

Article

The Impact of Financial Process Automation on Enterprise Economic Efficiency and Capitalization: Assessment and Improvement Pathways - Evidence from “O‘zbekko‘mir” JSC

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Abstract: This article examines the impact of financial process automation (FPA) on enterprise economic efficiency and capitalization, and develops a practical mechanism for improving automation outcomes at the operational level. The study combines a structured review of recent academic literature on automation, robotic process automation (RPA), enterprise resource planning (ERP) systems and digital transformation's effect on capital-structure adjustment, with a single-enterprise case study of “O‘zbekko‘mir” JSC, a coal-mining enterprise in Uzbekistan. The literature review synthesizes evidence on how automation affects reporting quality and efficiency, firm value, financial performance and capital structure, and identifies a gap: enterprise-level evidence that both quantifies the efficiency-capitalization linkage and documents a concrete, officially validated automation mechanism remains scarce for industrial enterprises in transition economies. To address this gap, the study documents an original improvement mechanism designed and implemented at the case enterprise: a billing-integration architecture that consolidates contract, trade-exchange and banking data streams into a single PostgreSQL-based information loop through a Contract_id key, replacing manual reconciliation between the Didox e-document platform, the UzEx exchange system and the 1C accounting system; and a Payment Score model - combining a Risk Score and a Trust Score - that automates preventive credit-policy decisions (ex-ante) and a staged, legally binding collection ladder (ex-post). Based on data certified by the Chamber of Commerce and Industry of the Republic of Uzbekistan (Ref. No. 01-06-30-7160, 14 July 2026), implementation reduced manual data entry by 25-30%, data-entry errors by up to 30%, and the financial-reporting cycle by 15-20%, while accelerating debt collection by 20-25% and reducing the overdue-debt share by 12-15%. The findings confirm that financial process automation is a measurable and replicable driver of enterprise economic efficiency and capitalization, and the study offers a five-stage implementation roadmap for industrial enterprises pursuing similar transformations.

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1. Introduction

In the digital economy, automation has become one of the principal levers of financial management and operational efficiency for enterprises. Finance departments are increasingly expected to move beyond bookkeeping and reporting toward active participation in strategic decision-making, a shift driven largely by digitalization and automation technologies that accelerate financial operations, reduce errors and widen the

scope for data-driven decisions. Financial process automation (FPA) refers to the transition of repetitive, labor-intensive tasks - accounting, payments, budgeting and financial reporting - to automatic execution through modern software solutions, allowing the finance function to shift its focus from operational routines to strategic planning [1].

The cost of inaction is well documented. Gartner estimates that the average accounting department spends up to 30 percent of a full-time employee's time on avoidable rework caused by manual errors, and that robotic process automation (RPA) can eliminate around 25,000 hours of such rework annually for a mid-sized finance department; the same study found that 88 percent of corporate controllers expected to adopt RPA within a year, yet only 29 percent of adopters had, at that point, applied it to financial reporting specifically - evidence of a persistent gap between automation intent and execution [2]. More recently, Gartner has projected that embedded artificial intelligence in cloud ERP applications will drive a 30 percent faster financial close by 2028, with the share of cloud-ERP spending directed to AI-enabled tools rising from 14 percent in 2024 to a projected 62 percent by 2027 - underscoring that the technological frontier of financial automation continues to move quickly [3].

Despite this evidence, most existing studies quantify FPA's effects either at an aggregate, cross-country or cross-industry level, or as theoretical channels illustrated with global benchmark statistics. Enterprise-level studies that both quantify the efficiency-capitalization linkage and document a concrete, replicable automation mechanism - validated with officially certified before-and-after data - remain scarce, particularly for capital-intensive industrial enterprises in transition economies such as Uzbekistan. Building on this gap, the purpose of this study is twofold: (i) to synthesize, from the applied literature, the channels linking financial process automation to enterprise economic efficiency and capitalization; and (ii) to present and empirically validate an original improvement mechanism - a billing-integration architecture and a Payment Score credit-risk model - designed and implemented at "O'zbekko'mir" JSC.

