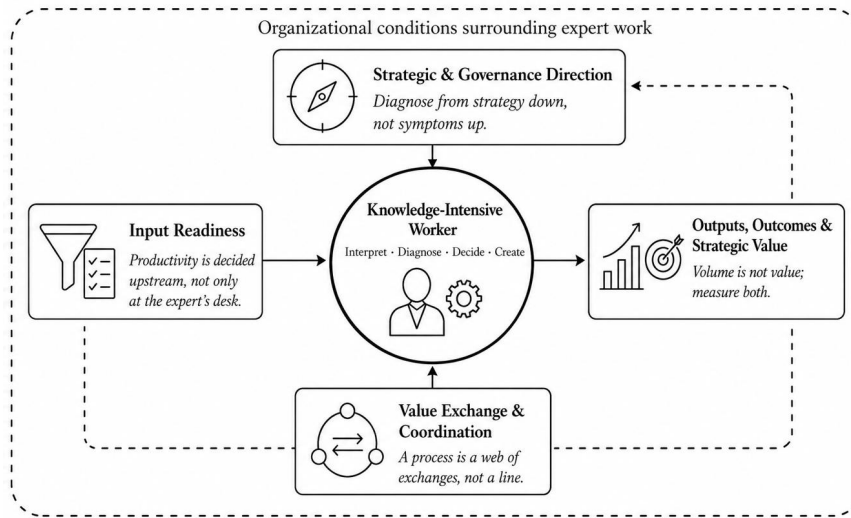


Figure 1: The Expert-Centered BPM Framework.

Expert-Centered BPM Framework, a guiding diagnostic instrument for examining the organizational conditions under which knowledge-intensive professionals produce value. It moves beyond flow-level diagnosis to the full system that directs, feeds, supports, coordinates, and evaluates expert work, while keeping the process as the object of transformation. Each dimension is presented with its diagnostic question, the PGE-SP evidence, and the guidance it generates.

The five dimensions were derived, not postulated. Asking which conditions along the path from expert work to value the diagnosis repeatedly showed to enable or constrain it, the evidence clustered around five non-redundant links: what orients the expert (strategic and governance direction), what feeds it (input readiness), who performs the work (the knowledge-intensive worker), with whom value is exchanged (coordination network), and what it produces (outputs, outcomes and strategic value), as presented in Figure 1. The number operationalizes, for knowledge-intensive contexts, the established BPM capability areas of strategic alignment, governance, people, and measurement [21].

The process mining analysis, over roughly 14.7 million records, did more than confirm the interviews. It quantified patterns these could only suggest and, in several cases, reframed them. Three measures proved especially informative: the share of recorded events attributable to expert work, the repertoire of recorded acts in the procedural layer surrounding that work, and the workload distribution across units classified by the institution's own work profiles. Each converges with the qualitative diagnosis rather than competing with it. These are transactional measures. The log records the mandatory procedural outputs of legal work, such as filing a document, not the cognitive effort behind them, so the patterns describe the recorded procedural layer rather than the underlying judgment.

Strategic and governance direction, the first dimension, addresses the institutional elements that orient, constrain, and prioritize expert work. In the PGE-SP case, attorneys frequently operated without clear visibility into how their caseloads connected to institutional priorities or the objective of reducing litigation costs. Without that connection, attention allocation is driven by volume rather than strategic relevance. The lesson is to diagnose from strategy down, not from symptoms up.

Input readiness, the second dimension, concerns the quality of what reaches the expert before judgment is applied. The CRT revealed a causal chain in which incomplete or misclassified demands, missing documentation, and deadlines already partly consumed before receipt were directly linked to compromised productivity. Process mining corroborates this: unclassified notifications and unclassified publications rank among the most frequent recorded activities, and case redistribution, both directed and automatic, figures prominently, an empirical proxy for the manual reclassification the CRT identified. Productivity is therefore decided upstream, not only at the expert's desk.

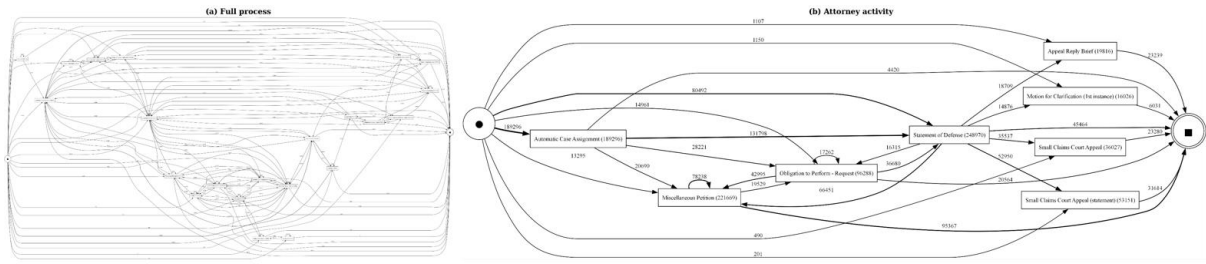


Figure 2: Full process (a) versus attorney activity (b).

