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The Role of Management Control in the Performance of Smart Supply Chains During Inflationary Periods

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Abstract

This article proposes a conceptual framework to explore the strategic role of management control systems in enhancing the performance of smart supply chains during periods of inflation. Based on an integrative literature review, the model connects four key constructs: inflation, logistics challenges, management control, and supply chain performance. It posits that inflation intensifies operational disruptions, which in turn hinder supply chain agility and efficiency. In response, digitalized and flexible management control systems act both as performance drivers and as moderators of negative impacts.

The study highlights how real-time KPIs, AI-based forecasting, and dynamic cost monitoring contribute to decision-making in uncertain environments. It also emphasizes the evolving role of the management controller as a cross-functional, data-oriented strategist. The paper offers theoretical insights into the interaction between economic volatility and internal control mechanisms, and practical recommendations for companies seeking to build resilient, digitally enabled supply chains.

Keywords*:* Management Control, Smart Supply Chain, Logistics Performance, Inflation, Resilience.

Introduction

With the current global economic environment of continued inflation and increasing uncertainty, supply chain management has become a serious challenge for organizations. Unstable raw material costs, logistics breakdowns, and geopolitical conflicts have taken a toll on conventional supply chain management mechanisms. The episode has served to underline the necessity for more responsive, resilient, and intelligent mechanisms that are capable of anticipating risks, reducing costs, and ensuring business continuity.

Meanwhile, the advent of Smart Supply Chains that integrate sophisticated technologies like artificial intelligence, Internet of Things, blockchain, and predictive analytics provides a significant strategic window to improve organizational responsiveness in economic downturns. These digital platforms provide superior capabilities related to visibility, forecasting, traceability, and decision support. Still, their efficacy relies most importantly on the quality of internal management, particularly through management control, which is becoming more and more of a determining factor in the coordination and optimization of logistics performance.

Management control has long been defined as a set of processes and mechanisms designed to support the implementation of organizational strategy, ensure the alignment of actions with objectives, and monitor both economic and operational performance (Anthony & Govindarajan, 2007). Beyond its traditional budgetary and

accounting functions, the literature increasingly views management control as a broader organizational system that combines planning, performance measurement, coordination, and decision support (Langfield-Smith, 2007). In this perspective, management control systems should not be understood as isolated technical tools, but rather as an integrated package of formal and informal controls that evolve according to strategic priorities and environmental constraints (Malmi & Brown, 2008). In a context marked by digitalization, inflationary pressures, and growing supply chain complexity, management control therefore extends its role beyond variance analysis and budget monitoring to become a strategic co-pilot capable of supporting agility, resilience, and informed decision-making across logistics processes.

The purpose of this paper is to examine the position of management control in the operation of intelligent supply chains during inflationary times based on what the existing literature has to say, alongside input from businesses that have encountered such issues. The purpose is to explain how management control tools and techniques can ensure supply chain resilience, profitability, and efficiency in the face of an unpredictable economic environment.

1. Literature Review

1.1. Conceptual foundations of the smart supply chain

The Smart Supply Chain represents a major evolution in contemporary logistics management. It is characterized by the strategic integration of advanced digital technologies such as Artificial Intelligence, Big Data, the Internet of Things, blockchain, and real-time information systems, which profoundly transform decision-making and operational processes. Unlike traditional supply chains, which are based on linear, fragmented, and often reactive logic, smart supply chains are designed to operate in a proactive, connected, and adaptive manner.

According to Ivanov and Dolgui (2020), a smart supply chain is a logistical structure capable of dynamically adjusting to environmental disruptions through a combination of advanced analytics, connected sensors, real-time simulation, and autonomous decision-making algorithms. These supply chains can anticipate risks, learn from past operational histories, and recommend corrective or optimizing actions without human intervention. This definition highlights the shift toward data-driven logistics, where agility and resilience become the cornerstones of performance.

The work of Wamba et al. (2017) emphasizes the cognitive dimension of these supply chains, comparing them to cyber-physical systems in which information flows as rapidly and as critically as the physical flows of goods. The Smart Supply Chain thus becomes an intelligent and interconnected network, where each link (supplier, warehouse, carrier, distributor) communicates, exchanges, and adjusts its decisions based on the overall state of the system. This interconnectivity promotes better flow synchronization, reduced cycle times, improved service levels, and ultimately, a strengthened ability to respond to volatile market demands.

In an environment marked by economic uncertainty, inflation, and health or geopolitical crises, the Smart Supply Chain emerges as a strategic and indispensable response. It enhances visibility across the entire logistics network, enables simulation of various what-if scenarios, and generates early warnings in the event of potential disruptions. It thus positions itself at the core of corporate resilience models (Ivanov, 2021), enabling organizations not only to survive shocks but also to leverage them as opportunities for reinvention.

1.1.1. Emerging Paradigm of the Smart Supply Chain

a. Strategic Technologies and Operational Objectives: Artificial Intelligence, Internet of Things, and Big Data as Enablers of Performance and Resilience

The performance of smart supply chains relies on the synergy of several cutting-edge technologies that profoundly transform how companies design, plan, execute, and control their logistics operations. Among the most foundational technologies are Artificial Intelligence (AI), the Internet of Things, and Big Data analytics. These tools are not only levers for automation but also catalysts for intelligent decision-making and organizational resilience.