The scientific contribution of the article is fourfold. First, it consolidates recent academic evidence on the cost, quality, value and capital-structure channels of automation into a single analytical framework. Second, it proposes an original billing-integration architecture that replaces manual, multi-source reconciliation with a Contract_id-based automatic matching mechanism. Third, it introduces a Payment Score mechanism combining a Risk Score and a Trust Score that shifts receivables management from reactive collection to preventive credit control. Fourth, it provides quantitative validation of both mechanisms using data certified by an official state body, and derives a practical, stage-by-stage implementation roadmap for industrial enterprises.

The remainder of the article follows the AJEBM article structure. Section 1 introduces the study and integrates the literature review and research gap; Section 2 presents the materials and methods; Section 3 reports the empirical results; Section 4 discusses the findings in relation to prior research; and Section 5 concludes with practical recommendations and directions for future research.

1.1. Literature Review and Research Gap

Automation and financial reporting quality and efficiency. Bedford et al. (2025) examine the digitalization of the finance function across a broad sample of firms and find that automation and analytics capability jointly determine finance function effectiveness - automation alone, without complementary analytical capability and staff skill, does not guarantee efficiency gains [1]. A more cautionary result comes from Oesch and Walser (2025), who use European robotics adoption as an instrument for U.S. firms' automation exposure and find that higher automation exposure is associated with lower reporting quality, driven predominantly by management exercising greater discretion in accruals when facing substantial technology-adoption costs rather than by an unintentional loss of organizational trust [4]. Taken together, these studies imply that the efficiency benefits of automation are conditional on how the automation mechanism is designed and governed - a point directly relevant to the transparency and audit-trail features built into the mechanism examined in this study. On the practitioner side, Gartner (2019) reports that RPA can save a finance department around 25,000 hours of avoidable rework annually,

equivalent to some \$878,000 for a department of 40 accounting staff, though at the time only 29 percent of RPA adopters had applied it to financial reporting specifically [2]; a later Gartner forecast (2026) projects that AI-enabled cloud ERP tools will drive a 30 percent faster financial close by 2028 as their share of cloud-ERP spending rises from 14 percent (2024) to 62 percent (2027) [3].

Durão and Palma dos Reis (2024), based on semi-structured interviews with practitioners, find that RPA creates measurable value in the downstream (customer-facing) and internal-operations dimensions of the value chain, while its effect on upstream, supplier-facing processes remains less clear [5]. Using a mixed-methods design across 50 service-sector firms, Huda et al. (2025) report that RPA significantly reduces process cycle times, minimizes errors and lowers operational costs, while also identifying workforce readiness and systems-integration quality as critical success factors - echoing the change-management emphasis in the implementation roadmap developed in Section 5 of this article [6].

Evidence from manufacturing and SME settings converges on a positive ERP-performance relationship. Wulan et al. (2024), studying ten Indonesian manufacturing firms that implemented ERP between 2016 and 2021, find that ERP adoption has a significant positive effect on operational and financial efficiency, with the strongest contributions coming from production-time reduction and inventory-management improvement [7]. AlMuhayfith and Shaiti (2020), surveying 120 Saudi SMEs, find that management support, user training and user satisfaction are the strongest predictors of ERP-usage intensity, and that ERP usage in turn enhances both financial and non-financial organizational performance [8]. Both studies reinforce that ERP-driven efficiency gains depend as much on implementation quality - training, change management, module fit - as on the technology itself, consistent with the phased, KPI-driven implementation approach adopted at the case enterprise.

A separate strand of the literature connects digitalization directly to capitalization and capital structure rather than only to operating efficiency. Niu et al. (2023), analyzing Chinese listed firms over 2007-2020, find that digital transformation speeds up dynamic capital-structure adjustment by reducing information asymmetry between management and investors, lowering agency costs, and easing financing constraints - effects that intensify in competitive industries and in regions with more developed financial markets [9]. Ktit and Abu Khalaf (2025), using panel GMM estimation on 514 European non-financial firms over 2010-2023, similarly find that digital transformation improves the speed and accuracy of capital-structure adjustment toward target leverage [10]. These findings support the theoretical channel used in this article's discussion: operational efficiency gains from automation, by improving profit retention and reducing information asymmetry with external financiers, plausibly strengthen an enterprise's capitalization and leverage capacity, even though this study's own case evidence captures the operational rather than the capital-structure leg of that channel directly.