The knowledge-intensive worker, the third dimension, places the expert at the analytical center. Interviews showed attorneys interpreting disputes, diagnosing procedural risk, and defining strategy. This is work that requires sustained cognitive engagement, continuously interrupted by administrative and corrective tasks.

Process mining makes a complementary point, one that must be read with care about what the log measures. About 13% of recorded events are attributable to attorneys, the overwhelming majority being automated integrations and supporting work. This figure is a recorded footprint, not a measure of cognitive effort: a single logged act such as filing condenses the composition of an entire legal defense, much as a single recorded step may stand for extensive prior reasoning. The value the institution delivers to society is produced within that 13%, since it is the core legal work of advocacy; whether this proportion is high or low is a separate, largely institutional question that we leave open for future discussion.

What the footprint does establish is that expert acts are a small, dispersed share of the recorded flow, which is precisely why protecting and concentrating that share on high-value work becomes a decisive performance lever, and why the process bottleneck is unlikely to lie there.

The full process is also highly fragmented, with no single end-to-end variant covering even 1% of cases; isolating the attorney's own recorded acts reveals a more recognizable repertoire, in which the most common attorney variant rises to about 5.6% of cases and the median attorney sequence is about four recorded steps, organized around familiar acts such as statement of defense and ordinary appeals. This regularity belongs to the surrounding, non-expert layer of the work rather than to legal judgment itself. It is the administrative, procedural, and corrective steps around the expert, and not the composition of the defense, that are amenable to templates, forms, system rules, and automation, consistent with evidence that internally-driven standards can support rather than harm KIP performance [12]. The guidance follows: separate high-value judgment from the administrative, repetitive, and corrective work that surrounds it, and standardize the latter, not the former.

This reading rests on a distinction the process maps make concrete. *Structural* complexity concerns the number and arrangement of distinct activities, and by that measure the process is not especially complex. *Contextual* complexity concerns the variability of circumstances an expert must navigate to act correctly, and it is here that the knowledge intensity of the work resides. The literature characterizes knowledge-intensive processes precisely as coupled to contextual data and knowledge and as robust to unanticipated exceptions that cannot all be modeled in advance [29]. In the PGE-SP case, mastering this variability is itself part of the cognitive load: the attorney composes a defense while accounting for procedural circumstances whose mishandling can later be challenged in court, even though the surrounding tasks are executed by others. The transactional log therefore records the structurally simple footprint of a contextually complex judgment, and reading the former as a proxy for the latter would understate the work rather than describe it.

Figure 2 makes this contrast visible. Panel (a) shows the process map discovered from the full event log: a dense, strongly connected structure in which no single path dominates, the "spaghetti" pattern often observed in this kind of setting. This density reflects the variability of circumstances surrounding the work rather than the topological complexity of the activities themselves.

That distinction matters, but it does not make the setting trivial for the expert: mastering this

contextual variability is itself part of the cognitive load of legal work, because procedural missteps in the surrounding flow can later be challenged in court as failures of due process, and the attorney composes a defense while accounting for this whole environment, including exchanges with external parties, even without executing or monitoring those surrounding tasks. Panel (b) shows the map discovered from attorney activity alone, displaying its most frequent recorded acts. A clear backbone emerges, formed by automatic case assignment, statement of defense, and the associated appeal and petition steps, around which the remaining variation organizes. The two maps are built from the same cases; the difference lies entirely in whether attorney acts are read within the full procedural noise or isolated from it.

Panel (b) aggregates recorded acts across the full attorney workforce, so the backbone describes the population-level repertoire of procedural steps rather than any individual attorney's end-to-end handling of a case. The recognizable repertoire it reveals belongs to that surrounding procedural layer; it becomes legible only once the recorded acts are separated from the surrounding automated and external flow.

Value exchange and coordination network, the fourth dimension, reframes the process as a network of exchanges rather than a flow. Process mining shows that, among cases passing through an attorney, each is associated with a median of two distinct attorneys in the log, rising to four at the ninetieth percentile and up to nineteen in extreme cases. This count must be read for what it is. At first instance, a case is typically composed by a single attorney; the additional identities recorded against a case are largely institutional and registration artifacts rather than a cognitive ping-pong of the legal work itself: a substitution during vacation or leave, a redistribution when a case initially routed to one unit in fact belongs to another, and the presence of the unit coordinator, who is also an attorney in the log but not the one performing the knowledge-intensive composition.