Artificial Intelligence plays a crucial role in enhancing the predictive and prescriptive capabilities of the supply chain. Through machine learning and deep learning algorithms, companies can anticipate demand, optimize logistics routes, automatically adjust inventory levels, and detect anomalies in production chains. According to Dubey et al. (2019), Artificial Intelligence enables dynamic flow management by integrating predictive models that adapt in real time to data collected from both internal and external environments [Dubey et al., 2019, *Information Systems Frontiers*].

The Internet of Things complements this analytical capability by capturing real-time physical data through sensors embedded in equipment, vehicles, products, or infrastructure. Connected objects ensure complete traceability, provide insights into stock levels, monitor storage temperatures, and detect supply chain disruptions. This granularity of information facilitates swift responses to malfunctions or disturbances. Wang et al. (2016) emphasize that the Internet

of Things creates an interconnected, transparent, and responsive logistics environment, which is essential for maintaining competitiveness in an uncertain world.

b. Objectives of Smart Technologies in the Supply Chain

Technologies such as Artificial Intelligence, the Internet of Things, and Big Data while technically innovative hold real value only when they serve clearly defined objectives related to value creation, organizational resilience, and overall performance. In smart supply chains, these technologies are not merely data processing tools but powerful drivers of strategic transformation.

Among the primary objectives is the enhancement of logistical event predictability. With Artificial Intelligence and machine learning algorithms, companies can better anticipate demand fluctuations, delivery lead times, and supply disruption risks. This predictive capability reduces planning errors and enables real-time adjustments to optimize product availability (Ivanov, 2021).

Another key objective lies in the optimization of logistics costs, particularly in environments where profit margins are heavily compressed by inflation. Task automation (e.g., warehouse robotics, intelligent transportation routing, predictive maintenance) helps reduce operational costs while improving service quality. Big Data, in particular, supports more accurate resource allocation, identification of inefficiencies, and streamlining of operations (Wamba et al., 2020).

Resilience and agility form another central objective. In the face of economic, health, or geopolitical shocks, a smart supply chain can respond swiftly by reconfiguring flows, activating alternative suppliers, or reallocating resources. This agility relies on the connectivity enabled by Internet of Things and the instant processing of large-scale data.

c. Performance Models Applied to the Smart Supply Chain

The performance of a Smart Supply Chain cannot be assessed solely through conventional logistics criteria such as cost minimization or delivery speed. In a context shaped by digitalization, interconnectivity, and growing environmental uncertainty, this notion must be approached as a multidimensional construct. It reflects the capacity of the supply chain to combine efficiency, responsiveness, resilience, visibility, and sustainability through the coordinated use of advanced technologies and appropriate managerial systems. In this sense, performance is no longer limited to the optimization of material and financial flows. It also refers to the ability of the supply chain to produce reliable information, facilitate timely and informed decisions, withstand disruptions, and preserve operational continuity in unstable environments.

This broadened understanding implies the integration of several complementary dimensions. At the operational level, Smart Supply Chain performance may be evaluated through indicators such as lead time reduction, delivery reliability, service level improvement, inventory accuracy, and process flexibility. At the financial level, it involves the control of logistics costs, the protection of margins, the profitability of digital investments, and the ability to mitigate the effects of inflation on sourcing, storage, and transportation activities. An environmental dimension must also be taken into account, especially in view of the increasing importance of sustainable supply chain management. This dimension may be assessed through indicators related to carbon emissions, energy consumption, waste reduction, and the optimization of resource use. In addition, the informational dimension has become central in smart supply chains, since performance increasingly depends on data quality, real-time visibility, forecasting accuracy, traceability, and the fluidity of information sharing across actors and processes.

The theoretical foundation of this concept can be linked to systemic and dynamic perspectives in supply chain management, which consider performance as a network-level outcome rather than as the sum of isolated firm-level results. From this standpoint, Smart Supply Chain performance is rooted in an integrated logic combining operational excellence, adaptability, resilience, and strategic responsiveness. Such a conceptual delimitation helps avoid an overly narrow reading of performance and strengthens the consistency of the analysis developed in this chapter, particularly with regard to the interactions between inflationary pressures, logistics constraints, management control systems, and digitally enabled supply chain capabilities.

Against this backdrop, the transition toward smart supply chains requires a reconsideration of traditional performance models. Classical measures centred on cost, cycle times, or inventory levels are no longer sufficient to capture the complexity of digitally enabled supply chains operating in uncertain and rapidly changing contexts. For this reason, more recent models place greater emphasis on flexibility, resilience, agility, visibility, and sustainability as central dimensions of performance evaluation.

The framework proposed by Ivanov and Dolgui (2020) is especially relevant in this regard. It adopts a systemic view in which performance is not assessed only through operational outputs such as efficiency, service quality, or logistics costs,

but also through the ability of the supply chain to anticipate, absorb, and recover from disruptions. In this model, the use of dynamic key performance indicators supported by Internet of Things technologies and analytical dashboards allows a more refined monitoring of performance at strategic, tactical, and operational levels.

