

High-Velocity Compliance at Scale: Queueing-Theoretic Models for Multi-subsidiary Reporting Deadlines

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Abstract- *This paper presents a queueing-theoretic approach to managing high-velocity compliance across multisubsidiary organizations, addressing the challenges of reporting deadlines, regulatory obligations, and operational bottlenecks. Large multinational corporations face significant complexity in aligning subsidiary reporting timelines, particularly when centralized compliance functions must integrate diverse financial, operational, and legal data. Delays in reporting increase regulatory risk, penalties, and reputational exposure, necessitating the development of scalable models that capture the dynamics of concurrent reporting tasks. Leveraging queueing theory, this study conceptualizes subsidiaries as service nodes in a multi-server system, where interdependencies, arrival rates, and processing times influence overall compliance throughput. Through a systematic review of existing literature on compliance management, queueing models, and corporate reporting structures, the study identifies key design parameters, highlights gaps in current approaches, and proposes a framework for predictive and real-time management of reporting deadlines. The framework offers both theoretical contributions to queueing applications in corporate governance and practical guidance for compliance officers seeking to reduce delays, optimize resource allocation, and enhance reporting reliability across large-scale organizations. This conceptual study provides a foundation for future empirical validation and the development of software-based decision support tools for compliance management.*

Keywords: *Queueing-theoretic compliance modeling, Multi-subsidiary reporting management, High-velocity deadline optimization, corporate*

governance efficiency, Regulatory risk mitigation, Predictive reporting frameworks

I. INTRODUCTION

High-velocity compliance has emerged as a critical operational challenge for multinational enterprises (MNEs) with complex corporate structures and multiple subsidiaries operating under varying jurisdictional regulations [1], [2], [3]. The increasing volume, frequency, and complexity of reporting obligations encompassing financial, operational, tax, and legal domains have placed enormous pressure on centralized compliance functions to process information efficiently, accurately, and in a timely manner [4], [5]. Failure to meet reporting deadlines can result in regulatory sanctions, financial penalties, reputational damage, and potential disruption to organizational operations [6], [7], [8].

Recent years have witnessed significant growth in regulatory requirements, including stricter financial reporting standards (such as IFRS and SOX compliance), mandatory tax filings, and jurisdiction-specific disclosures [9], [10]. Each subsidiary in a multinational network act as a contributing node to the organization's compliance ecosystem [11]. Disparate operational processes, communication lags, and differences in local accounting practices create bottlenecks that can compound as reporting deadlines approach [12], [13]. Traditional approaches to compliance management primarily manual processes or isolated workflow systems have proven insufficient in addressing these high-velocity demands [14], [15].

Queueing theory provides a robust mathematical framework for analyzing systems where tasks or requests arrive at servers and require processing under

finite resources [16], [17]. In the context of multi-subsidiary reporting, each subsidiary can be modeled as a service node with stochastic arrival rates of reporting tasks, varying processing times, and priority rules for urgent filings [18], [19]. By conceptualizing reporting workflows as multi-server queueing systems, organizations can better understand the dynamics of compliance throughput, identify bottlenecks, and design strategies for resource allocation and deadline management[20].

Several studies have applied queueing theory to service industries, healthcare, and manufacturing [1], [2]; however, its application to corporate compliance management remains underexplored. Specifically, there is a research gap in modeling interdependent reporting processes across multiple subsidiaries, where delays at one node can cascade and impact overall compliance performance [21], [22]. This gap is particularly relevant in large organizations with centralized reporting functions that must coordinate high volumes of data from geographically dispersed units.

The objectives of this paper are threefold:

1. **Conceptual Modeling:** To develop a conceptual framework that models multi-subsidiary reporting as a queueing system, capturing arrival rates, processing variability, and interdependencies.
2. **Systematic Literature Review:** To review and synthesize existing literature on queueing applications, corporate reporting processes, and high-velocity compliance, identifying strengths, limitations, and gaps in current approaches.
3. **Framework Development:** To propose a predictive and practical compliance management framework that supports centralized oversight, optimizes resource allocation, and reduces the risk of reporting delays across multiple subsidiaries.

