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André Dinis Gomes Costeira

Risk-Intelligent Supplier Management: Designing Resilient Governance Systems

Coimbra, October 2025

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Dissertation submitted to the Instituto Superior de Contabilidade e Administração de Coimbra in partial fulfilment of the requirements for the degree of **Master in Management Information Systems**, carried out under the supervision of Professor Isabel Maria Mendes Pedrosa and co-supervision of Professor Ana Cristina dos Santos Amaro.

Coimbra, October 2025

STATEMENT OF RESPONSIBILITY

I hereby declare that I am the author of this dissertation, which constitutes an original and unpublished work that has never been submitted to any other higher education institution for the purpose of obtaining an academic degree or any other qualification. I further certify that all quotations are properly identified and that I am fully aware that plagiarism constitutes a serious breach of academic ethics, which may result in the annulment of this dissertation.

EPIGRAPH

"The only true voyage of discovery would be not to visit strange lands, but to possess other eyes."

- **Marcel Proust**, *In Search of Lost Time*, *The Prisoner* (1923)

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ABSTRACT

The long-held perception of stability in global supply chains has dissolved, revealing networks that were never truly steady but sustained by an illusion of predictability and efficiency. Geopolitical fragmentation, climatic volatility, technological dependence, and regulatory turbulence now expose the fragility of international trade, turning continuity into a strategic rather than operational pursuit. In this context, resilience and risk-intelligence have become essential to competitiveness, yet many organisations still underestimate their significance, lacking the integration of management information systems (MIS), maturity assessment, and governance needed to turn data into foresight and foresight into action.

This dissertation addresses that challenge through the Resilience-Oriented Supplier Management Cycle (RO-SMC), a governance-based framework that embeds risk-intelligence into supplier management and strengthens decision-making across global supply networks. Grounded in the Design Science Research methodology, it combines conceptual synthesis with artefact design to connect five stages of intelligence, evaluation, classification, monitoring, and adaptive re-evaluation within a continuous governance loop. The RO-SMC aligns information systems, analytics, and organisational maturity, enabling firms to progress from fragmented data to structured, evidence-based foresight.

Evaluation by senior professionals confirmed the framework's conceptual integrity, adaptability, and practical value, recognising its capacity to enhance transparency and institutional learning. Academically, the study advances understanding of how data-driven governance and MIS can operationalise resilience in global supply networks. Practically, it offers organisations a pathway to transform uncertainty into strategic readiness, embedding resilience as a measurable and enduring source of competitive strength.

Keywords: Supply Chain Resilience; Risk-Intelligence; Supplier Governance; Data-Driven Decision-Making; Organisational Maturity

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List of Abbreviations, Acronyms and Initialisms

AHP – Analytic Hierarchy Process

AI – Artificial Intelligence

BA – Business Analytics

BI – Business Intelligence

BoM – Bill of Materials

BWM – Best-Worst Method

CAoS – Circular Assessment of Suppliers

CAS – Continuity Assurance Score

CEaR – Critical Exposure at Risk

DEA – Data Envelopment Analysis

DEMATEL – Decision-Making Trial and Evaluation Laboratory

DSR – Design Science Research

ERP – Enterprise Resource Planning

ESG – Environmental, Social and Governance

Fuzzy GRA – Fuzzy Grey Relational Analysis

GRPS – Global Risks Perception Survey

IoT – Internet of Things

KPI – Key Performance Indicator

MABAC – Multi-Attributive Border Approximation area Comparison

MCDM – Multi-Criteria Decision-Making

MIS – Management Information Systems

OTIF – On-Time In-Full

RFID – Radio Frequency Identification

RO-SMC – Resilience-Oriented Supplier Management Cycle

SCM – Supply Chain Management

SCR – Supply Chain Resilience

SFBWM – Stochastic Fuzzy Best-Worst Method

SRCC – Spearman Rank Correlation Coefficient

SRM – Supplier Relationship Management

S-BCM – Supplier Business Continuity Management

TOPSIS – Technique for Order Preference by Similarity to Ideal Solution

VIKOR – VlseKriterijumska Optimizacija I Kompromisno Resenje (Multi-Criteria Optimisation and Compromise Solution)

INTRODUCTION

Disruption has become the defining condition of global commerce. Geopolitical fragmentation, climatic volatility, regulatory uncertainty, and technological interdependence have reshaped supply networks into adaptive systems exposed to continuous turbulence. Within this landscape, efficiency alone no longer ensures competitiveness. Resilience has emerged as a strategic imperative for organisations seeking both continuity and long-term advantage.

Resilience is not born of contingency but of design. Procurement stands at the centre of this architecture, as supplier choices delineate both opportunity and exposure. Yet many organisations persist in operating through fragmented data, unstructured evaluation, and weak connections between analysis and action. Information is plentiful, but intelligence remains scarce. Advances in analytics and artificial intelligence (AI) can narrow this divide when governed effectively, enabling earlier detection, sharper interpretation, and proportionate responses. The challenge lies less in technological capacity than in organisational discipline: transforming analytical potential into adaptive, evidence-based decision-making that embeds resilience as a sustained capability.

Research Questions

This research was guided by two central questions:

RQ1. How can data-driven governance operationalise resilience in supplier management?

RQ2. How can risk intelligence, supported by management information systems (MIS), enhance decision quality and capability development across global supply networks?

Objectives

The study seeks to deepen understanding of how organisations can strengthen supply chain resilience (SCR) by anticipating, managing, and learning from disruptive events. Its principal objective is to design and validate a model that transforms dispersed information into structured intelligence, enabling more informed, transparent, and adaptive decision-making. Drawing upon analytical and AI-enabled methods, and grounded in the literature, the research advances this purpose by examining how risk-intelligence can be integrated into supplier evaluation and governance processes, enhancing the ability to identify vulnerabilities, prioritise exposures, and sustain continuity under uncertainty. Through the development and expert validation of the proposed artefact, it aims to offer practical and theoretically robust guidance for embedding resilience as a measurable, evolving, and enduring capability within organisational practice.

Dissertation Structure

The dissertation comprises five interrelated chapters that combine conceptual synthesis, methodological rigour, and applied design. The first chapter situates the study within the evolution of SCR and supplier risk management, outlining the conceptual and managerial gap that underpins the research. The second presents the methodological foundations, describing how the Design Science Research (DSR) approach guided the development of the Resilience-Oriented Supplier Management Cycle (RO-SMC), a governance framework integrating supplier intelligence, evaluation, classification, monitoring, and adaptive re-evaluation within a continuous learning loop. Chapter three explores the framework's conceptualisation and design, establishing its theoretical basis and operational logic. Chapter four demonstrates its practical application, showing how resilience principles can be embedded into data-driven supplier management. The final chapter evaluates and discusses the artefact, assessing its contribution to analytical integration, decision coherence, and organisational resilience.

1 Literature Review

This chapter establishes the conceptual foundations of the study through an integrative review that connects SCR, supplier governance, information systems, and analytical decision-making. It examines the transition from efficiency-based management towards resilience as a strategic, data-enabled capability, highlighting how risk-intelligence and digital integration reshape supplier evaluation and continuity practices. The discussion unfolds through four interrelated themes: the evolution of supply chain management (SCM), supplier-centric risk governance, data-driven evaluation frameworks, and the integration of analytics and AI. Collectively, these perspectives consolidate the theoretical and methodological ground upon which the study advances its inquiry.

1.1 The Evolution of Supply Chain Management (SCM) and the Rise of Resilience

Global supply chains have long been engines of cost efficiency, scalability, and international reach. Yet the same interdependence that fuels competitiveness also amplifies vulnerability, exposing networks to frequent and often unpredictable shocks that disrupt continuity and performance (Christopher, 2023; Parast & Subramanian, 2021). As such risks become more frequent and interconnected, managing supply chain complexity has evolved into a strategic necessity.

1.1.1 From Efficiency to Complexity: The Transformation of SCM

Since its origins in the 1980s, SCM has evolved from a logistics-centred pursuit of cost efficiency into a broad, integrative discipline focused on resilience and strategic risk management. The establishment of institutions such as the Supply Chain Council (1996) and the Council for Supply Chain Management Professionals (2004) consolidated SCM's place at the heart of corporate strategy (Laguir et al., 2023). Today, its remit spans supplier relationships, sustainability, and digital transformation as well as traditional operational concerns.

As sourcing networks extend across geographies and tiers, exposure to disruption increases. Addressing this challenge demands proactive risk management enabled by technologies such as real-time monitoring, predictive analytics, and digital supplier integration. These tools strengthen visibility, responsiveness, and agility within supply chain operations (Laguir et al., 2023; Liu et al., 2023).

In this environment, resilience has become a central principle of modern supply chain strategy. It involves not only recovery from disruption but also the ability to anticipate, absorb, and adapt to change across operational, political, and technological dimensions (Javed et al., 2022; Laguir et al., 2023) Firms now focus on four guiding principles: responsiveness, reliability, resilience, and relationships (Christopher, 2023).