Country-specific evidence for Uzbekistan is more limited but consistent with the international findings. Kadirova (2026) finds that Uzbek enterprises that integrate multiple digital tools into their core management processes have a significantly higher probability of reducing costs and increasing demand than those adopting isolated digital solutions, and identifies digital-skill gaps and fragmented process integration as the principal barriers to realizing efficiency gains [11]. Soibov (2026), using econometric analysis of Uzbek enterprises, documents quantifiable relationships between the adoption of digital technologies - FinTech, AI, Big Data analytics, cloud computing and ERP systems - and financial-stability indicators such as return on assets, liquidity ratios and financial-resilience scores [12].

Across these strands, the literature robustly supports two propositions: that automation and digitalization raise operating efficiency when accompanied by adequate implementation capability, and that, over time, digitalization eases capital-structure adjustment and strengthens capitalization (Section 2.4). Uzbekistan-specific evidence confirms the pattern but remains largely at the survey or aggregate econometric level, and the Oesch and Walser (2025) finding that automation can, under cost pressure, degrade

reporting quality shows that the design of the automation mechanism - not merely its presence - shapes the outcome [4]. What is largely absent from this literature is enterprise-level evidence that documents a specific, replicable automation mechanism, links it explicitly to both efficiency and capitalization channels, and validates it with officially certified before-and-after data from an industrial enterprise in a transition economy. This study addresses that gap.

Table 1. Summary of reviewed literature

Focus	Method / sample	Key finding
Finance-function digitalization	Multi-firm empirical study	Automation + analytics jointly, not automation alone, raise finance-function effectiveness
Automation & reporting quality	Instrumental-variable analysis, U.S./EU firms	Higher automation exposure lowers reporting quality via strategic earnings management
RPA and firm value	Exploratory interviews, 7 experts	RPA creates value in downstream and internal dimensions; upstream effect unclear
ERP and manufacturing efficiency	10 firms, regression, 2016-2021	ERP significantly improves operational and financial efficiency
ERP and SME performance	SEM, 120 Saudi SMEs	Training and management support drive ERP usage, which raises performance
Digitalization & capital structure	Panel data, China, 2007-2020	Digitalization speeds dynamic capital-structure adjustment
RPA, productivity, performance	Mixed methods, 50 service firms	RPA cuts cycle time, errors and cost; workforce readiness is a critical factor
Digital transformation & leverage	Panel GMM, 514 EU firms, 2010-2023	Digital transformation improves capital-structure adjustment speed
Digitalization in Uzbek enterprises	Empirical survey, Uzbekistan	Integrated (not isolated) digital tools significantly cut costs and raise demand
RPA in finance departments	Industry survey	RPA saves ~25,000 hrs/year; 30% of FTE time otherwise spent on rework
AI-enabled cloud ERP	Industry forecast	AI-enabled cloud ERP adoption to reach 62% of spend by 2027; 30% faster close by 2028
Digital technologies & financial stability	Econometric analysis, Uzbekistan	Digital adoption improves ROA, liquidity and resilience indicators