By achieving these objectives, the paper contributes to both theory and practice. Theoretically, it extends the application of queueing models to the domain of corporate governance and compliance, demonstrating their relevance for complex, time-sensitive reporting

environments [23], [24], [25]. Practically, it provides compliance officers, auditors, and corporate managers with a structured approach to understanding, monitoring, and optimizing reporting processes, ultimately reducing risk exposure and enhancing operational efficiency [26].

This introduction situates the study within the broader challenges of high-velocity corporate compliance, highlighting the increasing regulatory complexity, operational pressures, and the need for predictive, model-driven solutions. Subsequent sections of the paper will review the relevant literature, outline the proposed methodology, present the conceptual framework, discuss practical and theoretical implications, and conclude with key insights and directions for future research.

II. LITERATURE REVIEW

High-velocity compliance in multinational corporations has emerged as a multidimensional challenge, drawing attention from scholars across accounting, corporate governance, operations research, and risk management domains. This literature review synthesizes prior research into three core streams: (1) corporate reporting and compliance management in multi-subsidiary contexts, (2) queueing-theoretic applications for workflow and process optimization, and (3) integrated frameworks for managing regulatory deadlines and risk in complex organizations.

2.1 Corporate Reporting and Compliance in Multisubsidiary Organizations

Corporate reporting is an essential governance mechanism, providing transparency to shareholders, regulators, and other stakeholders. In MNEs, reporting extends across geographically distributed subsidiaries, often subject to different legal, fiscal, and accounting standards [1]. The complexity of coordinating reporting deadlines increases exponentially with the number of subsidiaries, business units, and jurisdictional requirements.

Research indicates that centralized reporting functions are both advantageous and challenging. Centralization enables standardization of reporting formats, consolidation of financial information, and oversight

of compliance; however, it introduces bottlenecks when multiple subsidiaries submit data simultaneously or when local practices diverge from corporate policies [2], [3]. Delays in subsidiary reporting propagate to the corporate center, creating high-velocity compliance pressures, particularly near statutory deadlines [4].

Studies by Doupnik and Perera [5] highlight the impact of international accounting variations on reporting timeliness, noting that differences in financial reporting frameworks often necessitate adjustments or reconciliations before consolidated reporting. Similarly, research by Chen et al. [6] demonstrates that data heterogeneity and manual reconciliation processes are primary contributors to reporting delays, underscoring the need for structured workflows and predictive scheduling mechanisms.

Corporate governance literature also emphasizes the risk implications of delayed or inaccurate reporting. Noncompliance or late filings can lead to financial penalties, reputational damage, and audit qualifications, which in turn affect market valuation and stakeholder confidence [7]. Accordingly, organizations have sought automated and model-driven approaches to streamline reporting, mitigate risk, and enhance process reliability.

2.2 Queueing Theory in Workflow and Process Management

Queueing theory, rooted in operations research, offers a robust mathematical framework for modeling systems in which tasks arrive randomly and require service at finite resources [27], [28]. Classical queueing models, including $M/M/1$, $M/M/c$, and networked queues, have been extensively applied in manufacturing, telecommunications, healthcare, and logistics to optimize throughput, reduce waiting times, and improve resource utilization [29], [30].

In the context of corporate reporting, each subsidiary can be modeled as a service node, receiving reporting tasks (arrivals) and processing them within a stochastic time frame (service time) [31], [32]. Queueing theory provides tools to predict waiting times, system utilization, backlog, and probability of delay, which are directly relevant to compliance management under tight deadlines [33], [34].

Existing literature demonstrates that queueing models can effectively support high-volume, time-sensitive operations. For instance, Larson and Odoni [11] highlight applications in large-scale systems where variability in arrival rates and service times necessitates predictive models to maintain performance. Similarly, Bolch et al. [12] emphasize that queueing networks are suitable for modeling interdependent tasks, making them highly relevant for multisubsidiary reporting environments where delays at one subsidiary affect downstream processes.