Of these principles, resilience links long-term planning with short-term adaptability. Achieving this balance often requires prioritising flexibility over pure efficiency through approaches such as supplier diversification, geographical dispersion, and built-in redundancy. Although such measures add complexity, they are essential for managing systemic shocks and maintaining supply continuity (Baldwin & Freeman, 2022).

1.1.2 Information Systems, Supplier Collaboration, and Continuity Practices

Technological innovations play a key role in enhancing SCR. Tools such as AI, blockchain, and real-time analytics improve visibility, enable early warnings, and support data-driven supplier risk evaluations (Jones, 2025; Sharma & Joshi, 2023). However, resilience also relies on strong inter-organisational collaboration and the integration of risk awareness into procurement practices.

Supplier Relationship Management (SRM) is essential in this context. By fostering trust, aligning objectives, and promoting transparency, SRM enables joint risk governance and coordinated disruption responses (Jones, 2025). Supplier business continuity management (S-BCM) further strengthens resilience by assessing suppliers' preparedness, recovery capabilities, and risk-mitigation efforts. This systematic approach embeds continuity into sourcing and supports more stable operational and financial outcomes (Sadeghi R. et al., 2022).

1.2 Supplier-Centric Risk Management in a Global Risk Landscape

The expansion of global supply chains has intensified interdependence, allowing local disturbances to escalate into systemic shocks that expose structural fragilities (Laguir et al., 2023; Parast & Subramanian, 2021). In this environment, the inadequacy of reactive risk management is evident. Resilience now depends on supplier-centred strategies that extend visibility and control beyond first-tier relationships, enabling anticipation rather than response (Zahoor et al., 2023).

1.2.1 Responding to Geopolitical, Environmental, and Digital Disruption

Geopolitical risks such as protectionist trade measures, investment screening, and regulatory fragmentation are prompting firms to reassess sourcing structures and geographical exposure as part of broader risk-mitigation strategies (Zahoor et al., 2023). These developments underscore the need to integrate macro-level political and economic factors into procurement planning.

In response, many firms are adopting diversification strategies, including multi-sourcing and geographical dispersion, to reduce regional dependencies and enhance continuity in volatile environments (Sonar et al., 2022). While these strategies strengthen resilience, they also introduce coordination challenges, making structured evaluation frameworks essential for maintaining consistency and efficiency (Huma et al., 2020; Javed et al., 2022).

The urgency of this transformation is reinforced by global risk trends. The 2024-2025 Global Risks Perception Survey (GRPS) identifies state-based armed conflict as the leading short-term threat (23 per cent), followed by extreme weather events (14 per cent) and geoeconomic confrontation (8 per cent), including sanctions and trade restrictions (Elsner et al., 2025). These findings, illustrated in Figure 1, reflect growing macro-environmental instability and highlight the importance of supplier evaluation frameworks that account for geopolitical and economic exposures (Elsner et al., 2025; Zahoor et al., 2023).

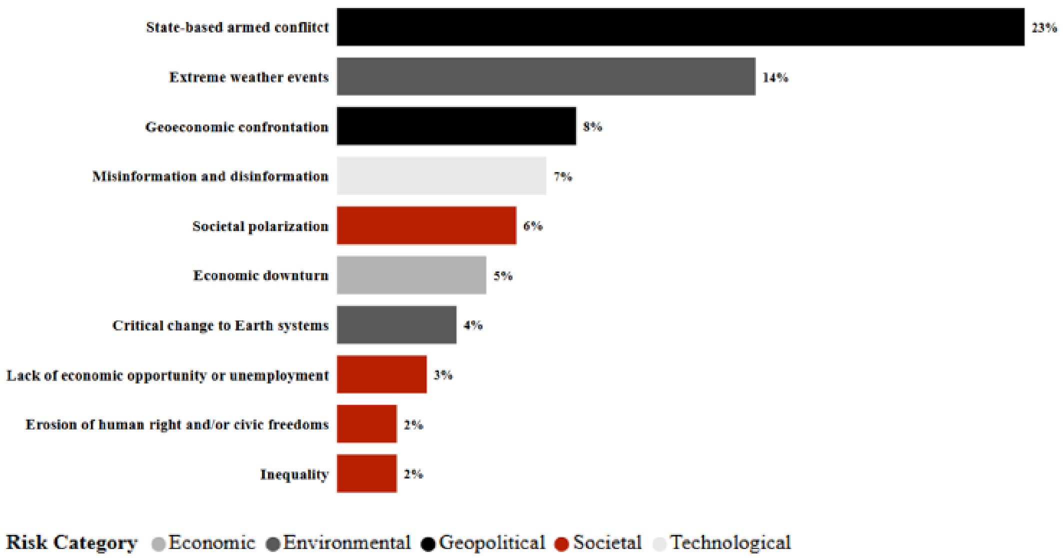

Figure 1 - Top 10 Global Risks Selected by Respondents

Source: Adapted from Elsner et al. (2025).

Environmental and digital risks add complexity to maintaining supply chain continuity. Climate-related events such as floods, hurricanes, and wildfires disrupt production and logistics, especially in regions with concentrated suppliers or weak infrastructure. Fourteen per cent of survey respondents cite environmental disruptions as major risks (Elsner et al., 2025), with impacts intensified where resilience and adaptation planning are lacking (Chukwuka et al., 2023).

Simultaneously, digital supply chains face rising threats from cyber-attacks, data breaches, and system failures. The integration of AI adds complexity, and without safeguards such as auditability, explainability, and control, algorithmic opacity and bias can undermine decision quality and trigger cascading disruptions (Joel et al., 2024). Resilience now rests on the reliability and integrity of these digital systems.

1.2.2 Advancing Supplier Risk-Intelligence Through Structured Evaluation

Despite technological progress, internal challenges persist. Many organisations still struggle with fragmented procurement structures, inconsistent risk assessments, and siloed data systems, limiting the development of supplier-centric risk-intelligence (I. A.

Mohammed, 2023; Sadeghi R. et al., 2022). Overcoming these issues requires coordination, shared metrics, and standardised protocols (Gopal et al., 2024).

Effective supplier risk assessment should combine internal performance metrics with external exposure indicators. Traditional criteria such as cost and delivery must be complemented by factors such as financial resilience, adaptability, environmental compliance, and geopolitical positioning (Wissuwa et al., 2022; Zahoor et al., 2023). Recent studies also emphasise dependency-adjusted evaluation, where risk ratings are scaled by buyer reliance, offering a clearer view of systemic exposure (Baldwin & Freeman, 2022).

Integrating these dimensions helps align procurement decisions with resilience objectives and supports structured evaluations in dynamic environments (Javed et al., 2022). However, even the most sophisticated evaluation frameworks require governance mechanisms that coordinate actions, maintain alignment across multiple tiers, and embed sustainability and resilience objectives into supplier relationships.

1.2.3 Governance Mechanisms in Multi-Tier Supplier Networks

Governance in supply chains consists of formal and informal structures that coordinate inter-organisational relationships to achieve sustainability and resilience objectives (Marttinen et al., 2024). Formal governance, through codes of conduct, standards, certifications, and audits, defines rights and responsibilities, reduces behavioural uncertainty, and ensures consistent practice (Barbieri et al., 2022). Relational governance, based on trust, commitment, and open communication, supports mutual adjustment and collaborative problem-solving in dynamic contexts (Wu et al., 2023). Combined, these mechanisms balance compliance assurance with adaptability and capability development (Stekelorum et al., 2021).

Extending governance upstream is challenging, as many risks originate beyond direct suppliers where control is limited (Marttinen et al., 2024). Firms address this by cascading requirements through first-tier suppliers or by engaging lower tiers directly. Assessment-based mechanisms, such as certifications and audits, communicate expectations and verify compliance, while collaboration-based approaches, including supplier visits, joint projects, and training, build capabilities and strengthen alignment (Stekelorum et al., 2021). Recent approaches enhance these mechanisms through visibility tools that trace sub-tier dependencies and reveal where risks concentrate. Bill of materials (BoM) mapping, supplier-discovery platforms, and network analytics make hidden linkages transparent, enabling earlier detection of vulnerabilities and coordinated mitigation across the network (Quan et al., 2024). Lower-tier suppliers can also contribute innovation and promote cross-tier collaboration when governance supports openness and shared learning (Marttinen et al., 2024).

The effectiveness of governance depends on contextual factors such as uncertainty, supply chain complexity, and relationship significance (Barbieri et al., 2022). Formal governance is effective in stable, low-complexity contexts, while relational governance is critical in high-complexity environments. Hybrid approaches that integrate both forms enable adaptation to evolving conditions (Barbieri et al., 2022). Governance also enhances resilience by enabling collaboration that turns governance structures into joint decision-making, information sharing, and coordinated action. Collaboration mediates this relationship, while institutional conditions can strengthen governance's impact on resilience (Wu et al., 2023). In this way, governance establishes the structural and relational foundations that allow advanced analytical and decision-support approaches to be applied with greater consistency and impact.