Other contributions, such as those of Gunasekaran et al. (2017), defend a multi-criteria approach to performance in smart logistics systems. Their perspective incorporates dimensions such as responsiveness, visibility, collaboration, and sustainability, using indicators related to response time, traceability, information exchange, energy efficiency, and environmental footprint. These models are often associated with predictive analytics and optimization tools that support more informed managerial decisions. Recent studies further argue that performance in smart supply chains should be understood through a holistic lens, since it no longer concerns the individual firm alone but the broader logistics network within which value is created, coordinated, and sustained.

1.1.2. Inflation and Its Effects on the Supply Chain

a. Definitions and Economic Impacts: Cost Increases, Stockouts, and Margin Pressures

Inflation is traditionally defined as a sustained and generalized rise in the prices of goods and services within an economy. When it becomes persistent, it has significant repercussions throughout the entire supply chain, affecting both direct costs (raw materials, transportation, energy) and indirect costs (logistics, storage, risk management).

According to Kraus et al. (2023), inflation exerts substantial pressure on purchasing prices and supply contracts, forcing companies to continuously renegotiate commercial agreements, revise procurement volumes, and adapt production cycles [Kraus et al., 2023, *Journal of Purchasing & Supply Management*]. These price increases can trigger a domino effect across the supply chain, resulting in stockouts, extended delivery times, and declining profit margins.

In inflationary periods, supply chains become more vulnerable. Price volatility introduces uncertainty into budgetary and logistics planning, making cost control more complex. Moreover, companies with limited bargaining power over their suppliers are more exposed to price hikes and often unable to fully pass them on to customers, leading to a deterioration in profitability.

Oracle (2023), in an industry report on the effects of inflation on supply chains, highlights the cascading sequence: inflation → increased transportation and raw material costs → production pressure → extended lead times → lower customer satisfaction and loss of competitiveness [Oracle.com]. The fragility of global supply chains further exacerbates these effects, particularly when firms depend on foreign suppliers or volatile energy sources.

b. Typical Corporate Responses in Times of Inflation

In response to these challenges, companies adopt various adaptation strategies aimed at mitigating the impact of inflation on supply chain performance.

First, renegotiating supplier contracts becomes a priority. This may involve price indexation clauses, periodic price reviews, or short-term agreements to limit prolonged exposure to rising costs. Some companies choose to diversify their supplier base to reduce dependency on a single geographic area or a sole partner highly exposed to inflationary pressures (ASCM, 2023).

Second, organizations rely on more refined inventory management, supported by advanced planning systems (APS). This includes building strategic stock reserves to hedge against future price increases, or conversely, reducing inventories to free up cash during periods of financial strain. The use of digital tools enables scenario simulation (low, moderate, or high inflation) and dynamic adjustment of order levels.

Third, some companies strengthen collaboration with supply chain partners by sharing more information regarding costs, risks, and forecasts. This transparency allows for a fairer distribution of cost increases, improves flow synchronization, and reduces stockout risks.

1.1.3. The Strategic Role of Management Control in Steering Smart Supply Chain Performance

a. The Role of Management Control in Supply Chain Decision-Making

Management control is traditionally defined as a process aimed at steering an organization's performance through planning, monitoring, evaluating, and analyzing variances between expected and actual results. In the specific context of the supply chain, it takes on a new strategic and operational dimension, as it becomes increasingly integrated into interconnected, real-time logistics systems that are exposed to growing external risks such as inflation, shortages, or geopolitical crises.

According to Anthony and Govindarajan (2011), the role of management control in logistics decision-making is to provide managers with the economic, operational, and strategic information needed to optimize decisions related to procurement, production, inventory, and distribution. This

includes the analysis of logistics costs, profitability by product or distribution channel, and the monitoring of key performance indicators (KPIs) related to physical and financial flows.

In smart supply chains, management control becomes a dynamic governance tool. It no longer limits itself to traditional cost accounting or budgeting, but incorporates real-time data from Internet of Things sensors, forecasts powered by artificial intelligence, and simulations based on big data. This evolution transforms the management controller into a strategic actor within the supply chain, capable of proposing proactive trade-offs in response to cost increases, supply delays, or shifts in demand.

According to Bourguignon (2005), management control also plays a mediating role between the various functions of the company (logistics, production, finance, purchasing), facilitating the coordination of short- and medium-term objectives. Such coordination is essential in an inflationary context, where decisions made at one link in the chain can have significant financial repercussions on others.

b. Modern Management Control Tools: Dashboards, Flexible Budgets, and Real-Time Indicators

The rapid evolution of supply chains toward smart and digitalized models has led to a profound transformation of management control tools. Traditionally centered around annual budgeting and post-hoc variance analysis, these tools have now been enhanced and adapted to meet the needs for reactivity, accuracy, and cross-functionality in modern supply chains.

One of the most emblematic tools of this transformation is the Balanced Scorecard, developed by Kaplan and Norton (1992). This multidimensional framework enables comprehensive management of logistics performance by integrating not only financial indicators (e.g., transport costs, logistics margins), but also operational metrics (e.g., service levels, inventory levels, cycle times), customer-related KPIs (e.g., satisfaction rates, complaints), and innovation-related indicators (e.g., automation levels, data quality). In the context of smart supply chains, dashboards have become interactive, visual, and updated in real time often integrated into cloud platforms or ERP systems.