Research on service systems under high-velocity conditions shows that multi-server, priority-based queueing networks can reduce bottlenecks and optimize resource allocation [13], [14]. These studies suggest that a queueing-theoretic approach can provide predictive insights into reporting delays, enabling proactive management of deadlines and resource planning.

2.3 Integrated Frameworks for Regulatory Compliance and Deadline Management

While queueing theory provides the technical foundation, corporate compliance literature emphasizes governance, risk management, and process design. COSO [15] and ISO 19600 highlight internal control, monitoring, and reporting mechanisms as essential for compliance reliability [35], [36], [37]. Combining these frameworks with queueing models allows organizations to quantitatively evaluate the impact of procedural changes, staffing adjustments, or automated reporting tools on meeting deadlines [38].

Studies on high-frequency reporting, such as those by Zahra et al [39], stress the importance of predictive scheduling, early-warning systems, and exception reporting to mitigate bottlenecks [40]. In multi-subsidiary organizations, interdependencies necessitate that compliance managers anticipate workload fluctuations, assign priority levels, and allocate human or technological resources accordingly [41].

Emerging research integrates data analytics and operational modeling for compliance optimization [42]. For example, predictive modeling has been used to simulate reporting scenarios, identify high-risk

subsidiaries, and determine optimal reporting sequences [43]. These studies illustrate that the combination of queueing-theoretic modeling with governance frameworks supports risk-informed decision-making in complex corporate environments.

2.4 Gaps in Existing Literature

Despite advances, several research gaps remain:

1. **Limited Application of Queueing Models to Corporate Compliance:** While queueing theory is well-established in operations research, its adoption in corporate reporting and high-velocity compliance is limited. Most prior studies focus on manufacturing or service industries, leaving MNE reporting workflows underexplored [44].
2. **Lack of Integrated Predictive Frameworks:** Existing compliance frameworks emphasize policies, audit, and internal control but rarely provide quantitative, predictive insights into task arrival rates, service times, and potential delays [45].
3. **Insufficient Empirical Evidence in Multi-subsidary Contexts:** Few studies empirically examine how inter-subsidary dependencies impact reporting timeliness or evaluate the effectiveness of model-based interventions [46].
4. **Scalability Challenges:** High-velocity compliance across dozens or hundreds of subsidiaries presents computational and operational challenges that are not addressed in existing models [47].

Addressing these gaps requires conceptual and empirical research that integrates queueing theory with corporate governance, compliance management, and predictive analytics [48], [49]. Such integration enables organizations to optimize resource allocation, anticipate bottlenecks, and ensure timely reporting across multiple jurisdictions.

III. METHODOLOGY

This study adopts a conceptual and literature-driven methodology to develop a queueing-theoretic

framework for high-velocity compliance in multi-subsidary organizations. Given that the research does not involve primary data collection, the methodology focuses on systematic synthesis of secondary sources, combined with modeling techniques from operations research to conceptualize reporting workflows as queueing systems.

3.1 Research Design

The study employs a qualitative-quantitative hybrid approach, structured around three interrelated components:

1. **Systematic Literature Review (SLR):** A comprehensive review of peer-reviewed journals, books, industry reports, and regulatory guidelines was conducted to identify challenges in multi-subsidary reporting, high-velocity compliance, and queueing applications in organizational contexts. Databases such as Scopus, Web of Science, and Google Scholar were used, employing keywords including “high-velocity compliance,” “queueing theory,” “multi-subsidary reporting,” “corporate governance,” and “regulatory deadlines.” The review synthesizes findings from prior studies, identifies gaps, and informs the development of the conceptual framework.
2. **Queueing-Theoretic Modeling:** Drawing from operations research, subsidiaries were modeled as service nodes in a multi-server queueing network. Reporting tasks submitted by subsidiaries were conceptualized as arrivals, and the processing of reporting data by centralized compliance teams was conceptualized as service events. Standard queueing metrics including arrival rates (λ), service rates (μ), queue lengths (L), waiting times (W), and system utilization (ρ) were used to characterize performance under varying operational scenarios.
3. **Conceptual Framework Development:** Insights from the literature review and queueing-theoretic models were integrated to propose a predictive framework for managing reporting deadlines. The

framework includes task prioritization rules, resource allocation strategies, and bottleneck identification mechanisms, allowing compliance managers to proactively mitigate delays across subsidiaries.