1.3 Data-Driven Approaches to Resilient Supplier Selection and Monitoring

Heightened uncertainty within global supply networks has reinforced the need for data-driven decision-making in supplier management. Traditional evaluation methods focused on static, cost-based metrics are being replaced by adaptive frameworks that assess suppliers across interdependent dimensions such as continuity, adaptability, and strategic alignment (Nayeri et al., 2023; Zahoor et al., 2023). In parallel, analytics-based assessment tools have become integral to modern procurement strategies, enabling organisations to anticipate disruptions, optimise sourcing portfolios, and strengthen responsiveness to risk (Lotfi et al., 2024).

Recent research highlights that such analytical capability depends on coherent data governance that ensures analytical credibility and organisational alignment. Governance frameworks define the decision rights, responsibilities, and stewardship principles required to transform dispersed supplier information into a reliable analytical asset (Bližnák et al., 2024). Within this context, well-structured master-data systems serve as the foundation for comparability, enabling consistent metrics, data lineage, and cross-functional integration. When governed strategically, data form the foundation for the transparency, trust, and analytical depth necessary for resilient supplier evaluation and intelligence-driven sourcing (Acev et al., 2025; Aljabhan & Abeyie, 2022).

1.3.1 Enhancing Supplier Selection with Analytics and AI

Business Analytics (BA) enables the systematic collection, integration, and analysis of supplier-related data to inform more resilient procurement decisions. By applying descriptive, predictive, and prescriptive analytics, firms can assess historical performance, forecast potential disruptions, and optimise sourcing strategies under a range of operational conditions (Evans, 2020). These analytical capabilities extend the scope of supplier evaluation to include indicators such as financial health, environmental performance, and long-term strategic viability, ensuring supplier choices align with resilience goals (Patrucco et al., 2023).

AI strengthens data-driven supplier evaluation by applying advanced algorithms to large and complex data sets. Techniques such as neural networks, support-vector machines, and deep learning are used to classify risks, detect anomalies, and forecast potential supplier disruptions under uncertain conditions (Mirzaee & Ashtab, 2024). When integrated into analytics platforms, AI enables real-time supplier monitoring and supports adaptive sourcing decisions that align procurement with broader organisational continuity objectives (I. A. Mohammed, 2023).

1.3.2 Monitoring, Interpretation, and Maturity as Enablers of Resilience

Maintaining supplier resilience requires continuous monitoring of performance and risk indicators such as lead-time variability, quality compliance, financial stress, and exposure to environmental or social disruptions (Sadeghi R. et al., 2022). Real-time monitoring systems consolidate data from Enterprise Resource Planning (ERP), Internet of Things (IoT), and procurement platforms into dashboards that translate signals into actionable insights. By linking indicators to specific triggers and responsibilities, these tools enable early warnings, coordinated responses, and clear accountability within the monitoring process (Gopal et al., 2024; Hasan et al., 2024).

Beyond operational metrics, supplier risk-intelligence must account for structural factors such as criticality, concentration risk, and alignment with continuity goals. These help identify systemic vulnerabilities often missed in transactional data (Baldwin & Freeman, 2022; Corsini et al., 2024). Scenario analysis and predictive simulations allow firms to assess supplier viability under disruption and adjust sourcing accordingly (Hasan et al., 2024).

Monitoring should differentiate between tracking performance and evaluating continuity planning. S-BCM offers insight into preparedness and recovery capabilities, adding a forward-looking resilience perspective (Sadeghi R. et al., 2022). This distinction supports more proactive mitigation and governance.

Predictive analytics also enable the integration of external data sources, including geopolitical trends and macroeconomic indicators. To convert this intelligence into decisions, firms must develop absorptive capacity, meaning the ability to identify, process, and apply external knowledge effectively (Hasan et al., 2024). This strengthens awareness and adaptability to changing risks.

The effectiveness of these tools depends on organisational data maturity. According to Langer (2025), less mature firms often rely on fragmented data and retrospective reports, whereas advanced firms use predictive models, automation, and integrated dashboards. Aligning resilience efforts with maturity levels is therefore essential, as data quality, system integration, and model transparency remain critical challenges even when the combination of BA, AI, and digital monitoring offers substantial potential (Gopal et al., 2024; Zhang et al., 2024).

1.4 Evaluation Frameworks for Risk-Based Supplier Selection

To strengthen procurement resilience, organisations are increasingly adopting structured evaluation frameworks that consider multiple and often conflicting decision criteria. Multi-Criteria Decision-Making (MCDM) techniques are central to this effort, enabling supplier comparisons across dimensions such as cost, quality, delivery performance, and sustainability (Sivanagaraju Pitchaiah et al., 2021). These methods integrate expert judgement with data-driven weighting to support consistent and transparent decision-making processes (Chen, 2020).

1.4.1 Classical and Fuzzy Techniques for Structured Decision-Making

Classical MCDM methods such as the Analytic Hierarchy Process (AHP), the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), and VlseKriterijumska Optimizacija I Kompromisno Resenje (VIKOR) provide structured approaches to supplier evaluation by ranking and prioritising criteria through systematic comparison (Sivanagaraju Pitchaiah et al., 2021). These models help decision-makers handle trade-offs among performance dimensions and maintain analytical rigour across diverse procurement contexts.

Other techniques extend this reasoning by capturing interdependencies and efficiency relationships. Decision-Making Trial and Evaluation Laboratory (DEMATEL) identifies causal links among resilience factors to support prioritisation, while Data Envelopment Analysis (DEA) benchmarks supplier efficiency using input-output relationships (A. Mohammed et al., 2021).

To address uncertainty and qualitative judgement, fuzzy logic has been incorporated into classical models. Fuzzy AHP and Fuzzy TOPSIS enable the evaluation of intangible factors such as flexibility, adaptability, or ethical standards, translating linguistic assessments into quantitative scores (Pramanik et al., 2020; Rane & Choudhary, 2023) Fuzzy entropy weighting further refines this balance between expert perception and objective data, improving the reliability and interpretability of results. Hybrid forms such as Fuzzy Grey Relational Analysis (Fuzzy GRA) extend the approach to incomplete or imprecise data, enhancing decision flexibility in uncertain contexts (Leong et al., 2022).

Together, these methods form a structured, transparent, and explainable foundation for supplier evaluation under uncertainty, supporting resilience-oriented decision-making.

1.4.2 Hybrid Frameworks and Maturity-Aligned Evaluation Models

Several studies propose multi-stage frameworks that combine these models to enhance evaluation accuracy and better align with resilience objectives. As summarised in Table 1, these integrated approaches address multiple aspects of supplier assessment, including weighting, ranking, validation, and probabilistic modelling.

Model selection should reflect analytical maturity, with less digital firms using simplified scorecards, while more mature organisations can adopt ERP integrated models that incorporate fuzzy logic, causal mapping, and real-time data to support scalable, adaptive evaluations (Abdulla & Baryannis, 2024; Gopal et al., 2024). This ensures that evaluation methods remain rigorous and feasible within existing systems.

Table 1 - Overview of MCDM Methods in Resilient Supplier Evaluation

MCDM Method(s)	Focus	Verified Reference
AHP, TOPSIS, VIKOR	Classical ranking and prioritization	Sivanagaraju Pitchaiah et al. (2021)
DEMATEL, MABAC	Structure interdependencies and rank options	A. Mohammed et al. (2021)
OCRA, TOPSIS, VIKOR	Multi-method ranking with internal validation	A. Mohammed et al. (2021)
Fuzzy AHP, Fuzzy TOPSIS	Evaluate qualitative and subjective criteria	Pramanik et al. (2020); Rane & Choudhary (2023)
Fuzzy entropy	Balance subjective and objective weightings	Rane & Choudhary (2023)
Fuzzy GRA	Fuzzy ranking under incomplete or imprecise data	Leong et al. (2022)
GRA-BWM-TOPSIS	Combine grey analysis, preference elicitation, and distance ranking	Leong et al. (2022)
SFBWM, Bayesian BWM	Probabilistic fuzzy weighting for resilient criteria	Nayeri et al. (2023)

Source: Own Elaboration

Integrated evaluation models strengthen procurement resilience by addressing the complexity and uncertainty of global supplier networks. The Stochastic Fuzzy Best-Worst Method (SFBWM) improves the robustness of weighting under ambiguity (Nayeri et al., 2023), while DEMATEL-MABAC and multi-method combinations such as OCRA-TOPSIS-VIKOR strengthen consistency and internal validation (A. Mohammed et al., 2021). Complementary matrix-based frameworks, including the Kraljic Matrix and its recent adaptation, the Circular Assessment of Suppliers (CAoS), translate analytical results into strategic segmentation, linking supplier positioning with resilience and continuity objectives (Corsini et al., 2024). Hybrid approaches that merge MCDM, fuzzy logic, and analytics-based frameworks further enhance flexibility and alignment with resilience goals (Leong et al., 2022). When embedded in business intelligence (BI) systems, these models improve transparency and coordination, enabling the systematic integration of risk-intelligence into procurement decisions (Gopal et al., 2024).