Read this way, the dispersion at the tail reflects the coordination and administrative structure surrounding the case, not fragmentation of the expert's own reasoning, and it is complementary to the recognizable repertoire of recorded acts noted above rather than in tension with it. Untangling such many-to-many relationships between attorneys and cases is precisely the setting for which Object-Centric Process Mining has been proposed [30]. A single-case, single-flow abstraction forces this web into a line and, in doing so, either inflates the handover count or hides it; the divergence and convergence between attorneys, cases, and procedural objects that this dimension exposes is exactly the structure an object-centric reading is designed to preserve. The most frequent recorded activity overall is judicial notification, reflecting the intensity of exchange with courts and external parties rather than internal rework. A process, in this reading, is a web of exchanges, not a line.

Outputs, outcomes and strategic value, the fifth dimension, connects expert work to results. Cycle-time evidence quantifies the stakes: half of all cases reach at least a first-instance judgment within roughly 262 days, but the distribution has a long tail. Ten percent take more than 694 days, five percent exceed 837 days (about 28 months), and the most protracted extend beyond four years. Measuring only countable outputs would obscure this variation in quality, complexity, and timeliness. Volume, in other words, is not value; both must be measured.

The most direct support for the framework's central premise is the asymmetry of workload across units, aligned with the work profiles the institution itself recognizes. Mass-volume units, such as labor liability, personnel, and public health, concentrate the majority of events, driven by exogenous litigation the institution does not control at the source. At the opposite pole, strategic units register minute volumes but high-complexity work: the Special Litigation Task Force (GEAC) handles administrative-misconduct and asset-recovery cases, and the Arbitration unit operates like a private-chamber firm through artisanal effort. The same process label thus hosts radically different natures of work, and a volume-privileging diagnosis would fail precisely where expert judgment is most decisive. The management lever differs by profile: standardization and automation at the mass pole; protection of expert time at the strategic pole.

Table 1 summarizes the framework as a practitioner-ready instrument. For each dimension it pairs the guiding diagnostic question with the PGE-SP evidence and with example indicators that operationalize it. Consistent with the transactional nature of the log discussed above, these indicators characterize the

Table 1

The Expert-Centered BPM Framework: diagnostic questions and example indicators.

Dimension	Diagnostic question	PGE-SP evidence	Example indicators
Strategic, Governance & Regulatory Direction	Is expert attention allocated by strategic relevance or by incoming volume?	Caseloads not linked to priorities; workload concentrated in mass-volume units driven by exogenous litigation	Share of caseload tied to declared priorities; volume vs. strategic-value ratio per unit
Input Readiness	Does what reaches the expert arrive complete, classified, and on time?	Unclassified notifications and publications among top activities; directed/automatic redistribution prominent	Rate of unclassified or mis-routed inputs; redistribution rate; deadline consumed at receipt
Knowledge-Intensive Worker	Is expert time concentrated on judgment or diluted across administrative work?	~13% of recorded events attributable to attorneys (a footprint, not effort); regularity lies in the surrounding procedural layer	Expert-attributable share of recorded acts; ratio of judgment to administrative/corrective steps around the expert
Value Exchange & Coordination Network	How dispersed is a case across professionals and external parties?	Judicial notification is the most frequent recorded activity, reflecting exchange with courts and external parties	Distinct handovers per case (median, 90th pct., tail); share of external vs. internal exchanges
Outputs, Outcomes & Strategic Value	Are volume, timeliness, and strategic value measured as separate layers?	Median cycle ~262 days; 5% exceed ~28 months; strategic vs. mass-volume units demand different metrics	Cycle-time distribution (median and tail percentiles); per-profile metric set (volume vs. complexity)

conditions surrounding expert work, such as input readiness, handover dispersion, cycle-time tails, and workload asymmetry, rather than attempting to measure legal judgment itself, which the recorded data does not capture. They are offered as illustrative starting points, to be adapted to each context, not as a fixed scorecard. Its lessons for practitioners are that diagnosis must examine input quality, governance, and coordination rather than the expert's output alone; that protecting expert focus is a design decision, not a cultural aspiration; and that outputs, outcomes, and strategic value must be measured as separate layers to avoid optimizing for volume while degrading quality.