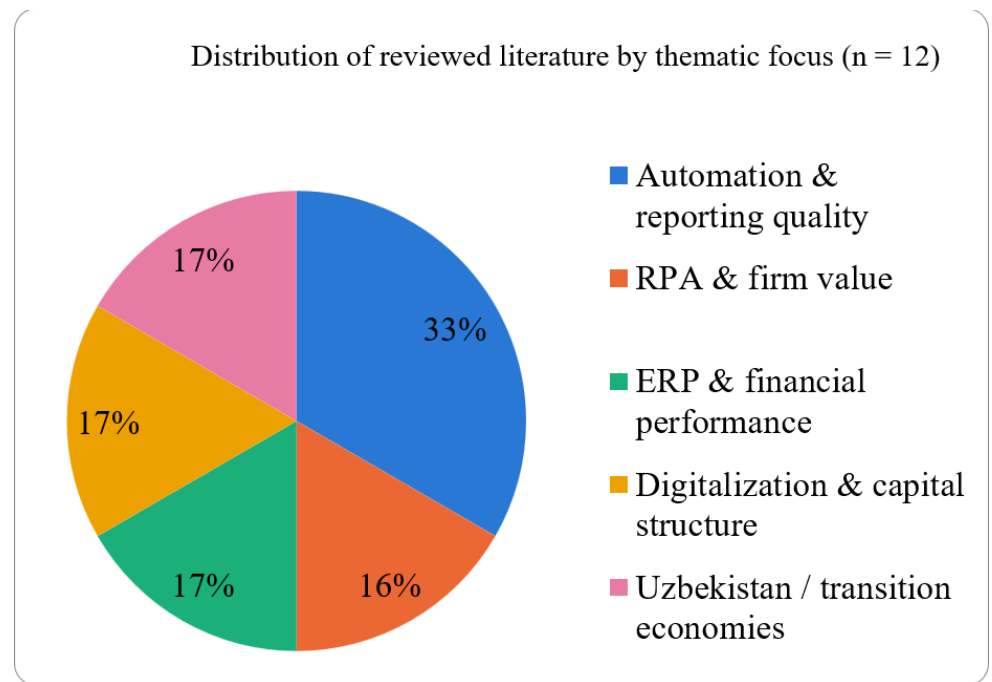


Figure 1. Distribution of reviewed literature by thematic focus (n = 12)

2. Materials and Methods

Research design. The study combines two complementary components a structured literature synthesis that establishes the theoretical channels linking financial process automation to efficiency and capitalization, and a single-enterprise case study that documents and validates a specific automation mechanism against officially certified indicators. A single-case design was chosen because the object of study is not a statistical population effect but a replicable mechanism - its architecture, decision logic and measured before/after outcomes - which is best documented in depth for one enterprise before being generalized; the approach follows established practice in operations- and mechanism-design research, where a well-instrumented case demonstrates feasibility and effect size ahead of broader panel validation.

Data sources. Two data sources were used. The first is the peer-reviewed and industry literature reviewed in Section 2. The second is primary case-study evidence from “O‘zbekko‘mir” JSC - process-audit documentation, the design specification of the proposed automation mechanism, and implementation results - certified by the Chamber of Commerce and Industry of the Republic of Uzbekistan (Reference No. 01-06-30-7160, 14 July 2026) [15].

Case enterprise and baseline diagnosis. A diagnostic review of “O‘zbekko‘mir” JSC’s financial indicators identified a set of structural issues typical of capital-intensive industrial enterprises: a high volume of working capital tied up in inventories and receivables; a large share of fixed assets on the balance sheet; rising gross profit alongside constrained net-profit growth due to increasing period expenses. These findings motivated a targeted automation intervention in contract-payment reconciliation and receivables management.

Under the prior (AS-IS) process, an electronic contract was formed and executed on the Didox e-document platform, but contract details and bank-channel payment data had to be entered into the 1C accounting system manually by staff. Identifying and matching a single payment took an average of 2-3 minutes; exchange-executed transactions (via the UzEx trading system) were transferred to 1C separately, and receivables and advances were tracked in parallel Excel registers. This reliance on manual, multi-source entry created a chain of risk - entry error, incorrect balance, incorrect report, incorrect decision - and constrained the timeliness of financial analysis.

To address these weaknesses, a billing-integration architecture was designed in which a billing system serves as the central connecting component, unifying transaction streams from the Didox platform, the UzEx exchange channel and bank channels into a single information flow. All data are centralized in a PostgreSQL database, ensuring data integrity and consistency. A Contract_id key automatically matches each incoming transaction to its corresponding contract, enabling contract-payment reconciliation without manual intervention; validated entries are then transferred automatically to the 1C accounting system. Every transaction is logged in an automatic audit trail - recording who changed what, and when - directly addressing the governance concern raised by Oesch and Walser (2025) that automation without adequate oversight can degrade, rather than improve, financial reporting quality [4]. The architecture further links the payment and cargo-movement chains: once a payment is confirmed against its Contract_id, the system automatically authorizes shipment, generates the rail waybill, and issues the electronic invoice via Didox - turning the billing system from a simple accounting tool into an operational mechanism governing the enterprise's cash-and-cargo cycle. The separate inclusion of the UzEx exchange channel also anticipates the enterprise's gradual shift toward exchange-based coal trading, since exchange transactions and clearing payments are recorded in the same unified database with a full audit trail.