1.5 Integrating BA and AI for Supplier Risk-Intelligence

The integration of BA and AI has significantly advanced supplier risk-intelligence by enabling organisations to convert complex data into actionable insights. BA provides a structured foundation for supplier evaluation through the three primary forms of analysis: descriptive, predictive, and prescriptive. Descriptive analytics helps organisations assess past supplier performance through data aggregation and visualisation. Predictive analytics leverages statistical models to forecast potential disruptions before they occur, while prescriptive analytics goes further by recommending optimal sourcing decisions based on predefined objectives and constraints (Evans, 2020).

1.5.1 Enabling Intelligent Risk Detection Through Analytics and AI

AI enhances supplier risk-intelligence by automating data interpretation, detecting complex patterns, and enabling adaptive learning. Techniques such as machine learning and neural networks are used to classify risk, identify anomalies, and forecast failures using large volumes of structured and unstructured data (Gopal et al., 2024; Mirzaee & Ashtab, 2024).

The effectiveness of analytics depends on data quality and availability. Technologies such as blockchain, cloud computing, IoT, and Radio Frequency Identification (RFID) enhance traceability, enable real-time access, and improve reliability. Integrated into ERP and SRM systems, these technologies support continuous supplier monitoring (Gopal et al., 2024; Kalaiarasan et al., 2022).

Analytics also enhances MCDM models by standardising data normalisation, weighting, and evaluation. Hybrid methods such as AHP, TOPSIS, and fuzzy logic gain clarity and rigour when supported by analytical tools, particularly under conditions of uncertainty (Leong et al., 2022; Rane & Choudhary, 2023). Although some models employ adaptive weighting, AI-driven learning integration remains an emerging field.

Optimisation approaches can further strengthen these frameworks by modelling trade-offs among the different factors, supporting resilient and scalable sourcing strategies in complex environments (Mirzaee & Ashtab, 2024).

1.5.2 Implementation Challenges and Governance for Responsible AI Use

While AI and analytics expand analytical capability, they also introduce significant governance challenges. Resilience-oriented criteria such as adaptability or social compliance often lack standard benchmarks, which can result in inconsistency and bias. Oversight mechanisms are therefore essential to maintain fairness and reliability in AI-supported evaluation (Mirzaee & Ashtab, 2024).

Effective AI model governance depends on transparency, explainability, and accountability throughout the analytical lifecycle. Bias detection, version control, and independent validation strengthen ethical integrity and traceability, transforming AI from a technical instrument into a governed decision-support system (Gopal et al., 2024; Guida et al., 2023).

Predictive analytics also faces limitations under high uncertainty. Rapid geopolitical, regulatory, or environmental shifts may render historical data unreliable, demanding robust data infrastructure and collaboration across procurement, risk, and analytics functions to maintain adaptability (Hasan et al., 2024; Zhang et al., 2024).

By replacing static assessments with dynamic, continuously updated intelligence, AI-driven analytics enable proactive detection of financial, environmental, and reputational risks. This responsiveness supports transparency, governance, and resilience across supplier networks, reinforcing the shift from reactive assessment to continuous, risk-informed decision-making (Gopal et al., 2024; I. A. Mohammed, 2023).

1.6 Toward a Resilience-Oriented Supplier Evaluation Model

Building on the theoretical foundations and analytical tools explored throughout this study, supplier evaluation must evolve into a continuous, intelligence-driven process that directly supports organisational resilience. The complexity of today's supply chains demands that procurement teams integrate structured methodologies with real-time data and forward-looking risk indicators (Hasan et al., 2024). This evolution requires both methodological sophistication and organisational alignment to navigate uncertainty and build adaptive sourcing capabilities (Laguir et al., 2023).

1.6.1 Structuring Supplier Evaluation Around Resilience Dimensions

A resilience-oriented model should assess suppliers across a diverse set of interrelated dimensions. As outlined in previous chapters, these dimensions include financial stability, geopolitical exposure, technological readiness, environmental performance, and social compliance, along with more traditional considerations such as cost, quality, and delivery reliability (Nayeri et al., 2023; Wissuwa et al., 2022). The selection and weighting of these criteria should be tailored to reflect the organisation's specific risk landscape, category strategy, and analytical maturity (Javed et al., 2022; Leong et al., 2022). Incorporating disruption likelihood and impact within supplier evaluation reinforces the strategic alignment and economic rationale that underlie resilience-oriented decision-making.

To operationalise these dimensions, organisations can apply MCDM methods such as Fuzzy AHP, TOPSIS, or VIKOR. These approaches accommodate both quantitative and qualitative inputs, enabling the inclusion of expert judgement when data are incomplete or uncertain (Rane & Choudhary, 2023). When implemented within structured evaluation processes, such models contribute to greater consistency and transparency in supplier assessments (Leong et al., 2022).

Table 2 presents a synthesis of the key evaluation dimensions identified in the literature, including representative criteria and supporting references.

Table 2 - Supplier Evaluation Dimensions and Criteria for Supply Chain Resilience

Evaluation Dimension	Associated Criteria	Supporting References
Operational Risk and Reliability	Delivery performance, quality assurance, compliance, business continuity planning	Sadeghi R. et al. (2022)
Geopolitical and Location-Based Risk	Political instability, regulatory changes, trade barriers, infrastructure, proximity	Zahoor et al. (2023); Baldwin & Freeman (2022)
Technological Capability and Readiness	Digital maturity, information sharing, real-time monitoring, cybersecurity, platform integration	Modares et al. (2025)
Environmental and Sustainability Factors	Emissions, resource efficiency, climate risks, waste management	Nayeri et al. (2023); Mirzaee & Ashtab (2024)
Economic and Financial Resilience	Financial stability, liquidity, capital structure, cost optimization	Sadeghi R. et al. (2022); Gopal et al. (2024)
Social and Ethical Compliance	Labor rights, workplace safety, ethical compliance	Mirzaee & Ashtab (2024)
Strategic Fit and Dependency Risk	Dependency, strategic alignment, sole-source risk, partnership compatibility	Baldwin & Freeman (2022); Corsini et al. (2024)
Adaptability and Risk Mitigation	Flexibility, responsiveness, disruption readiness, innovation, collaborative governance	Leong et al. (2022); Sonar et al. (2022)
Visibility and Multi-Tier Awareness	Transparency, sub-tier visibility, upstream risk detection	Leong et al. (2022); Baldwin & Freeman (2022)

Source: Own Elaboration

1.6.2 Operationalising the Model Through Monitoring and Governance

Supplier evaluation should operate as a continuous cycle of monitoring, reassessment, and informed adjustment. Effective monitoring frameworks distinguish between operational performance indicators and forward-looking measures of continuity readiness, enabling early detection of vulnerabilities and timely corrective action (Sadeghi R. et al., 2022). Scaling resilience assessments by buyer-side dependence also enhances systemic awareness, since concentrated reliance on critical suppliers amplifies both disruption probability and cascading impact (Baldwin & Freeman, 2022; Zahoor et al., 2023).

Real-time analytics and predictive modelling further strengthen adaptability by allowing organisations to refresh supplier risk profiles as internal and external conditions evolve. These tools integrate signals from market trends, regulatory dynamics, and geopolitical change to maintain alignment between evaluation parameters and the surrounding environment (Hasan et al., 2024). Yet, their reliability remains sensitive to data quality and uncertainty, underlining the need for sound data governance, interdisciplinary collaboration, and ongoing validation to ensure analytical outputs remain interpretable and actionable (Hasan et al., 2024; Zhang et al., 2024).

In essence, operationalising resilience requires a governance structure that is both analytical and adaptive. Models must balance methodological rigour with flexibility, linking structured evaluation to real-time intelligence (Leong et al., 2022). Such integration reinforces the continuity of buyer–supplier relationships (Sadeghi R. et al., 2022) and strengthens long-term competitiveness in increasingly uncertain supply environments (Hasan et al., 2024).

2 Methodology

This study employs the *Design Science Research* (DSR) methodology as a rigorous and structured approach to develop a solution that is both theoretically robust and practically relevant. DSR is particularly suited to complex organisational contexts, as it generates knowledge through the systematic creation and evaluation of artefacts designed to address real-world problems (Peffers et al., 2020). Within this research, it provides the methodological foundation for linking the conceptual principles of SCR with the practical mechanisms of supplier governance and analytics.

2.1 Design Science Research (DSR)

The DSR process unfolds through five interdependent stages: problem identification and motivation, objective definition and solution design, artefact development, demonstration and evaluation, and communication and contribution. Together, these stages ensure coherence between the research problem, the artefact, and the study's theoretical and practical contributions.

The methodological focus of this work arises from a persistent gap between analytical capability and governance practice in supplier management. Organisations often possess vast procurement data yet lack a structured framework to translate it into decision-ready intelligence. Existing evaluation systems tend to be static and fragmented, limiting responsiveness to dynamic risk conditions. The DSR approach enables the structured development of a framework that addresses this gap through iterative design, ensuring both conceptual integrity and practical applicability.