In parallel, flexible budgeting techniques such as rolling forecasts are increasingly replacing fixed annual budgets. This approach involves regularly updating cost and volume assumptions in line with evolving economic conditions an especially relevant practice in inflationary environments. It allows for rapid adjustment of targets and avoids the biases introduced by static forecasts. According to Morard & St-Pierre (2017), such budgetary agility is a strategic lever for maintaining performance in supply chains exposed to external shocks.

Moreover, the growing use of real-time indicators fed by Internet of Things devices, Manufacturing Execution Systems (MES), or advanced analytics solutions enables continuous monitoring of supply chain performance. These indicators track logistics costs, inventory levels, or delivery status on a daily or even hourly basis. The Interaction Between Digitalization, Management Control, and Strategic Responsiveness.

The rise of digital technologies within organizations is profoundly transforming steering functions particularly management control, which is emerging as a key enabler of strategic responsiveness. This responsiveness refers to an organization's ability to swiftly adapt its decisions in the face of sudden changes in the economic, logistical, or competitive environment such as those caused by inflation, supply disruptions, or demand fluctuations.

The digitalization of the supply chain through AI, Internet of Things, and advanced analytics systems provides management controllers with real-time access to large volumes of operational data that were previously difficult to exploit. This enables better risk anticipation, continuous monitoring of logistics indicators, and early warning in case of performance deviations. According to Becker and Schläfke (2018), this transformation positions management control as the nervous system of the organization, connecting information to decision-making.

The link between digitalization and management control is also reflected in the evolution of decision-making tools. The integration of intelligent dashboards, predictive algorithms, and dynamic visualizations within ERP systems (e.g., SAP, Oracle, Power BI) allows controllers to simulate various logistics scenarios (price increases, delivery delays, stockouts) and instantly assess their financial impacts. This ability to translate operational decisions into financial outcomes feeds directly into the company's overall strategy.

Digitalization further strengthens the cross-functional role of management control. By collaborating with logistics, procurement, production, and finance teams, the controller acts as a coordination facilitator aligning local objectives (e.g., reducing transportation costs) with global goals (e.g., profitability, customer satisfaction, flexibility). This synergy fosters agile governance, enabling organizations to respond to unforeseen events while maintaining strategic consistency.

1.1.4. Theoretical Foundations Linking Management Control, Inflation, and the Smart Supply Chain

The intersection of management control, inflation, and smart supply chains forms a multidimensional field of analysis that draws upon concepts from management accounting, strategic management, and the study of complex systems. Within this framework, several theoretical approaches can be mobilized to structure reflection and guide research on how organizations adapt to uncertainty and economic pressure particularly in a digitalized environment.

a. Strategic Cost Management

Strategic Cost Management, as formalized by Shank & Govindarajan (1993), goes beyond traditional budgetary control by analyzing costs through the lens of the firm's strategic choices. The goal is not simply to reduce costs, but to understand how they interact with value creation across the entire logistics chain. In an inflationary context, this approach helps assess the impact of rising prices on the value cycle (procurement, transformation, distribution), and to rethink supplier relationships and logistics configurations.

In smart supply chains, the integration of tools such as Activity-Based Costing (ABC), scenario simulations, and cost optimization algorithms strengthens this strategic perspective. The management controller using data generated from intelligent systems (ERP, IoT, AI) becomes a key decision-maker in proposing informed trade-offs between cost, service, and flexibility.

b. Contingency Theory

Contingency Theory, developed by Lawrence and Lorsch (1967) and further extended by Otley (1980) in the field of management control, posits that the effectiveness of a management system depends on its alignment with the specific context in which the organization operates. There is no one-size-fits-all solution tools, processes, and structures must adapt to both external (turbulence, uncertainty, inflation) and internal (technological maturity, organizational culture, strategic orientation) conditions.

For smart supply chains facing inflationary pressure, this theory implies that the management control system must be flexible, responsive, and contextualized. For instance, a firm operating in a sector heavily impacted by raw material volatility should develop specific indicators for logistics resilience, regularly revise its budgeting assumptions, and adapt analytical tools to match the pace of environmental change.

c. Resource-Based View (RBV)

The Resource-Based View, as proposed by Barney (1991), argues that sustainable competitive advantage stems from the possession and effective deployment of valuable, rare, inimitable, and non-substitutable resources. In this logic, a digitalized management control system, mastery of advanced analytics, and the ability to interpret real-time data can be considered strategic resources.

In an environment where inflation requires constant trade-offs and technology is reshaping operational models, a controller's ability to combine economic intelligence, technological expertise, and strategic vision becomes a key competitive advantage. Likewise, technological platforms (e.g., real-time dashboards, simulation tools, AI-based decision systems) represent intangible assets that enhance supply chain competitiveness and adaptability.

d. Toward an Integrative Approach: Strategic Steering in Turbulent Environments

A combined analysis of these three frameworks offers an integrated perspective on the relationship between management control, inflation, and the smart supply chain. Strategic Cost Management supports long-term economic performance management, Contingency Theory explains the need to adjust control systems to inflationary conditions, and RBV highlights digitalization as a strategic asset.