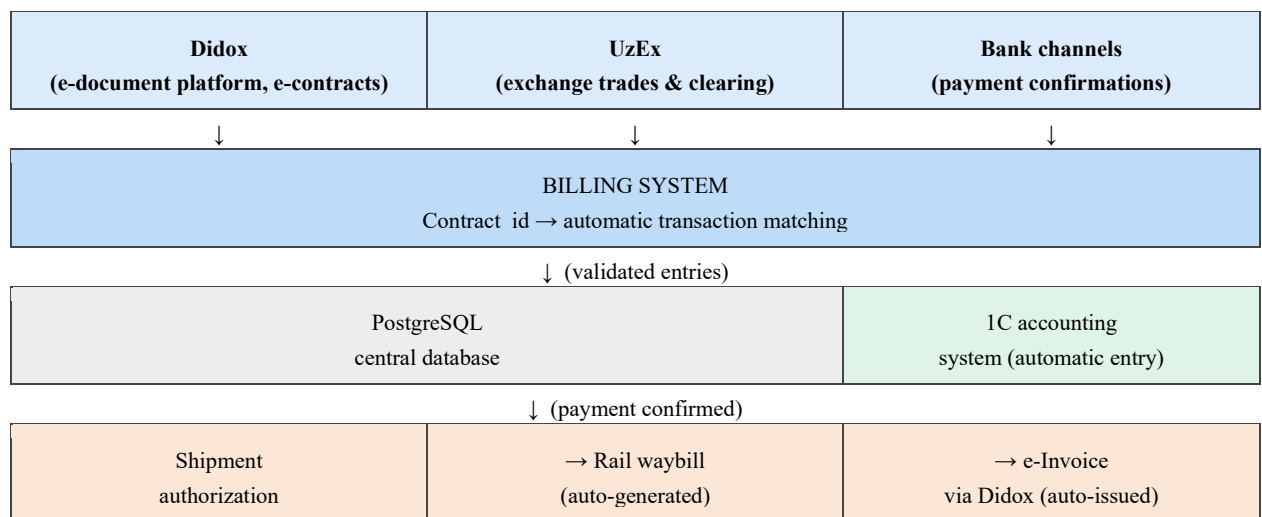


Figure 2. Billing-integration architecture

For receivables management, a Payment Score model was developed from billing transactions, combining two components: a Risk Score, reflecting a counterparty's days overdue, share of overdue amounts and frequency of payment-discipline violations; and a Trust Score, reflecting payment-history reliability, the duration of the business relationship, and participation in the exchange-clearing mechanism. The score is automatically recalculated after every payment event. It operates through two linked loops: an ex-ante (preventive) loop, in which the Payment Score is mapped to a credit-policy matrix - counterparties with high scores receive a lower advance-payment requirement and a higher shipment limit, while a falling score raises the advance requirement toward 100 percent and reduces the shipment limit toward zero, with shipment authorization automatically suspended once the score falls below a defined threshold; and an ex-post (collection) loop, in which overdue debt triggers a staged, digitally signed sequence of legally binding documents issued via Didox - a formal notice at T+3, a reconciliation act with penalty calculation at T+10, a claim letter at T+20, and a litigation document package with management escalation at T+30 - branched by counterparty segment (strategic accounts escalate to senior management; budget-funded counterparties follow treasury-based payment schedules; commercial counterparties follow the full document ladder). Because payment outcomes continuously update the score, the mechanism functions as a self-learning, closed-loop system.