Through this process, the research advances a model that embodies the logic of DSR, aligning theoretical insight with operational feasibility while maintaining methodological rigour. Each stage contributes to refining the artefact and validating its relevance within the broader context of procurement and SCR.

Figure 2 illustrates the methodological flow of DSR, highlighting the progression from conceptualisation to evaluation and communication.

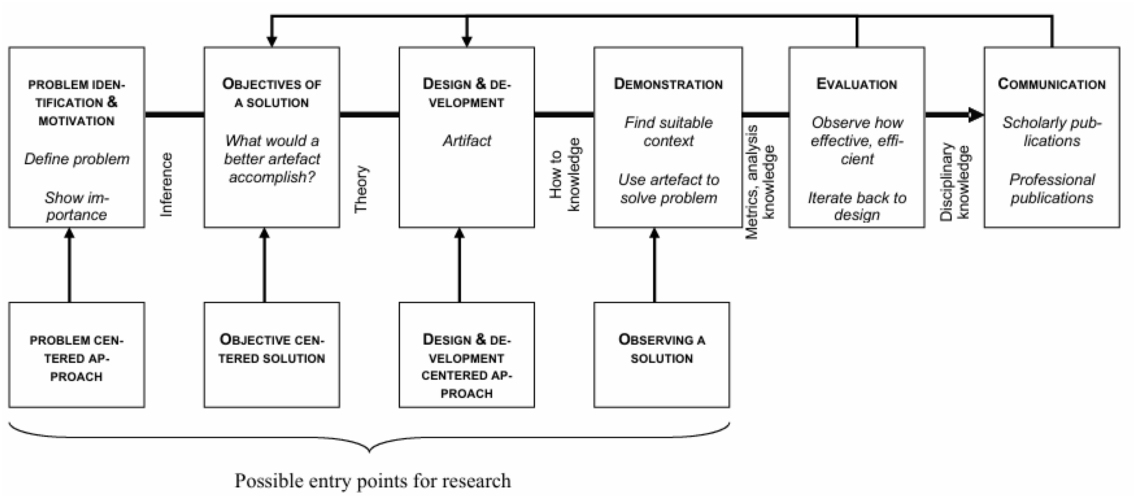

Figure 2 - Design Science Research Methodology

Source: (Peffers et al., 2020)

2.1.1 Problem Identification and Motivation

The first stage seeks to identify a problem that is both practically relevant and academically significant. It involves examining an existing challenge within organisational practice that has not been adequately addressed in the literature. The process requires a comprehensive analysis of the research domain to understand current limitations and to justify the need for an improved approach. This ensures that the investigation is anchored in both theoretical foundations and practical relevance (Peffers et al., 2020).

2.1.2 Objective Definition and Solution Design

Once the problem is defined, clear objectives are established to guide the design of a suitable solution. These objectives outline the intended purpose of the artefact and define the criteria for its evaluation. The design phase draws upon established theories, frameworks, and methodological insights from the literature to ensure conceptual coherence and practical feasibility. This stage also delineates the principles and requirements that will inform the artefact's subsequent development and its alignment with the research objectives (Peffers et al., 2020).

2.1.3 Development of the Artefact

The development stage focuses on constructing an artefact that responds to the defined problem and fulfils the established objectives. It follows an iterative process that integrates theoretical insight, empirical reasoning, and critical reflection. Each cycle of design and refinement aims to enhance the artefact's robustness, relevance, and methodological consistency. The process is exploratory and adaptive, allowing the emerging design to evolve in response to analytical findings and contextual understanding. This ensures that the artefact remains aligned with the DSR principles of utility, quality, and rigour.

2.1.4 Demonstration and Evaluation

The demonstration and evaluation stage aims to assess the artefact's ability to address the identified problem effectively. Demonstration involves applying the artefact within a defined context to illustrate its functionality and intended purpose. Evaluation examines its performance against the criteria established earlier, focusing on conceptual validity, practical applicability, and overall coherence. This stage ensures that the artefact satisfies the research objectives and contributes meaningful insights to both academic knowledge and professional practice (Peffers et al., 2020).

2.1.5 Communication and Contribution

The final stage of DSR concerns the dissemination of the research process and its outcomes. It involves clearly articulating the problem investigated, the methodological rationale adopted, the design logic applied, and the insights derived from demonstration and evaluation. The goal is to communicate the research transparently and effectively to both academic and professional audiences, enabling replication, refinement, and further development. Through this process, DSR promotes cumulative knowledge building and strengthens the link between theoretical research and organisational application (Peffers et al., 2020).

By following the DSR methodology, this research is structured to ensure methodological rigour, transparency, and coherence. It provides a clear pathway for linking problem definition, design, and evaluation within a unified framework, allowing knowledge to emerge through the systematic creation and assessment of a purposeful artefact.

2.2 Research Strategy

The research strategy outlines how conceptual analysis, design activity, and evaluative inquiry are integrated within a coherent methodological framework. It complements the DSR approach by ensuring consistency between theoretical development, methodological execution, and practical relevance.

The study commences with an extensive review of literature on SCR, supplier risk, and analytics-driven decision-making. This examination establishes the conceptual foundation, identifies shortcomings in current practices, and defines the requirements guiding the research design.

Rather than reproducing existing models, the strategy promotes synthesis and integration. It combines complementary theoretical perspectives and empirical insights into a unified structure capable of addressing the multifaceted nature of supplier evaluation and risk governance. The resulting framework aspires to strengthen decision-making through clarity, adaptability, and the informed use of data, linking analytical capability with robust governance processes.

Relevance is maintained through grounding in established models while remaining sensitive to organisational factors such as scalability, usability, and maturity of systems. Iterative reflection and expert feedback reinforce contextual alignment, ensuring that conceptual reasoning translates into mechanisms applicable across varied procurement settings.

Ultimately, the research strategy provides a structured pathway that connects conceptual inquiry, artefact creation, and evaluative assessment. By uniting theoretical precision with practical understanding, it delivers a rigorous and meaningful contribution to advancing supplier risk management and enhancing procurement resilience.

3 Artefact Conceptualisation and Design

Markets have entered an era of enduring volatility. Supply networks are increasingly interdependent, their complexity heightened by geopolitical tension, environmental disruption, and technological transformation. Within this landscape, procurement evolves beyond its transactional origins to act as a governance discipline that balances risk, cost, and continuity through informed and traceable decisions (Christopher, 2023; Laguir et al., 2023). Achieving such balance depends on MIS that transform dispersed data into coherent intelligence, enabling anticipation, proportionate action, and organisational learning.

Despite advances in digitalisation and analytics, practice remains fragmented. Resilience criteria are inconsistently applied, evaluation routines lack standardisation, and monitoring is often disconnected from sourcing decisions (Wissuwa et al., 2022). Data and tools are abundant, yet weak ownership and irregular review cycles continue to undermine accountability (Zahoor et al., 2023). The limitation lies less in technological capability than in the absence of a unifying model that connects governance and analytics within a structured and adaptive system.

This chapter introduces the RO-SMC, developed under the DSR methodology as a governance framework for embedding resilience into supplier management. It integrates analytical reasoning with organisational governance, enabling decisions that are transparent, proportionate, and continuously informed by evidence.

The following sections establish the conceptual foundation of this artefact, identifying the problem and motivation, defining its objectives and requirements, and outlining the design principles through which governance, analytics, and maturity converge into a coherent framework for resilience-oriented supplier management.

3.1 Problem Identification and Motivation

Supply chains now operate in conditions of persistent turbulence. Disruptions propagate rapidly across tiers, amplified by structural dependencies, geopolitical tensions, and environmental pressures (Christopher, 2023; Parast & Subramanian, 2021). These realities demand supplier management systems that embed exposure and dependency within decision logic rather than treating them as external uncertainties.

In many organisations, practice still reflects earlier paradigms. Supplier evaluations remain centred on cost, quality, and delivery, with limited consideration of resilience-related factors (Wissuwa et al., 2022). Processes are often manual, fragmented, and constrained by inconsistent data and criteria (Zahoor et al., 2023). Governance represents a persistent gap: risk indicators lack formal thresholds, escalation paths are undefined, and monitoring responsibilities are unclear (Sadeghi R. et al., 2022). As Baldwin & Freeman (2022) observe, when information systems are disjointed, supplier data cannot be converted into decision-ready intelligence, leading to undocumented rationales and limited organisational learning.

The literature offers mature methods for decision-making under uncertainty, such as fuzzy AHP, TOPSIS, and GRA, which strengthen consistency and analytical robustness (Leong et al., 2022; Rane & Choudhary, 2023). Yet their potential remains constrained when analytical maturity and system interoperability are limited. As Gopal et al. (2024) highlight, the barrier lies less in the techniques themselves than in the absence of governed processes and integrated interfaces that enable their systematic use in daily decision-making.