This integrative approach reinforces the idea that management control can no longer be seen as a mere support function, but must be reconfigured as a central pillar of strategic steering in high-uncertainty environments. It becomes the point of convergence for managing economic risks, optimizing logistics performance, and leveraging digital technologies intelligently.

1.1.5. Synthesis and research gap

Before formulating the research gap, this chapter was grounded in a structured and integrative review of the literature in order to strengthen the consistency of its conceptual positioning. The review was based on two major academic databases, namely Scopus and Web of Science, selected for their strong coverage of peer-reviewed research in the fields of management, logistics, and supply chain studies. The search process relied on combinations of keywords associated with the main concepts addressed in this chapter, such as *smart supply chain*, *digital supply chain*, *management control*, *supply chain performance*, *inflation*, *logistics challenges*, and *resilience*. These terms were combined through Boolean operators, especially AND and OR, to refine the identification of relevant publications. The review covered the period from 2010 to 2025 in order to include both the early

development of research on smart supply chains and the more recent debates related to digital transformation and inflationary pressures. Only English-language journal articles and book chapters directly connected to the relationship between supply chain digitalization, management control, and performance in uncertain environments were retained. By contrast, duplicate records, publications outside the supply chain field, and studies with a purely technical focus detached from managerial concerns were excluded. The final corpus was selected through a sequential examination of titles, abstracts, keywords, and full texts, which allowed the identification of dominant themes in the literature and, more importantly, revealed the still limited attention given to the combined effects of inflation, management control systems, and smart supply chain performance.

The literature reviewed in the previous sections provides a multidimensional understanding of the smart supply chain paradigm. It shows that advanced technologies such as artificial intelligence, the Internet of Things, and Big Data are reshaping supply chain structures and improving several dimensions of operational performance. The review also underlines that inflation has become a major source of pressure for logistics systems, notably through rising operating costs, growing uncertainty in sourcing activities, and increasing disruptions in procurement and delivery processes. At the same time, management control appears no longer confined to its conventional accounting and monitoring functions. It is now increasingly considered as a strategic lever that supports organizational responsiveness, coordination, and decision-making in digital and unstable environments.

Despite the richness of these contributions, an important gap persists at the crossroads of these different streams of research. Existing studies have widely addressed inflation as a disruptive force within supply chain activities, yet only a limited number of works have examined how digitally enabled smart supply chains respond specifically to inflation-related disturbances. In the same way, the literature on management control systems has not sufficiently explored their strategic role in strengthening agility and resilience in logistics environments marked by inflationary instability. In most cases, inflationary dynamics and control mechanisms are analyzed separately, which leaves unanswered the question of how their interaction may influence the performance of smart supply chains. This unresolved intersection constitutes the main research gap addressed in this chapter.

2. Presentation of a Conceptual Model Linking Inflation, Logistical Challenges, Management Control, and Smart Supply Chain Performance

2.1. Rationale for the Conceptual Model

In recent years, the growing instability of macroeconomic environments—particularly due to inflationary pressures—has placed increasing strain on global supply chains. This context calls for a rethinking of how firms manage their logistics performance in times of uncertainty. The conceptual model proposed in this research seeks to provide an integrated understanding of these issues by linking external disruptions, operational challenges, and internal strategic responses. Rather than serving as a basis for empirical validation at this stage, the model is offered as a theoretical lens through which researchers and practitioners can explore the interdependencies between economic turbulence, logistical adaptation, and organizational control mechanisms.

The model aims to illuminate how inflation serves as a catalyst for disruption within supply chains, creating both direct and indirect pressures on logistical flows, cost structures, and supplier relationships. More importantly, it highlights how management control—when properly configured and integrated—can act as both a corrective mechanism and a source of strategic agility, enabling firms to preserve or even enhance supply chain performance under stress.

2.2. Core Variables and Relationships

At the heart of the model lie four essential constructs: inflation, logistics challenges, management control, and smart supply chain performance. The inflation variable represents external macroeconomic turbulence characterized by cost volatility, unpredictability of raw materials, and disruptions in global markets. This inflationary environment tends to trigger logistical difficulties, such as stockouts, rising procurement costs, and delays, which are grouped under the concept of logistics challenges.

These challenges, in turn, exert a negative influence on the ability of firms to ensure efficient, agile, and customer-focused supply chain operations—key attributes of smart supply chains. However, the presence of a robust and digitalized management control system can help firms better anticipate, measure, and respond to these disruptions. Management control is therefore modeled as both an independent factor influencing performance directly, and a moderating factor that weakens the negative effect of logistics challenges on performance.

2.3. Theoretical Positioning of the Model

The construction of this conceptual model is anchored in three complementary theoretical frameworks. The contingency theory (Lawrence & Lorsch, 1967) argues that organizations must align their internal systems with external contingencies. In an inflationary context, rigid control systems prove ineffective, whereas adaptive, real-time control mechanisms enhance resilience. The resource-based view (Barney, 1991) sees management control as a valuable organizational capability that can generate competitive advantage when properly leveraged. Finally, the strategic cost management approach (Shank & Govindarajan, 1993) highlights the need to manage costs not only at the operational level but across the entire value chain, especially in times of resource scarcity and price instability.