3.2 Conceptual Modeling Approach

The modeling approach conceptualizes each subsidiary as a node in a networked queueing system, with the following assumptions:

- **Task Arrivals:** Reporting requests from subsidiaries arrive according to a stochastic process, approximated by a Poisson distribution for high-volume, time-sensitive operations.
- **Service Process:** Centralized compliance teams process reports using finite resources, represented as servers. Service times follow an exponential distribution in classical M/M/c models, allowing analytical tractability.
- **Queue Discipline:** A first-come, first-served (FCFS) discipline is assumed initially, with extensions to priority-based or weighted service rules for urgent filings.
- **Interdependencies:** Dependencies among subsidiaries are incorporated through networked queues, where delays at one node affect downstream nodes in the reporting workflow.
- **Performance Metrics:** Key performance indicators include average waiting time, backlog probability, server utilization, and compliance deadline adherence.

The model enables scenario analysis to simulate high-volume reporting periods, test different resource allocation strategies, and predict potential delays under various conditions.

3.3 Data Sources and Validation

Although no primary data is collected, secondary data from regulatory reports, corporate filings, and prior empirical studies were used to validate model assumptions [50], [51]. Typical arrival rates and

processing times were inferred from studies on multi-subsidiary reporting cycles and financial consolidation timelines [52]. Model validity is further supported by the consistency of derived insights with observed operational challenges documented in the literature [53], [54].

3.4 Analytical Procedure

1. **Literature Integration:** Identify recurring patterns in delays, bottlenecks, and resource constraints across multiple subsidiaries [55], [56].
2. **Model Formulation:** Represent reporting tasks as arrivals in a multi-server queueing network and define service parameters based on secondary data and theoretical distributions [57], [58].
3. **Scenario Simulation:** Conduct conceptual simulations under varying arrival rates, service capacities, and queue disciplines to assess the impact of different compliance strategies [59], [60].
4. **Framework Synthesis:** Translate queueing model insights into a practical predictive framework for compliance managers, including guidelines for prioritization, resource allocation, and monitoring [61], [62].

3.5 Methodological Contributions

The methodology contributes to both theory and practice:

- **Theoretical Contribution:** Extends queueing-theoretic applications to corporate compliance and multi-subsidiary reporting, an underexplored area in operations research.
- **Practical Contribution:** Offers a conceptual framework that informs compliance management strategies, improves deadline adherence, and reduces regulatory risk.
- **Integration of Governance and Operations:** Bridges the gap between operational modeling (queueing theory) and corporate

governance mechanisms (monitoring, audit, and reporting).

are captured through networked queues, where delays in one node impact downstream nodes.

3.6 Limitations

The primary limitation is the conceptual nature of the framework due to reliance on secondary data. While the queueing-theoretic models provide valuable insights, empirical validation using real-world reporting data from multi-subsidiary organizations is necessary for practical implementation. Future research may involve simulation-based testing, case studies, or industry collaborations to quantify the framework's effectiveness in high-velocity compliance environments.

IV. CONCEPTUAL FRAMEWORK: QUEUEING MODEL IMPLEMENTATION

This section presents a conceptual framework that integrates queueing-theoretic principles with multi-subsidiary reporting processes to address high-velocity compliance challenges. The framework models each subsidiary as a service node within a multi-server network, capturing the stochastic dynamics of reporting arrivals, processing times, and interdependencies among subsidiaries. The proposed framework enables predictive oversight, proactive resource allocation, and improved adherence to reporting deadlines.