This research addresses that gap by positioning supplier evaluation within a governed process that integrates risk, performance, and dependency, and evolves with organisational maturity. The motivation is practical: to transform dispersed data into shared intelligence, ensure consistency in evaluation, connect outcomes to portfolio posture, and adapt decision rules as conditions change. The next section defines the objectives and requirements that guide the design of the proposed artefact, establishing the foundation for its operationalisation in Chapter 4, where resilience is embedded into routine procurement practice rather than treated as an exceptional initiative.

3.2 Objective Definition and Solution Requirements

Against this backdrop of fragmented evaluation practices and limited governance integration, the objective is to design a governance-based artefact that translates analytical principles into a structured decision framework connecting multi-criteria evaluation models with organisational information systems. Its purpose is to transform management data into supplier decisions that balance risk, cost, quality, and continuity through defined ownership, measurable thresholds, and systematic review cycles integrated within ERP, SRM, BI, and external intelligence platforms (Patrucco et al., 2023).

The artefact operates as a continuous process rather than a static scorecard. Supplier intelligence integrates internal reliability and quality indicators with external exposure and strategic fit, defining eligibility logic and traceable exceptions. Evaluation applies structured weighting and documented expert judgement, distinguishing inherent supplier risk from buyer dependency so that priorities remain both comparable and defensible (Baldwin & Freeman, 2022). The resulting insights inform portfolio posture, aligning oversight and investment with exposure, while a concise signal set sustains vigilance and triggers proportionate re-evaluation as conditions evolve.

Method selection balances analytical rigour with usability. Operational records on delivery and audit performance are complemented by forward-looking indicators such as financial health, Environmental, Social and Governance (ESG) conduct, and geopolitical exposure, ensuring that assessments capture both performance and vulnerability (Gopal et al., 2024). When evidence is qualitative or incomplete, multi-criteria and fuzzy approaches preserve consistency, transparency, and interpretability in evaluation (Leong et al., 2022; Rane & Choudhary, 2023).

The artefact is designed to scale with organisational maturity. Its governance logic can function through structured templates and periodic reviews in less integrated contexts or be embedded within SRM and BI dashboards featuring automated alerts, scenario testing, and version-controlled rules. Success is measured not by technological sophistication but by traceable decisions, proportionate responses, and institutionalised learning that make resilience a sustained organisational capability.

3.3 Artefact Design and Development

Building on these foundations, the artefact materialises as a governed operating model that aligns procurement decisions with the organisation's MIS. It translates diverse data from ERP, SRM, BI, and external intelligence sources into decision-ready insight, channelled through defined roles, thresholds, and review cadences that embed resilience into daily operations (Patrucco et al., 2023). Developed under the principles of DSR, the design emphasises contextual fit and practical utility while preserving methodological rigour.

At its core lies Resilience, represented through the RO-SMC, a continuous governance loop that integrates information, interpretation, and action into a dynamic system of learning. It combines descriptive, predictive, and prescriptive analytics so that data become insight and insight translates into measurable, adaptive outcomes. The model is maturity-scaled and technology-agnostic: it can operate through governed templates in less integrated contexts or within digital environments where SRM and BI systems automate alerts, version control, and audit trails, ensuring coherence and traceability across the cycle.

Each stage functions under clear ownership, measurable thresholds, and review cadences proportionate to supplier relevance and risk exposure. Decisions are logged with their underlying data, applied rules, rationale, approver, and next review date. As illustrated in Figure 3, the model forms a continuous feedback loop in which intelligence, evaluation, classification, monitoring, and re-evaluation interact to sustain alignment between information, action, and strategic intent.

Figure 3 - Resilience-Oriented Supplier Management Cycle

Source: Own Elaboration

The first stage, **Supplier Intelligence and Eligibility**, defines the entry conditions for supplier assessment by consolidating internal evidence of reliability and quality with external indicators of exposure and continuity. This integration ensures that supplier selection supports long-term continuity objectives and mitigates vulnerabilities that may propagate across interdependent tiers (Christopher, 2023; Parast & Subramanian, 2021).

Evaluation and Risk-Based Prioritisation transforms intelligence into structured and defensible priorities. Criteria and weights are established at the outset of each review, expert judgements are documented, and inherent supplier risk is analytically differentiated from buyer dependency. When uncertainty is high, methods such as fuzzy AHP or TOPSIS provide a systematic means of comparison and consistency testing, strengthening transparency and the stability of results (Leong et al., 2022; Rane & Choudhary, 2023).

Classification and Segmentation translates evaluation outcomes into strategic posture. Suppliers are positioned according to risk and strategic relevance, while dependency and substitution difficulty act as modifying factors. Segmentation determines oversight intensity and review cadence, adapting portfolio logic to resilience objectives while maintaining clarity of action.

Monitoring and Signal Detection sustains vigilance through a concise set of indicators that combine operational reliability with forward-looking signals such as financial health, continuity assurance, and external exposure. Predefined triggers and escalation paths enable timely intervention, while dependency levels calibrate sensitivity in areas of higher reliance (Gopal et al., 2024; Hasan et al., 2024).

Finally, **Adaptive Re-Evaluation and Strategic Adjustment** closes the cycle and reinforces the central role of resilience. Monitoring signals may prompt targeted reviews, supplier reclassification, or recalibration of eligibility logic and weighting. Outcomes follow four governed paths: Indicator Review, Reclassification, Logic Adjustment, or Full Re-evaluation. All changes are versioned and time-stamped to ensure traceability and to strengthen organisational learning.

Together, these stages integrate governance and analytics into a continuous evidence-to-decision system. By combining structure, proportionality, and learning, the RO-SMC transforms resilience from an abstract ideal into a verifiable organisational capability. The next chapter operationalises this cycle in detail, outlining its inputs, methods, thresholds, and maturity pathways to support scalable implementation across diverse organisational settings.

4 Operationalising the Resilience-Oriented Supplier Management Cycle (RO-SMC)

The value of a resilience-oriented supplier evaluation model lies not only in its conceptual integrity but in its ability to inform decisions across diverse organisational contexts. This chapter operationalises the RO-SMC, translating its five governance stages into practical modules that align analytical reasoning with proportionate, transparent, and traceable action.

The approach follows the principle of adaptive modularity. No single design suits every environment, and application must reflect each organisation's maturity, complexity, and strategic priorities. Diagnostic prompts and integration pathways support context-sensitive implementation. While advanced organisations may embed the logic in analytics platforms and near-real-time monitoring, others may begin with structured templates, expert judgement, and progressive adoption. In all cases, evidence becomes comparable assessment and assessment becomes an accountable decision.

Transforming data into intelligence depends less on quantity than on the organisation's ability to govern, integrate, and interpret it effectively. Supplier information arises from ERP, SRM, audit, and transactional systems, often enriched by external financial or ESG data. Its value emerges only when these sources are connected through disciplined governance and analytical coherence. As Patrucco et al. (2023) observe, analytical advantage derives not from technological sophistication but from the absorptive capacity to interpret diverse information and convert it into actionable knowledge that enhances both decision quality and resilience.

Within this framework, data maturity is a structural element of the artefact, expressing an organisation's readiness to transform dispersed information into decision intelligence through the alignment of technology, governance, and analytical capability. It typically evolves from fragmented and retrospective practices to integrated systems with predictive insight, reflecting the progression identified by Langer (2025) across maturity models. Among these, Buitelaar (2018) 5×10 Data-Driven Maturity Model provides a clear example of a structured maturity assessment framework, complemented by a digital self-assessment tool that supports practical evaluation and benchmarking. Assessing ten dimensions across data, skills, technology, leadership, and integration, it illustrates how coherence between analytical and organisational capabilities enables information to become actionable intelligence.

Maturity serves both diagnostic and developmental purposes, helping organisations identify strengths, prioritise improvements, and align analytical capability with governance quality. More than a technical benchmark, it provides the foundation for operationalising the RO-SMC, determining the pace and depth at which each stage can be effectively embedded in practice.

Grounded in the DSR methodology, the following sections apply this maturity logic to demonstrate how resilience principles are operationalised across the five stages of the Cycle, ensuring that intelligence is consistently transformed into timely, proportionate, and transparent action.

The operational architecture comprises five interdependent modules:

- **Module 1**: Supplier Intelligence and Eligibility
- **Module 2**: Evaluation and Risk-Based Prioritisation
- **Module 3**: Strategic Classification and Portfolio Segmentation
- **Module 4**: Monitoring and Signal Detection
- **Module 5**: Adaptive Re-Evaluation and Strategic Adjustment

Each module may operate independently, but their combined application creates a continuous governance system that embeds learning, coherence, and resilience within organisational decision-making.

4.1 Supplier Intelligence and Data Integration

The cycle begins by treating supplier intelligence as a governed capability rather than a data collection exercise. This module forms the informational foundation for all subsequent stages. Fragmented data leave procurement reactive; integrated intelligence transforms information into foresight. By aligning eligibility with resilience objectives, it ensures that decisions are transparent, proportionate, and timely.

