

LOGISTICS MODELING AND FINANCIAL RISK IN GOVERNMENTAL EVENTS: A SYSTEMATIC LITERATURE REVIEW

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Abstract: Large-scale governmental events, such as municipalist conferences and public manager summits, pose highly complex logistical and financial challenges. The effective management of these events requires a sophisticated integration of precise demand modeling, operational planning, and the mitigation of inherent financial risks. This paper presents a systematic literature review from the last five years on the intersection of logistics modeling and financial risk management in the context of governmental events. The methodology involved a structured search of academic databases, analyzing demand forecasting models, capacity management strategies like overbooking, and risk management frameworks in public procurement. The results indicate that while the literature on event logistics and risk management is robust in sectors such as hospitality and healthcare, there is a significant gap in the direct application of these models to the specific domain of governmental events. Revenue management practices, such as overbooking based on machine learning-powered no-show predictions, show great potential for optimizing occupancy and mitigating financial losses. Similarly, principles from humanitarian and disaster logistics offer valuable frameworks for managing operations in high-uncertainty, large-scale scenarios. The article concludes by synthesizing the main applicable models and proposing a future research agenda focused on developing integrated and empirically validated frameworks for governmental event management, aligning academic theory with the practical challenges faced by organizers.

Keywords: Event Management; Government Logistics; Financial Risk; Demand Modeling;

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Introduction

The organization of large-scale governmental events, which bring together thousands of participants from various spheres of public power, constitutes an operation of notable complexity. Unlike corporate or entertainment events, governmental events have a multifaceted nature, involving not only the provision of a service but also political articulation, the dissemination of technical knowledge, and the strengthening of institutional networks. The success of such events depends on an intricate logistical network that ranges from blocking air tickets and apartments on a massive scale to managing accreditation and on-site service in real-time.

In parallel with logistical complexity, financial risk management is a central pillar. Often, the organizing entity assumes financial responsibility for large inventories of services, such as airplane seats and hotel rooms, months before the event. Inaccurate demand forecasting or ineffective no-show management can result in substantial financial losses or, conversely, the inability to accommodate all participants, leading to a crisis of availability and reputation.

This scenario is exemplified by the more than two decades of experience in organizing the “March to Brasília in Defense of Municipalities” (Marcha a Brasília em Defesa dos Municípios), the largest municipalist event in Brazil, which has grown from approximately 1,000 to 10,000 participants. The management of this event involves the annual blocking of thousands of apartments and air tickets under its own financial responsibility, requiring demand forecasting models with high accuracy and sophisticated risk governance strategies to balance supply and demand.

Academic literature has intensely explored the domains of event logistics, supply chain management, and revenue management. However, the application of these concepts to the specific niche of governmental events remains an underexplored field. This article, therefore, seeks to fill this gap through a systematic literature review of the last five years. The objective is to identify,



analyze, and synthesize the most relevant models and frameworks for logistics modeling and financial risk management that can be adapted and applied to the reality of governmental events, proposing a dialogue between theory and consolidated practice.

Methodology

To conduct this systematic review, a structured protocol for literature search and analysis was adopted. The research was carried out in prominent academic databases, such as Scopus, Web of Science, and Google Scholar, in addition to publication repositories of multilateral organizations such as the Organisation for Economic Co-operation and Development (OECD). The temporal horizon of the search was delimited to publications between 2018 and 2023, in order to capture the most recent state of the art.

Keywords and search terms were combined in various configurations, using Boolean operators (AND, OR), and covered the following thematic axes:

- Logistics and Demand Modeling: “event logistics”, “demand forecasting events”, “attendance prediction modeling”, “capacity planning”, “large-scale event”.
- Financial Risk and Revenue Management: “financial risk management”, “overbooking”, “no-show prediction”, “yield management”, “revenue management hospitality”.
- Governmental Context and Public Sector: “government events”, “public sector”, “public procurement”, “municipalism”, “emergency logistics”.