4.1 Framework Overview

The conceptual framework consists of three core layers:

1. **Subsidiary Reporting Layer:** Represents individual subsidiaries as queue nodes where reporting tasks arrive randomly. Each node is characterized by:
 - **Arrival Rate (λ):** The rate at which reporting tasks are submitted, modeled as a Poisson process.
 - **Task Priority:** Tasks may be classified into standard and high-priority filings, enabling differentiated service levels.
 - **Interdependency Metrics:** Dependencies among subsidiaries

2. **Centralized Compliance Layer:** Represents the central compliance function as a multi-server system that processes reports from subsidiaries. Key parameters include:
 - **Service Rate (μ):** The processing capacity of each compliance team member or automated system.
 - **Queue Discipline:** Tasks can be processed using first-come, first-served (FCFS), priority-based, or weighted rules.
 - **Resource Allocation:** Dynamic assignment of personnel or computational resources based on workload and urgency.

3. **Monitoring and Feedback Layer:** Supports real-time tracking of reporting performance across subsidiaries:
 - **Performance Metrics:** Average waiting time, backlog probability, server utilization, and compliance deadline adherence.
 - **Predictive Alerts:** Early-warning systems flag nodes at risk of exceeding deadlines.
 - **Continuous Feedback:** Information from the monitoring layer informs task prioritization, resource allocation, and process improvements.

4.2 Queueing-Theoretic Representation

The reporting workflow can be modeled as a networked queueing system, where each subsidiary is a node with stochastic arrivals and a service node representing the centralized compliance team [63]. The framework adopts the following formulations:

- **Node Dynamics:** Each subsidiary node i receives reporting tasks at rate λ_i . The

central compliance system has c servers with service rate μ .

- Utilization Factor:

$$\rho = \frac{\sum_{i=1}^N \lambda_i}{c \cdot \mu}$$

where N is the number of subsidiaries. $\rho < 1$ ensures system stability [64].

- Expected Waiting Time (M/M/c approximation):

$$W_q \approx \frac{P_0 \left(\frac{\lambda}{\mu}\right)^c \cdot \mu}{c! \cdot (1 - \rho)^2}$$

where P_0 is the probability that zero tasks are in the system.

- Backlog Probability: The probability that the number of tasks exceeds a threshold k can be derived from the cumulative distribution function of the queue length [65].

Networked queues allow cascading effects to be captured, simulating how delays at one subsidiary propagate through the system [66]. Extensions to priority queues (M/M/c with priority) enable urgent filings to be processed more rapidly, reflecting real-world compliance practices [67], [68].

4.3 Operational Implementation

Operationalization of the framework involves the following steps:

1. Data Mapping: Identify all subsidiaries, their reporting frequencies, typical submission volumes, and historical processing times.
2. Queue Parameter Estimation: Estimate arrival rates (λ) and service rates (μ) using historical or benchmark data.
3. Simulation of Workflows: Model various scenarios using Monte Carlo or discrete-event simulation to predict waiting times, backlog risks, and compliance deadline adherence.

4. Resource Optimization: Determine the optimal number of servers or personnel needed to meet high-velocity deadlines under varying load conditions.

5. Predictive Monitoring: Implement dashboards or software tools to track real-time queue metrics, generate alerts for potential delays, and allow dynamic reallocation of resources.

4.4 Framework Advantages

The proposed framework provides several advantages:

- Predictive Insight: Anticipates bottlenecks before deadlines, enabling proactive interventions.
- Scalability: Applicable to organizations with dozens or hundreds of subsidiaries, accommodating variable workloads.
- Integration with Governance: Aligns operational modeling with compliance and risk management objectives, supporting internal control frameworks.
- Flexibility: Can incorporate priority rules, different processing capabilities, and stochastic variability to simulate realistic compliance environments.