5. Significance and Relevance

For BPM practitioners, the contribution is a guiding diagnostic framework. The framework extends the analytical reach of standard BPM methods without abandoning the process as the object of transformation. Process architecture, BPMN modeling, value-added analysis, and bottleneck identification remain applicable; what the framework adds is a diagnostic orientation that guards against two failure modes. Flow reductionism leaves input quality, governance gaps, and coordination failures untouched; expert exceptionalism places value-critical work beyond the reach of governance. The PGE-SP case shows neither extreme is tenable. Attorneys need autonomy to exercise judgment, and they need well-classified inputs, clear priorities, and functional coordination to exercise it at scale.

For managers of professional organizations, such as hospitals, research centers, consulting firms, and public attorney offices, the case addresses a shared tension: value depends on experts whose autonomy is non-negotiable, yet whose work is hard to scale when the surrounding system is poorly designed. When the recorded footprint of expert acts is a scarce fraction of total flow, even though the value delivered is produced within it, and one label spans both mass-volume and strategic profiles, volume-based diagnostics misallocate attention. The framework is offered as analytically transferable: the dimensions are expected to travel to other knowledge-intensive settings, while which dominates, and how each is operationalized, varies by context and remains to be tested. It also reframes technology adoption. AI, process mining, and RPA do not reduce the need for expert judgment but often intensify it, so governance and strategic alignment must precede deployment, or technology amplifies existing

failures instead of yielding gains [18].

6. Scope and Limitations

This paper reports the first diagnostic cycle of a broader program, focused on Conducting General Litigation; subsequent waves will test whether the five dimensions remain stable or require extension. The framework's transferability is, at this stage, analytical rather than empirically validated, having been derived from a single case; cross-context applicability is therefore framed as a proposition and research agenda, not an established result. The paper reports a completed diagnostic cycle, not post-implementation outcomes, and makes no causal claim about litigation costs or productivity. The process mining evidence carries its own boundaries: the event log records mandatory transactional outputs imposed by procedural law, not the cognitive, decision-making work of legal judgment, so the quantitative findings describe the recorded procedural layer of the end-to-end business process rather than measuring the knowledge work itself. This is a diagnosis of the Conducting General Litigation business process as a whole, spanning expert, administrative, external, and technological activity, and not of any single slice of it. The evidence derives from a sample, reported as proportions and medians; cycle time approximates citation to first-instance judgment; attorney-touch counts are a conservative floor, and the tail of that count largely reflects coordination and registration artifacts rather than fragmentation of the expert's own reasoning; the isolated attorney map aggregates the full workforce, so the recognizable repertoire it shows is a population-level property of the surrounding procedural layer; and workforce ratios are approximate. Disentangling the many-to-many relationships between attorneys and cases is a task for which Object-Centric Process Mining offers a promising route [30]. Finally, the framework addresses process, governance, input, coordination, and measurement conditions, but not the cultural and behavioral ones, such as professional identity, trust in technology, and leadership style, known to shape whether BPM gains are sustained.

7. Conclusions

This paper asked *what diagnostic dimensions should orient BPM practitioners redesigning the organizational conditions under which knowledge-intensive professionals produce value*. The PGE-SP case shows that such derivation is both possible and productive when BPM diagnostic artifacts are treated as evidence for understanding what enables or constrains expert work, and not only as deliverables. The main conclusion follows: in knowledge-intensive organizations, BPM should not redesign process flows alone; it should redesign the conditions under which experts produce value. The Expert-Centered BPM Framework operationalizes this through five dimensions, each reinforced by quantitative evidence: the recorded footprint of expert acts is a scarce fraction of total flow, even as the value delivered is produced within it; the room for standardization lies in the administrative and procedural layer surrounding the expert, not in legal judgment itself; and mass-volume and strategic profiles coexist under one label, demanding different management levers. It extends process-centered BPM rather than replacing it, filling a gap that neither KIP modeling nor people-centric methods currently address in a practitioner-ready form.

Four directions warrant priority: testing the framework across other knowledge-intensive sectors to assess how far it transfers; longitudinal studies measuring whether framework-guided improvements yield efficiency gains; applying Object-Centric Process Mining to untangle the multi-attorney, multi-case coordination network the handover data revealed [30]; and incorporating cultural and behavioral dimensions of adoption. The takeaway for practitioners is clear. Improving knowledge-intensive processes requires changing the organizational conditions that let experts work well, not just what the experts themselves do.

Data Availability Statement

The study is part of an ongoing research collaboration between CeMEPI-USP and PGE-SP. The event log and interview data underlying it are not yet available for public release. Aggregated artifacts (process architecture, BPMN AS-IS models, and the Current Reality Tree) may be shared upon reasonable request, subject to institutional approval by PGE-SP.

Declaration on Generative AI

During the preparation of this work, the author(s) used Claude (Anthropic) in order to: reformat the manuscript to the CEUR-ART template, and assist with language editing for translation into English. After using this tool, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the publication's content.

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