4.1.1 Intelligence as a Governance Foundation

Supplier data are abundant yet seldom organised to support resilience. Internal systems capture performance and quality but overlook contextual exposure and continuity risk. External insights such as ESG alerts, geopolitical indicators, or financial stress signals rarely integrate into sourcing routines, creating information without interpretation.

Resilience-oriented intelligence relies on governance that connects measurement to intent. Governance defines which indicators matter, how they are validated, and how they inform eligibility decisions over time. Without this structure, organisations optimise what is convenient to measure instead of what safeguards continuity.

An effective framework balances three dimensions:

- **Internal performance**: reliability, responsiveness, and delivery quality.
- **Contextual exposure**: external risks including geopolitical instability, sustainability and compliance pressures, and financial fragility.
- **Strategic fit**: long-term alignment, innovation potential, and adaptive capacity.

Together, these dimensions offer a coherent lens through which supplier resilience can be assessed. Applied at the eligibility stage, they expose upstream vulnerabilities that may compromise continuity and align onboarding with broader resilience goals (Parast & Subramanian, 2021).

As illustrated in Figure 4, supplier intelligence emerges where reliability, exposure, and strategic alignment converge. This intersection establishes the governance foundation for eligibility, turning dispersed information into a clear and actionable view of resilience.

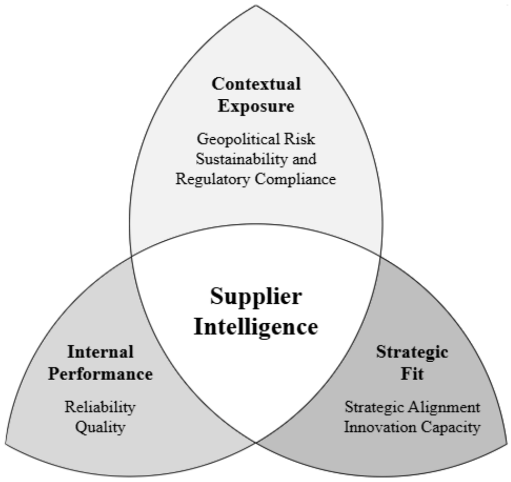

Figure 4 - Supplier intelligence model

Source: Own Elaboration

4.1.2 Operationalising Eligibility Logic

Intelligence gains significance when converted into clear rules that determine supplier entry into the evaluation process. Eligibility transforms information into decisions that reflect resilience priorities and contextual realities, creating a disciplined link between analysis and action.

Thresholds typically include minimum performance levels, the absence of unresolved ESG controversies, acceptable geographic or concentration exposure, and validated continuity plans for critical items. Criteria are calibrated to supplier tier, category sensitivity, and sourcing intent. A supplier in a high-risk region may qualify only if redundancy is secured, while limited transparency may be tolerated for non-critical items under enhanced oversight.

Governance ensures that these rules are applied consistently and transparently. Each decision requires justification, exceptions follow a defined escalation path, and mitigation must be time-bound. All outcomes are recorded with dataset and criteria versions, rationale, approver, and next review date, ensuring comparability and traceability over time.

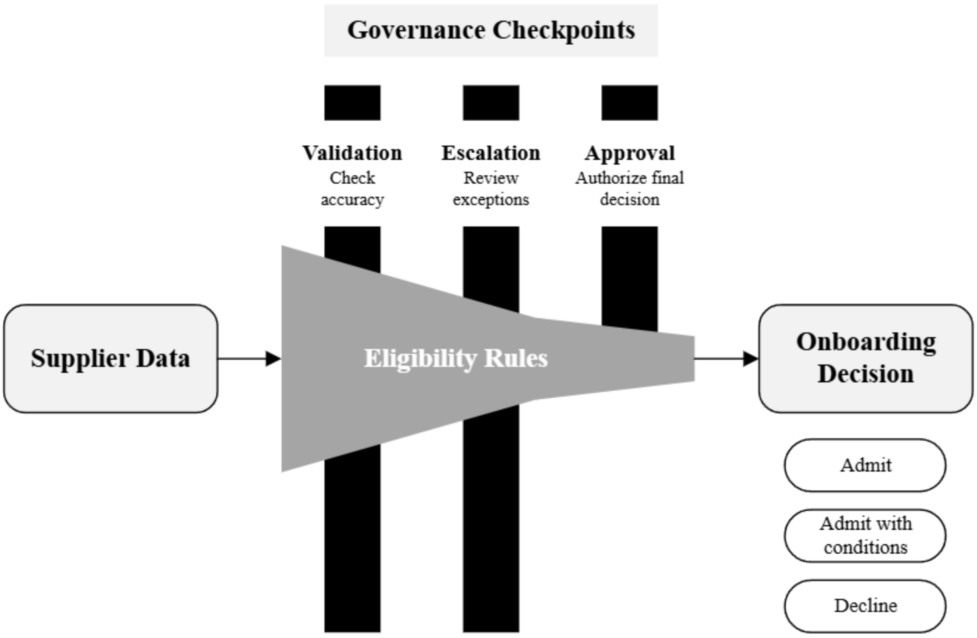

Figure 5 - Eligibility flow

Source: Own Elaboration

As shown in Figure 5, the eligibility process consolidates data, applies validation and escalation logic, and results in three possible outcomes: admit, admit with conditions, or decline.

Maturity progression within the framework:

- **L1 Foundational:** manual checks supported by templates and review logs.
- **L2 Intermediate:** SRM workflows integrate automated validation, selected data feeds, and defined exception routing.
- **L3 Advanced:** intelligence platforms enable near-real-time verification, continuous monitoring, and automated audit trails.

Eligibility turns analytical insight into structured governance practice. By embedding proportionality, consistency, and transparency within routine supplier evaluation, it anchors resilience within the operational fabric of decision-making.

4.1.3 Contextual Adaptation and Real-World Application

Effective application is a matter of calibration, not capability display. Eligibility and monitoring should be tuned to decision rights, review cadence, and stated risk appetite, with the minimum automation needed to produce reliable action. Start from the questions that govern inclusion and escalation, then select data and workflows that serve those questions rather than the other way round.

A critical lens is essential. Common failure modes include dashboard theatre, alert fatigue, indiscriminate ingestion of external feeds, opaque scoring, and false precision. Guardrails should include clear indicator lineage, version control of rules, periodic back-testing against realised events, and checks for bias and unintended incentives. External platforms, where used, are sources of signals rather than decision makers, and their outputs require validation before they alter supplier status.

Adoption benefits from tight sequencing. Pilot within a single category, specify hypotheses and measurable effects, and define stop–go criteria in advance. Evaluate impact on cycle time, false negatives, mitigation lead time, and rework. Only then scale across categories. Embed the resulting signals in contracting, planning, and review routines so that intelligence changes what the organisation does, not only what it sees.

4.1.4 Foundation for Risk-Based Prioritisation

Supplier intelligence and eligibility create the conditions under which evaluation produces meaningful insight. They ensure that prioritisation rests on verified data rather than assumption, aligning assessment with actual exposure and performance realities.

Evaluation must capture nuance rather than apply uniform metrics. A supplier with recurring ESG alerts may warrant greater sustainability weighting, while geopolitical exposure becomes critical only when alternatives or recovery capacity are limited. Effective prioritisation distinguishes signal from noise, integrating internal performance and external risk data within adaptive, multi-criteria structures.

A review of industry sources identified platforms such as S&P Global, Everstream Analytics, and Riskmethods that provide continuous supplier intelligence. These tools maintain live profiles, validate exposure data, and deliver timely insights that enhance situational awareness. Their value lies in keeping intelligence current and comparable, complementing professional judgement while enabling a more transparent and adaptive evaluation process.

4.2 Evaluation and Risk-Based Prioritisation

Evaluation converts supplier intelligence into structured prioritisation, treating assessment as a governed process that combines quantitative analysis with expert judgement. It ensures transparency, proportionality, and strategic alignment, linking eligibility with classification so suppliers are assessed for performance and their contribution to resilience.

As Zahoor et al. (2023) note, resilience in global networks relies on informed decisions that recognise geopolitical and structural risks while balancing efficiency with continuity. Within this logic, evaluation sets criteria and weights, makes trade-offs explicit, and keeps choices consistent across categories and geographies. In Figure 6, the architecture is maturity-aware: diverse inputs from internal systems and external signals are standardised, validated, weighted, and ranked, with outputs visualised through dashboards and review tools to support timely action. The same logic operates at different capability levels, from disciplined scorecards to integrated workflows, enabling a continuous, evidence-led process that produces defensible, resilience-oriented decisions.