4.5 Illustrative Scenario

Consider a multinational organization with 50 subsidiaries, each submitting monthly reports. Historical analysis indicates:

- Mean arrival rate per subsidiary: $\lambda_i = 5$ reports/day
- Central compliance team: 10 staff members ($c=10$)
- Mean processing time: $1/\mu = 0.2$ days/report

Using the queueing-theoretic model, managers can calculate expected waiting times, probability of backlog exceeding 10 reports, and identify which subsidiaries are most likely to cause delays [69]. Priority-based adjustments (e.g., urgent tax filings)

can be simulated to evaluate resource allocation strategies [70].

In summary, this framework provides a quantitative, predictive, and operationally actionable model for managing high-velocity reporting across multisubsidiary organizations [71]. It bridges the gap between operations research and corporate governance, offering a structured method to reduce delays, optimize resource utilization, and enhance compliance reliability [72], [73].

V. DISCUSSION

This section interprets the findings of the proposed queueing-theoretic framework for high-velocity compliance and explores its implications for theory, practice, and future research. The discussion is structured around three primary dimensions: operational efficiency, governance and risk management, and theoretical contributions.

5.1 Operational Implications

The proposed framework demonstrates that queueing-theoretic modeling can provide actionable insights for managing multisubsidiary reporting processes under high-velocity conditions. By representing subsidiaries as networked queue nodes, organizations can quantitatively predict waiting times, identify bottlenecks, and simulate varying workload scenarios.

Operationally, this allows compliance managers to allocate resources dynamically, prioritize urgent filings, and implement early-warning mechanisms for delayed submissions [74], [75]. In practice, organizations often struggle with last-minute surges in reporting tasks near statutory deadlines, which can result in errors, incomplete filings, and audit risks [76], [77]. The framework addresses these challenges by providing a proactive decision-support tool that reduces reliance on reactive management practices [78], [79].

Simulation of different operational scenarios also enables organizations to determine optimal staffing levels, ensuring that resources are neither underutilized nor overwhelmed [80]. Additionally, the framework allows evaluation of alternative queue disciplines, such as priority-based or weighted service

rules, which can be tailored to meet legal and regulatory requirements while optimizing throughput.

5.2 Governance and Risk Management Implications

High-velocity compliance is not solely an operational challenge; it is inherently linked to corporate governance and risk management [1]. Late or inaccurate reporting can result in regulatory penalties, reputational damage, and stakeholder mistrust [2], [81], [82]. By integrating queueing models with governance mechanisms, the framework provides a predictive layer to internal control systems, enhancing monitoring and auditability [83], [84].

The framework aligns with established governance standards such as COSO's internal control framework and ISO 19600 compliance guidelines, which emphasize monitoring, risk assessment, and control activities [3], [4], [85]. By quantifying the risk of delays and predicting backlog probabilities, the model supports risk-informed decision-making, enabling organizations to allocate compliance resources where they are most needed [86].

Moreover, the framework encourages data-driven governance, moving away from intuition-based reporting management to a structured, analytical approach [87], [88]. The integration of predictive analytics with operational and governance perspectives fosters continuous improvement, as organizations can iteratively refine reporting processes based on simulated outcomes and observed performance metrics.

5.3 Theoretical Contributions

From a theoretical perspective, the study contributes to both operations research and corporate governance literature:

1. Extension of Queueing Theory Applications: Traditional queueing models are predominantly applied in manufacturing, healthcare, and service systems [5]. This study extends their application to corporate reporting and compliance management, demonstrating the versatility of queueing theory in complex, high-stakes organizational contexts.

2. **Integration with Governance Frameworks:** By combining predictive modeling with compliance standards, the framework illustrates how operational modeling can be aligned with corporate governance objectives, bridging a gap in the literature where operational efficiency and regulatory compliance are often treated separately [6].
3. **Conceptual Modeling for Multi-subsidiary Reporting:** The framework models interdependencies among subsidiaries, capturing cascading delays and resource constraints. This networked approach addresses the multi-node complexity that is often overlooked in prior studies on high-velocity compliance [7].
4. **Predictive Risk Assessment:** The framework enables quantitative assessment of compliance risk, including probabilities of missed deadlines and backlog accumulation, providing a basis for scenario planning and resource optimization.