Together, these frameworks justify the inclusion and positioning of each variable in the model and underscore the strategic importance of control systems in managing environmental uncertainty. They also support the dual role of management control, as both a performance driver and a resilience mechanism, within the architecture of smart supply chains.

2.4. Conceptual Logic and Systemic Interactions

The model follows a systemic logic that emphasizes dynamic interactions rather than linear causality. Inflation is considered a triggering factor that initiates a cascade of logistical difficulties. These challenges, if unmanaged, degrade performance across key dimensions such as speed, reliability, and service quality. However, the presence of agile and responsive management control systems can alter this trajectory. By embedding control practices into decision-making processes, firms can detect early warning signals, simulate scenarios, and take corrective actions thereby limiting the impact of disruptions and preserving supply chain performance.

This conceptual architecture invites organizations to view their supply chains not as isolated operational entities, but as interdependent systems in which strategic governance, digital capabilities, and environmental sensitivity must be constantly aligned. It also encourages scholars to explore these interactions further, whether through empirical validation, comparative case studies, or sector-specific analyses.

2.5. Research Hypotheses

Building on the conceptual framework described above, we present four research hypotheses that articulate the theorized relationships between inflation, logistics disruptions, management control, and supply chain performance. These hypotheses are not only grounded in the literature but are also designed to offer a meaningful foundation for both empirical investigation and strategic application in business contexts.

Hypothesis 1: Inflation → Logistics Challenges

In periods of inflation, organizations typically experience a surge in input costs, procurement delays, and disruptions in supply availability. Such macroeconomic conditions introduce volatility into the logistics process, leading to challenges such as stockouts, increased freight rates, and planning uncertainties. The hypothesis assumes that inflation does not act in isolation but manifests through logistical complications that strain operational continuity.

- **H1: Inflation exerts a positive influence on the intensity of logistics challenges faced by organizations**.

Hypothesis 2: Logistics Challenges → Supply Chain Performance

Logistics challenges—amplified by inflation—are expected to negatively influence the performance of smart supply chains. These challenges disrupt responsiveness, reduce delivery accuracy, and hinder the ability to meet customer demands. As such, companies facing intensified logistics constraints are less likely to maintain high levels of agility and service quality, even when digital tools are available.

- **H2: Logistics challenges negatively affect the performance of smart supply chains, particularly in terms of agility, reliability, and customer satisfaction.**

Hypothesis 3: Management Control → Supply Chain Performance

Management control systems (MCS), particularly when digitalized and integrated into operational processes, contribute significantly to strategic alignment, cost optimization, and risk management. By leveraging MCS, firms can anticipate disruptions, monitor performance indicators, and implement corrective actions in real time. These capabilities are essential for improving supply chain performance under stress.

- **H3: The integration of management control systems positively contributes to the performance of smart supply chains.**

Hypothesis 4: Moderating Role of Management Control

Beyond its direct impact on performance, management control can also function as a moderator that reduces the negative effects of logistics challenges. By increasing visibility, enabling faster response, and supporting cross-functional

coordination, MCS can diminish the adverse outcomes typically associated with supply chain disruptions. This moderating effect positions MCS as a strategic buffer against environmental uncertainty.

- **H4: Management control systems moderate the relationship between logistics challenges and supply chain performance, reducing the negative impact of these challenges.**

Table N°1: Summary Table of Hypotheses

	HYPOTHESES
H1	Inflation exerts a positive influence on the intensity of logistics challenges faced by organizations.
H2	Logistics challenges negatively affect the performance of smart supply chains, particularly in terms of agility, reliability, and customer satisfaction
H3	The integration of management control systems positively contributes to the performance of smart supply chains.
H4	Management control systems moderate the relationship between logistics challenges and supply chain performance, reducing the negative impact of these challenges.

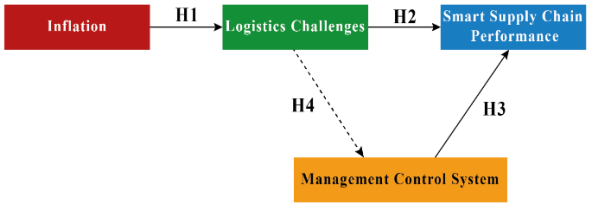
Source: author

These hypotheses provide a structured framework for future research while offering valuable insights for practitioners navigating complex logistical environments. They encapsulate the central logic of the conceptual model and reinforce the necessity of integrating management and technology in the face of economic uncertainty.

2.6. Visual Representation of the Conceptual Model

To further clarify the hypothesized relationships and provide a comprehensive view of the proposed framework, a visual conceptual model is presented below. This model illustrates the direct and moderating effects identified in the hypotheses, showing how inflation acts as a triggering factor of logistical challenges, how these challenges affect the performance of smart supply chains, and how management control systems intervene both as a performance enhancer and as a resilience mechanism. The diagram facilitates understanding of the systemic logic underlying the conceptual propositions and supports future empirical operationalization.