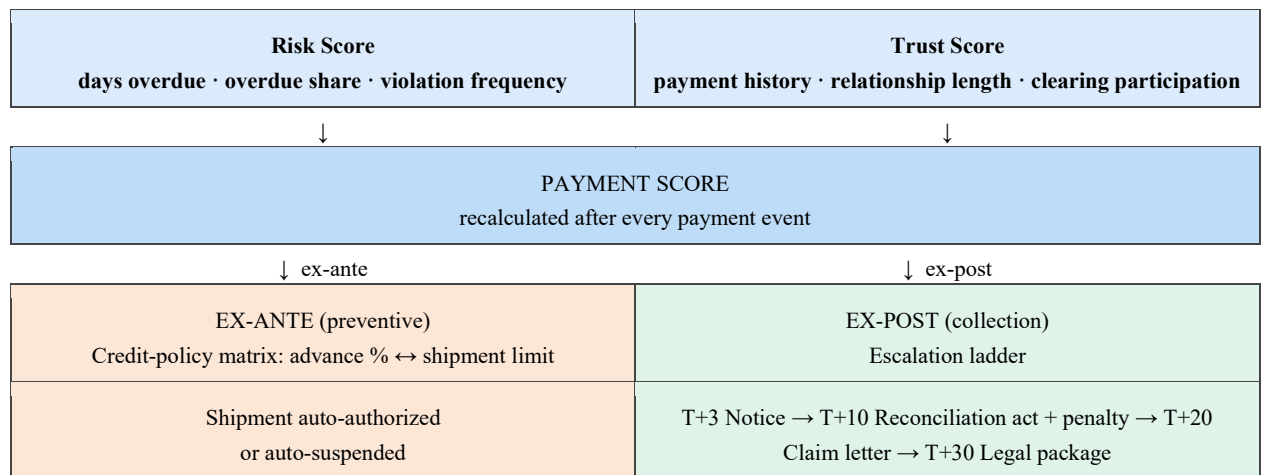


Figure 3. Payment Score mechanism: preventive (ex-ante) and collection (ex-post) loops

The following key performance indicators were measured before and after implementation and independently certified: the share of manually entered transactions; the error rate per 100 operations; the duration of the financial-reporting cycle; the speed of debt collection; and the share of overdue debt in total receivables.

3. Results

Table 2 compares the manual (AS-IS) and billing-integrated (TO-BE) contract-payment reconciliation processes at “O‘zbekko‘mir” JSC. Following implementation, certified results show manual data entry reduced by 25-30%, data-entry errors reduced by up to 30%, and the financial-reporting cycle shortened by 15-20% [15].

Table 2. AS-IS versus TO-BE contract-payment reconciliation

Indicator	AS-IS (manual)	TO-BE (billing-integrated)
Data entry	Manual, from 3 independent sources (Didox, UzEx, bank)	Automatic, Contract_id-matched, centralized in PostgreSQL
Reconciliation time per payment	~2-3 minutes, manual matching	Automatic, real time
Manual entry volume	Baseline (100%)	-25-30%
Error rate	Baseline (100%)	-up to 30%
Reporting cycle time	Baseline (100%)	-15-20%

Table 3 compares manual, communication-based collection with the Payment Score-based preventive-collection mechanism. Certified results show debt-collection speed increased by 20-25% and the overdue-debt share fell by 12-15% following implementation [15].

Table 3. Manual collection versus Payment Score-based mechanism

Dimension	Manual collection (AS-IS)	Payment Score mechanism (TO-BE)
Orientation	Reactive - acts after debt arises	Preventive - credit terms adjust before debt arises
Decision basis	Staff judgment, no unified quantitative criterion	Automated Risk Score / Trust Score, recalculated per payment event
Legal enforcement	Ad hoc, manually initiated	Automated, digitally signed ladder: T+3 / T+10 / T+20 / T+30

Dimension	Manual collection (AS-IS)	Payment Score mechanism (TO-BE)
Scalability	Requires additional staff as volume grows	Scales without proportional headcount growth
Collection speed	Baseline (100%)	+20-25%
Overdue-debt share	Baseline (100%)	-12-15%

4. Discussion

The case results are consistent with, and extend, the efficiency-channel literature reviewed in Sections 2.1-2.3. Replacing manual multi-source entry with a Contract_id-based automatic matching mechanism removes the principal source of the “error - incorrect balance - incorrect report” chain identified in the AS-IS diagnosis, which is reflected in the 25-30% reduction in manual entry and up to 30% reduction in errors - a magnitude broadly consistent with Gartner’s finding that accounting departments lose up to 30% of FTE time to avoidable rework under manual processes [2], and with the process-cost and cycle-time reductions documented by Huda et al. (2025) for RPA in service-sector firms [6]. The 15-20% reduction in reporting-cycle time supports faster, more reliable management decision-making, consistent with Bedford et al.’s (2025) finding that automation raises finance-function effectiveness when paired with adequate process integration [1], and with the ERP-efficiency evidence of Wulan et al. (2024) and AlMuhayfith and Shaiti (2020) [7], [8]. Notably, because every transaction in the billing-integration architecture carries an automatic audit trail, the mechanism is designed to avoid the reporting-quality risk that Oesch and Walser (2025) associate with automation under weak oversight [4] - transparency is built into the architecture rather than added afterward. Recent accounting-specific evidence further emphasizes that RPA benefits depend on governance and control design: Kogan et al. document specialized risk assessment and monitoring practices in accounting RPA programs [13], while Eulerich et al. identify control, security, cost, governance, and process-knowledge risks that can undermine poorly designed automation initiatives [14].