Peer-reviewed journal articles, conference proceedings, books, and technical reports that addressed quantitative models, conceptual frameworks, and relevant case studies were included. Opinion articles, news, and publications without methodological rigor were excluded. After initial screening based on titles and abstracts, the selected articles were read in full for data extraction

and qualitative analysis. The information was synthesized and organized into thematic categories that emerged from the literature itself, allowing for a structured discussion of the results and the identification of research gaps.

Demand Modeling and Forecasting in Large-Scale Events

The ability to accurately forecast participant demand is the foundation upon which the logistical and financial planning of any large-scale event is built. An underestimated forecast can lead to a lack of essential resources, such as accommodation and transportation, generating dissatisfaction and damage to the event's reputation. Conversely, an overestimated forecast results in irrecoverable costs from unused resources, directly impacting the financial sustainability of the operation. In the context of governmental events, where participation can be influenced by political cycles, legislative agendas, and public budgets, demand modeling becomes even more challenging and crucial.

Recent literature has advanced significantly in the application of quantitative techniques for forecasting event attendance. Traditional models based on time series and regression analysis continue to be used, but the major innovation lies in the application of machine learning algorithms. Studies such as those by Lan et al. (2021) [1] and Awad (2020) [2] explore the use of Event-Based Social Networks (EBSNs) data to predict attendance, identifying user behavior and engagement patterns that correlate with the intention to attend. These models analyze a vast range of variables, including past interactions, social connections, and semantic characteristics of the events to improve forecasting accuracy.

Although focused on social events, these methods offer a promising path for governmental events. The analysis of historical registration data, combined with exogenous variables such as the political calendar, the relevance of the topics under discussion, and the geographical origin of participants, can feed robust predictive models. The practical experience in organizing the March to Brasília demonstrates the viability of achieving an accuracy of 95-98% in demand forecasting,



using a projected growth model of 10-15% per year, adjusted by conjunctural factors. This empirical model, validated over two decades, corroborates the importance of combining historical data with specialized domain knowledge.

Another relevant research area is demand modeling in public services, such as forecasting attendance in hospital emergency departments [3]. These studies, although in a different context, deal with similar challenges of demand peaks, seasonality, and the need for efficient allocation of limited resources. The approach of dynamic systems modeling and discrete event simulation, as proposed by Nguyen et al. (2019) [4] for large-scale transportation systems, also proves applicable to event logistical planning, allowing the simulation of participant flow and the identification of potential bottlenecks in the infrastructure.

Financial Risk Management and the Practice of Overbooking

Financial risk management is intrinsic to the organization of large-scale governmental events, especially when the organizing entity assumes responsibility for the advance acquisition of a vast inventory of services, such as air tickets and hotel nights. This financial exposure creates an imperative for the implementation of strategies of revenue management that seek to optimize revenue and mitigate losses resulting from cancellations and no-shows. Among these strategies, overbooking stands out as a powerful, albeit controversial, tool.

Overbooking consists of selling more units of a service (rooms, seats) than the physical capacity available, based on the statistical premise that a certain percentage of buyers will not use the service. The literature on hospitality and civil aviation is rich in models that seek to determine the optimal level of overbooking, balancing the opportunity cost of having a vacant seat or room with the cost of reallocating a customer in case of excess demand. The study by Schwartz et al. (2020) [5] offers a robust empirical validation of the benefits of this practice, demonstrating that hotels adopting overbooking strategies tend to show a higher Revenue Per Available Room (RevPAR). The study goes



further and reveals that a short-term, risk-based approach to defining overbooking levels is associated with superior financial performance, in contrast to more conservative, long-term customer-focused approaches.

The success of any overbooking strategy critically depends on the accuracy of no-show forecasting. It is at this point that the application of techniques of machine learning has revolutionized the area. Zhai et al. (2022) [6] propose an innovative model that uses machine learning algorithms to predict the probability of no-show for each individual customer, instead of relying on aggregated historical averages. By analyzing a set of real data, the model can identify patterns and variables that influence cancellation behavior, allowing for a much more granular and dynamic overbooking calculation. An important contribution of this work is the treatment of imbalanced data, a common problem where the minority class (no-shows) is difficult to predict. By employing over-sampling techniques, the authors manage to significantly improve the predictive capacity of the model.