Figure N°1: Conceptual Model: Conceptual Model: Management Control, Inflation, and Smart Supply Chain Performance



Source: author

3. Methodological Considerations

3.1. Nature of the Research

This article adopts a conceptual and exploratory approach. It does not aim to empirically test the hypotheses presented, but rather to offer a theoretically grounded framework that integrates key variables identified in the literature. The purpose is to generate a comprehensive understanding of how inflation influences logistics challenges, and how management control can act as both a performance enhancer and a moderating force within smart supply chains. The development of this model is based on a qualitative synthesis of previous research, drawing from theoretical contributions in strategic management, cost control, and supply chain resilience.

The methodology used here is inherently inductive, seeking to build theory through conceptual integration rather than data analysis. This positions the model as a useful guide for future empirical inquiries, while also serving as a tool for reflective analysis in academic and professional contexts.

3.2. Perspective for Empirical Validation

Although empirical testing is beyond the scope of this paper, the proposed model is designed to be testable through a structured research design. A potential avenue for future research would involve quantitative validation using survey methods. Researchers could collect data from logistics managers, supply chain analysts, or financial controllers operating in sectors heavily affected by inflation, such as manufacturing, retail, or automotive industries.

Partial Least Squares Structural Equation Modeling (PLS-SEM) is recommended as an appropriate method to examine both direct and moderating effects in the model. This technique is particularly useful in exploratory research and when dealing with complex models involving multiple constructs.

3.3. Operationalization of Constructs

To facilitate future empirical work, we suggest preliminary ideas on how each construct in the model may be operationalized:

- Perceived Inflation: Measured through managers' assessment of price volatility, cost pressure, and input procurement uncertainty over the last 12 months.
- Logistics Challenges: Indicators may include disruptions in delivery schedules, increased lead times, stockout frequency, and supplier unreliability.
- Management Control Integration: Can be evaluated based on the use of digital dashboards, flexibility in budgeting systems, frequency of performance reviews, and availability of real-time data.
- Smart Supply Chain Performance: Measured via agility, responsiveness to market changes, customer satisfaction levels, and service reliability.

These constructs should be measured using multi-item Likert-type scales, previously validated in supply chain and management control literature. Such an approach would enhance the internal validity and generalizability of future studies. In summary, while this article does not include primary data collection or statistical testing, it lays the conceptual and methodological groundwork for future empirical studies. The clarity of its hypotheses and the precision of its constructs provide a solid base for researchers aiming to explore the dynamics of inflation, logistics, and control systems in greater depth.

4. Anticipated Results and Insights from the Conceptual Framework

The conceptual framework developed in this article brings to light several anticipated results that are both theoretically sound and practically significant. These expected findings reflect the underlying logic of the model, which emphasizes the interconnectedness of environmental uncertainty, internal management mechanisms, and supply chain performance. While the article does not include empirical testing, the depth of the conceptual relationships allows for reasoned expectations concerning the evolution of practices and roles within organizations navigating inflationary environments.

4.1. Management Control as a Pillar of Resilience

One of the most salient anticipated results is the affirmation of management control as a central component of organizational resilience. In inflationary contexts, supply chains are subject to frequent disruptions, erratic supplier behavior, and fluctuating cost structures. Traditional cost tracking and budgetary approaches prove insufficient in responding to such volatility. The model suggests that when management control systems are integrated into the strategic and operational levels of the supply chain, they enable organizations to absorb shocks more effectively. Through scenario planning, variance forecasting, and sensitivity analysis, controllers can simulate multiple outcomes and prepare agile responses. This enhanced reactivity, paired with financial discipline, forms the basis of a more resilient supply chain capable of maintaining performance under pressure.

Moreover, resilience here is understood not merely as the ability to recover from disruptions but as the capacity to anticipate, adapt, and evolve. Management control thus serves a dual function: first, as a shield against external volatility, and second, as a driver of internal coherence and alignment between strategic goals and operational execution.

4.2. Strategic Role of Digital Tools in Control Systems

A second expected outcome relates to the transformative power of digital tools in enhancing the strategic value of management control. In the era of smart supply chains, data flows are continuous, multidimensional, and decentralized. Traditional static reporting systems are no longer sufficient to support decision-making. The model points toward the emergence of new digital enablers such as dynamic performance dashboards, predictive analytics using artificial intelligence, and real-time cost monitoring alerts.

These tools allow firms to move from reactive to proactive management. For example, AI-based demand forecasting helps anticipate supplier shortages, while real-time KPI tracking enables supply chain managers to identify bottlenecks and respond swiftly. As a result, control systems are no longer confined to financial oversight; they become instruments of strategic coordination, empowering firms to align operational activities with broader performance objectives.

4.3. Transformation of the Management Controller's Role

The third and perhaps most profound result anticipated from this framework is the transformation of the management controller's role within the organization. Historically seen as a financial analyst operating in the background, the modern controller is being repositioned as a strategic business partner. This shift is driven by the increasing complexity of supply chain environments and the need for real-time, data-driven decision-making.

In the context of smart supply chains and inflationary uncertainty, controllers must not only master financial

principles but also develop cross-functional competencies. These include data analytics, technological fluency, systems thinking, and collaborative leadership. Controllers are now expected to engage in cross-departmental planning sessions, co-develop mitigation strategies with operations managers, and translate data insights into actionable recommendations for executives.