On the receivables side, the shift from reactive to preventive collection - anchored in a continuously updated Payment Score - both accelerates collection (20-25%) and reduces the stock of overdue debt (12-15%), directly easing the working-capital constraint identified in the baseline diagnosis. Faster receivables turnover and lower reporting-cycle time reduce the volume of capital “locked” in operating assets, which supports higher net profit and retained earnings; this is the operational leg of the same channel that Niu et al. (2023) and Ktit and Abu Khalaf (2025) document at the capital-structure level - digitalization reduces information asymmetry and financing constraints and thereby speeds capital-structure adjustment toward target leverage [9], [10]. In other words, the case evidence in this study documents the upstream, operational half of the automation-capitalization channel (cost, error and cycle-time reduction; faster, more predictable cash collection), while the reviewed capital-structure literature documents the downstream half (how those improvements translate into faster, easier access to and use of capital). Read together, the two bodies of evidence support the proposition that a well-designed automation mechanism strengthens enterprise capitalization, even though this study’s own certified data do not extend to directly measured leverage or equity outcomes.

The empirical validation in this study is drawn from a single enterprise in a single capital-intensive sector (coal mining), and the results represent a before-and-after comparison rather than a longitudinal panel; ranking stability over time and across sectors has not been tested. The capitalization effect is inferred by combining this study’s operational case evidence with separately documented capital-structure literature, rather than measured directly through the case enterprise’s own balance-sheet or leverage data before and after implementation, since a full accounting cycle had not elapsed at the time of certification. Extending the billing-integration and Payment Score mechanisms to enterprises in other industries, and tracking their effect on capitalization and leverage

indicators over a multi-year panel - in the spirit of Niu et al. (2023) and Ktit and Abu Khalaf (2025) [9], [10] - are natural directions for further validation.

5. Conclusion

This study set out to assess how financial process automation affects enterprise economic efficiency and capitalization, and to demonstrate a concrete, replicable mechanism for achieving that effect in practice. The literature review confirms that automation and digitalization raise operating efficiency when paired with adequate implementation capability, and that, over time, digitalization eases capital-structure adjustment and strengthens capitalization - while also showing that the design and governance of the automation mechanism, not merely its existence, determines whether reporting quality improves or deteriorates. The case of “O’zbekko’mir” JSC shows these channels operating in an industrial enterprise in Uzbekistan and contributes officially certified, enterprise-level evidence that has been largely absent from the literature.

The billing-integration architecture, built around a Contract_id-based automatic matching mechanism, a centralized PostgreSQL data store, and a built-in audit trail, reduced manual data entry by 25-30%, cut errors by up to 30%, and shortened the reporting cycle by 15-20%. The Payment Score mechanism, combining a Risk Score and a Trust Score within preventive (ex-ante) and collection (ex-post) loops, accelerated debt collection by 20-25% and reduced the overdue-debt share by 12-15%, both certified by the Chamber of Commerce and Industry of the Republic of Uzbekistan.

For industrial enterprises pursuing similar transformations, the case suggests a five-stage implementation roadmap:

1. Readiness and process audit - mapping existing financial processes, identifying priority automation candidates and setting baseline kpis;
2. Solution selection and design - choosing and configuring the ERP/billing platform, its modules and integration layer;
3. Pilot implementation - testing on a limited scope with dedicated user training and rapid issue resolution, addressing the workforce-readiness factor identified as critical by Huda et al. (2025) [6];
4. Full rollout - phased expansion, mass data migration, organization-wide training and parallel running before cut-over;
5. Monitoring and continuous improvement - ongoing KPI tracking, compliance review and iterative enhancement, including future integration of business-intelligence and machine-learning forecasting tools.

Future research should extend this evidence base in three directions: applying the billing-integration and Payment Score mechanisms to enterprises in other capital-intensive industries; tracking their effect on capitalization and leverage indicators directly, over a multi-year panel rather than a single before-and-after comparison; and examining, in the spirit of Oesch and Walser (2025) [4], whether the audit-trail and governance features built into such mechanisms are sufficient to prevent the reporting-quality risks that automation can otherwise introduce. Overall, the findings support the conclusion that financial process automation, when designed as a concrete, transparent operational mechanism rather than a generic digitalization initiative, is a measurable and replicable driver of enterprise economic efficiency and capitalization.

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