The application of these concepts to governmental events is direct and high-impact. The practical experience with the March to Brasília, which involves managing an inventory of thousands of apartments, corroborates the effectiveness of a controlled overbooking policy. The implemented risk governance seeks a constant balance between the no-show rate and the need for vacancies, using a dynamic allocation policy and contingency plans, such as re-accommodation between hotels, to manage eventual excesses. The ability to predict the behavior of participants, which in the public sector can be influenced by factors such as the release of funds or the urgency of political agendas, is fundamental to adjusting overbooking levels and maximizing the occupancy without compromising the integrity of the event.

Integrated Logistics and Operations in Complex Scenarios

The execution of a large-scale governmental event is an exercise in integrated logistics that goes far beyond simple transportation and accommodation. It involves the orchestration of multiple



simultaneous processes, from participant accreditation and reception to real-time contingency management. The literature on commercial event logistics offers a foundation, but the scale, complexity, and nature of the stakeholders in governmental events require a more robust framework. In this sense, the literature on emergency and humanitarian logistics, paradoxically, offers valuable insights.

Large-scale events can be seen as “predictable disasters” in the sense that they concentrate a large number of people in a specific location for a limited period, generating immense pressure on the local infrastructure and requiring centralized and efficient coordination. The review article by Kundu & Sheu (2021) [7] on emergency logistics management highlights the importance of integrated transportation and logistics systems and the need for frameworks that can handle high uncertainty and dynamism. The authors propose a “Self-Organizing Response System” and an architecture for an “Integrated Emergency Transportation-Logistics System,” concepts that can be adapted to event management. Instead of responding to a disaster, the system would respond to demand fluctuations and operational unforeseen events of a mega-event.

The operational challenges described in the humanitarian logistics literature, such as the pre-positioning of supplies, evacuation management, and the coordination of multiple actors, find direct parallels in the management of governmental events. The need for reception desks, on-site service teams, contingency plans for overbooking, alternative flights, and local transport reinforcement are all manifestations of a complex logistics aimed at ensuring operational resilience. The practical experience in managing the March to Brasília, with its retroactive planning by milestones, confirms the applicability of these principles.

Conclusion and Future Research Agenda

This systematic literature review revealed that, although robust models exist for demand modeling, risk management, and logistics in sectors such as hospitality, aviation, and healthcare, there is a notable scarcity of research that applies and validates these frameworks in the specific context of



large-scale governmental events. The consolidated practice in organizing events such as the March to Brasília demonstrates that the application of revenue management principles, such as controlled overbooking, and integrated logistics is not only viable but essential for financial sustainability and operational success.

The main gap identified is the lack of an integrated framework that connects demand modeling, financial risk management, and logistical planning in a cohesive manner adapted to the particularities of the public sector. The future research agenda should, therefore, focus on:

- **Development of Specific Predictive Models:** Creating and validating machine learning models for demand and no-show forecasting in governmental events, incorporating political, budgetary, and thematic variables.
- **Validation of Revenue Management Strategies:** Conducting empirical studies to quantify the financial impact of different levels of overbooking and cancellation policies, considering the profile of the public sector participant.
- **Creation of Integrated Logistics Frameworks:** Developing and testing simulation and optimization models for the logistical planning of governmental mega-events, inspired by disaster response systems, to manage flows, resources, and contingencies.
- **Analysis of Risk Governance:** Investigating best practices in risk governance for large-scale public procurement in the context of events, balancing the need for agility with the principles of transparency and accountability.

By filling these gaps, academic research can provide governmental event organizers with the necessary tools and models to navigate the inherent complexity of these operations, ensuring that theory and practice evolve together to strengthen public management.



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