This evolution has implications for organizational structure, recruitment, and training. Firms will need to invest in upskilling their controllers, equipping them with digital tools and analytical methods that extend far beyond traditional accounting. In turn, this will enable controllers to contribute more meaningfully to strategic discussions and to drive value creation through smarter, more integrated supply chain decisions.

5. Discussion

5.1. Comparison with Existing Literature

The conceptual findings presented in this paper align with and extend the existing literature on management control and supply chain performance. Prior studies have emphasized the value of integrated control systems in stabilizing operations during periods of uncertainty (Otley, 2016; Becker & Schläfke, 2018). However, most have focused either on technological tools in isolation or on financial control in stable environments. This article advances the debate by explicitly linking inflation, logistics disruptions, and digital management control as part of a cohesive system.

Recent works have started to explore the resilience of supply chains under macroeconomic pressures (Ponomarov & Holcomb, 2009; Ivanov, 2021), yet few have investigated how inflation specifically alters cost structures, procurement behaviors, and supply responsiveness. By integrating management control as a buffer and enabler, the model reinforces findings from strategic cost management literature while proposing new avenues for applying these principles in volatile and inflationary settings.

5.2. Limitations of Existing Control Models under Inflationary Conditions

Despite their effectiveness in stable environments, many traditional managements control models fall short when applied to volatile, inflation-driven contexts. These systems often rely on rigid budgeting cycles, historical cost data, and lagging indicators—elements that become quickly outdated in fast-changing markets. The inflationary environment requires more agile, real-time control practices that can adjust forecasts and actions dynamically.

Moreover, existing models often fail to account for the complexity of smart supply chains that rely on external data flows, automated decision-making, and AI-enhanced forecasts. As a result, firms that continue to operate with conventional control tools risk misalignment between operational reality and strategic decision-making. There is a growing need to adapt models toward more flexible, predictive, and integrated control architectures that reflect the hybrid nature of modern logistics networks.

5.3. Practical Recommendations for Firms

From a managerial perspective, this conceptual model highlights several actionable recommendations. First, companies should invest in digitalizing their management control systems to gain real-time visibility over performance metrics and logistics costs. Tools such as dynamic dashboards, AI-based forecasting, and integrated planning software are no longer optional—they are essential for maintaining competitiveness.

Second, organizations should foster closer collaboration between finance and supply chain departments. This involves redefining the role of the management controller as a strategic advisor embedded within operational decision-making processes. Cross-training and interdepartmental coordination are key to making this integration effective.

Third, firms must redesign their budgeting and performance evaluation frameworks to better reflect the realities of inflation and supply chain volatility. This includes adopting rolling forecasts, scenario simulations, and risk-adjusted KPIs that support agile and forward-looking decision-making.

Conclusion and Research Perspectives

This article has proposed a conceptual model that explores the strategic role of management control systems in enhancing the performance of smart supply chains during periods of inflation. Drawing on contingency theory, strategic cost management, and the resource-based view, the framework demonstrates how inflationary pressures trigger logistical disruptions, and how well-integrated management control systems can mitigate these disruptions and sustain operational performance.

5.4. Theoretical and Managerial Contributions

From a theoretical standpoint, the article contributes to the academic discourse by articulating a novel linkage between macroeconomic volatility (inflation), operational disruptions (logistics challenges), and organizational response mechanisms (management control systems). It also repositions management control from a purely financial tool

to a strategic capability embedded in the digital and operational architecture of the supply chain.

Managerially, the model highlights the growing importance of equipping controllers and decision-makers with real-time analytics, digital tools, and cross-functional collaboration practices. It provides actionable insights for firms seeking to future-proof their supply chains and improve their resilience through strategic governance and smart technologies.

5.5. Limitations of the Study

While conceptually robust, this article remains exploratory and does not include empirical validation. Its conclusions are based on theoretical integration rather than data analysis. This limits the generalizability of the findings and calls for caution in their direct application across all sectors. Furthermore, the complexity of real-world supply chains and inflationary dynamics may require the inclusion of additional variables not captured in this model, such as regulatory factors, international trade frictions, or human capital considerations.

5.6. Future Research Directions

Several avenues emerge for future research. First, the model could be tested empirically in specific sectors particularly vulnerable to inflation, such as the automotive, food, or pharmaceutical industries. Sector-specific studies would help refine the relationships and adjust the model to different operational contexts.

Second, future research could explore the integration of ESG (Environmental, Social, and Governance) indicators into performance control systems, especially as sustainable supply chains gain strategic importance. Investigating how management control can support sustainability and compliance objectives would further enhance the model's relevance.

Third, the evolution of explainable Artificial Intelligence in forecasting and decision-making opens new research possibilities. Understanding how such technologies can be embedded within control systems to enhance transparency, trust, and decision support is a promising direction.

Finally, comparative studies across regions or between traditional and digital-native firms could provide deeper insights into the maturity levels of control systems and the effectiveness of strategic responses in different inflationary contexts.

In conclusion, the model proposed here offers a structured foundation for understanding and reinforcing the role of management control in volatile economic environments. It aims to serve as a reference point for both academic inquiry and managerial innovation in the evolving landscape of supply chain management.

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