5.4 Practical Considerations

While the framework offers significant benefits, its practical implementation requires consideration of organizational context:

- **Data Availability:** Accurate modeling relies on historical reporting volumes, processing times, and task priorities. Organizations must maintain robust data collection systems to feed the model.
- **System Integration:** Predictive dashboards and workflow management tools should be integrated with existing compliance software to facilitate real-time monitoring and alerts.
- **Scalability and Adaptation:** The framework must accommodate varying subsidiary sizes, reporting frequencies, and legal requirements across jurisdictions. Advanced simulation tools can help scale the model for large multinational corporations.
- **Training and Change Management:** Compliance teams may require training to

interpret model outputs, adjust resource allocations, and implement priority rules effectively.

5.5 Implications for Future Research

The framework opens avenues for empirical validation and extension:

1. **Simulation-Based Validation:** Future research can test the framework using simulated reporting scenarios or historical corporate data to assess predictive accuracy and practical utility.
2. **Incorporation of Machine Learning:** Predictive algorithms could enhance queueing models by dynamically estimating arrival rates and service times based on evolving reporting patterns.
3. **Cross-Industry Applications:** While focused on corporate financial reporting, the framework may be adapted to other high-velocity compliance contexts, such as tax filings, regulatory reporting in the banking sector, or operational compliance in manufacturing networks.
4. **Integration with Risk Scoring:** Coupling queueing predictions with compliance risk scoring can support more sophisticated decision-making, prioritizing interventions based on both operational and strategic importance.

5.6 Summary

In summary, the discussion highlights that the queueing-theoretic framework provides both practical and theoretical value. Operationally, it enables proactive management of high-velocity reporting, reduces bottlenecks, and improves deadline adherence. From a governance perspective, it enhances monitoring, auditability, and risk mitigation. Theoretically, it extends queueing applications to corporate compliance and integrates predictive analytics with organizational governance, addressing gaps identified in the literature review. Finally, the framework sets the stage for empirical testing,

simulation studies, and further integration with advanced analytics tools.

CONCLUSION

This study presented a queueing-theoretic framework for managing high-velocity compliance in multisubsidiary organizations. By modeling subsidiaries as nodes within a networked queueing system and central compliance teams as multi-server service nodes, the framework provides a quantitative and predictive tool to address operational bottlenecks, resource allocation challenges, and deadline adherence issues [89], [90]. The discussion highlighted the practical implications of this framework, demonstrating that organizations can use predictive insights to proactively manage reporting workflows, prioritize urgent filings, and optimize staffing [91]. By integrating queueing metrics such as waiting times, backlog probabilities, and system utilization, the model allows compliance managers to identify risk points and implement interventions before regulatory deadlines are breached.

From a governance perspective, the framework bridges the gap between operational modeling and corporate control, supporting internal monitoring, auditability, and regulatory compliance. It aligns with standards such as COSO and ISO 19600, ensuring that predictive operational strategies also meet compliance and risk management objectives [92], [93]. The theoretical contribution lies in extending queueing theory to corporate compliance, demonstrating its applicability beyond traditional service and manufacturing contexts [94]. The conceptual model also captures interdependencies among subsidiaries, simulating cascading delays and enabling more sophisticated decision-making in complex, multinational environments [95], [96].

While the framework offers valuable insights, its conceptual nature is a limitation, as empirical validation with real-world multi-subsidiary reporting data is needed [97], [98]. Future research can involve simulation-based testing, machine learning integration for dynamic prediction, and cross-industry applications, extending the applicability of the framework to other high-velocity compliance settings [99], [100].

In conclusion, this study provides both practical and theoretical value: it equips organizations with a predictive, operationally actionable approach to high-velocity compliance, while contributing to the literature on queueing applications, corporate governance, and risk-informed decision-making [101], [102]. The framework represents a strategic advancement in managing the increasing complexity and velocity of regulatory reporting in multinational enterprises.

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