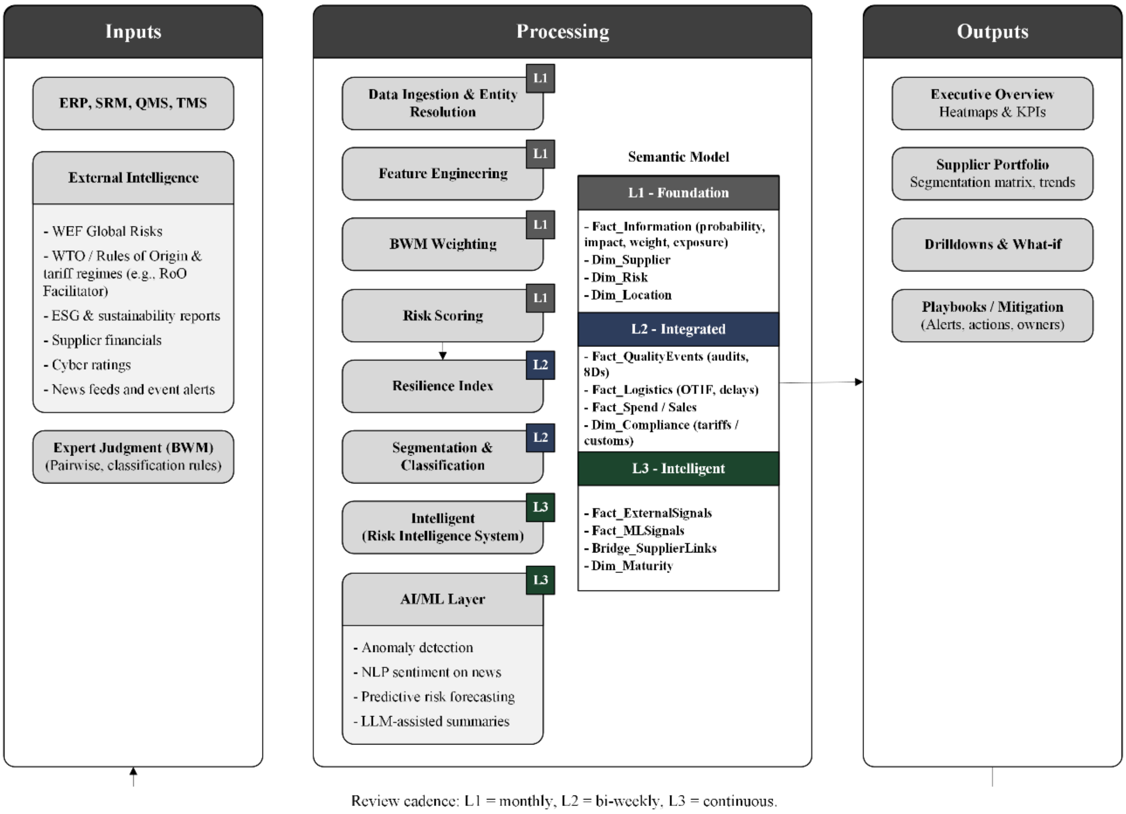

Figure 6 - Evaluation data model by maturity

Source: Own Elaboration

4.2.1 Inputs, Processing, and Outputs

Evaluation functions as a governed sequence that transforms dispersed information into coherent and comparable insight. Inputs combine internal data from ERP, SRM, quality, and logistics systems with external financial, risk, and sustainability intelligence. Their interpretation depends on data integrity, contextual exposure, and the organisation's analytical maturity.

Processing applies validation, weighting, and scoring routines that uphold consistency and proportionality. As analytical capability matures, this logic extends to dependency mapping and predictive assessment, allowing risks to be anticipated rather than detected after the fact. Research on multi-criteria decision methods, including Pramanik et al. (2020), demonstrates how expert judgement can be systematically integrated with quantitative weighting by translating linguistic assessments into fuzzy numbers and balancing them through entropy-based measures. This hybrid logic enables structured evaluation even when information is incomplete or imprecise, preserving analytical rigour under uncertainty.

Outputs evolve with capability. Foundational applications yield structured scorecards and prioritised shortlists; integrated systems provide dashboards, segmentation matrices, and scenario analyses; advanced configurations generate predictive alerts and governed playbooks that support continuous, evidence-based portfolio steering. Together, these layers form a coherent architecture in which data, analytics, and governance converge to deliver transparent and resilience-oriented supplier evaluation.

4.2.2 Expert Evaluation Routine

Extending this analytical sequence, expert judgement is operationalised through a defined routine supported by two visual anchors: a flow diagram outlining the process and a matrix translating it into supplier-level outputs. The flow, illustrated in Figure 7, begins with scoping, where criteria and definitions are confirmed, ownership and cadence established, and evidence sources captured to ensure traceability. Weighting follows through the Best-Worst Method (BWM): experts identify the most and least critical criteria, make pairwise comparisons on a 1–9 scale, and an optimisation model derives a weight vector w with an associated consistency ratio ε. Stochastic or Bayesian variants may be adopted in higher-uncertainty contexts, preserving interpretability while enhancing robustness.

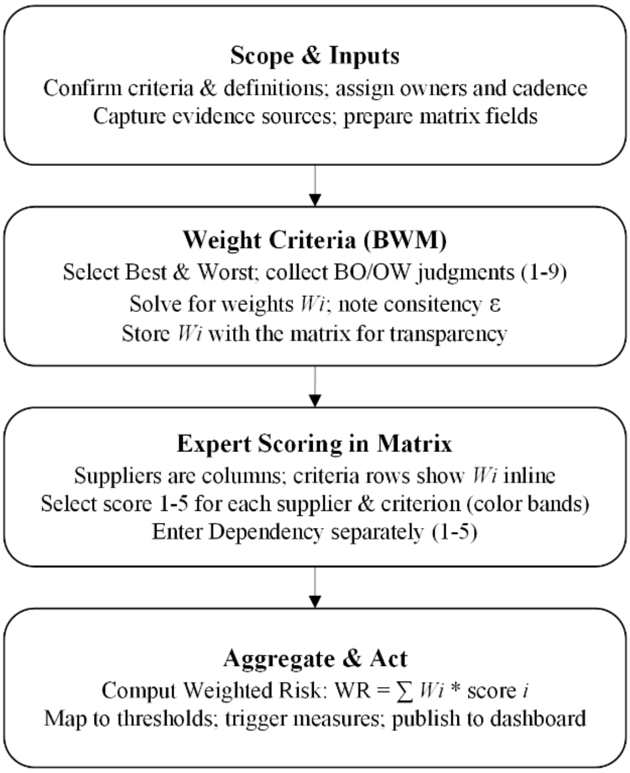

Figure 7 - Expert evaluation flow

Source: Own Elaboration

Suppliers are evaluated within the matrix, where criteria form rows, i, suppliers form columns, s, and each cell records a 1–5 risk score, $score_{i,s}$. Dependency is assessed separately on the same scale to distinguish inherent supplier risk from buyer criticality. This stage translates expert judgement into a consistent logic of evaluation, turning qualitative insight into defensible, data-informed decisions.

Weighted risk for each supplier s, in the set of evaluated suppliers S is

$$WR_s = \sum_i w_i * score_{i,s} \qquad \forall s \epsilon\ S \qquad (1)$$

Where a single parameter k, $k\ \epsilon\ [0,1]$ is required for prioritisation, a documented policy is applied consistently. A common rule is a convex blend, based on k balance, of weighted risk, WR_s, and rescaled dependency, Dep_s, such as:

$$Total_s = (1-k)WR_s + k\ Dep_s \qquad \forall s \epsilon\ S \qquad (2)$$

Alternative policies, such as multiplicative uplifts or threshold rules that elevate suppliers when both WR_s and Dep_s exceed limits, can be applied within the same interface.

Criterion	BWM Weight Wi	Supplier A	Supplier B	Supplier C	Supplier D
		Risk level 1 (low) → 5 (high)			
Financial resilience	0,15	2	3	4	4
Natural hazard exposure	0,10	3	2	3	4
Quality compliance	0,14	2	3	4	4
CSR & regulatory	0,08	1	2	3	3
Geopolitical exposure	0,18	3	4	5	4
Cybersecurity posture	0,12	2	2	3	4
Lead-time variability	0,12	2	3	4	4
Capacity & flexibility	0,11	1	2	3	4
Weighted risk (Σ Wi × score i)		2,09	2,77	3,77	3,92
Dependency (1–5) → supply criticality / single-source exposure		2	3	4	3
Total risk ((1–k)×Weighted risk + k×Dependency)		2,06	2,85	3,85	3,60

Figure 8 - Expert evaluation matrix (worked example)

Source: Own Elaboration

The worked example in Figure 8 presents an expert evaluation matrix that organises weighted criteria, supplier scores, and dependency ratings into a unified view of risk. Each criterion retains its BWM-derived weight, and the aggregated results form an index reflecting both performance and resilience, while dependency is shown separately to capture buyer exposure and contextualise outcomes. Beyond illustrating the evaluation logic, this matrix also exemplifies a format accessible even to organisations at early maturity levels, where structured templates can serve as both an evaluation tool and a source of traceable data for progressive integration into digital systems. It thus demonstrates how expert assessments can be transformed into transparent, repeatable, and data-ready supplier evaluations.

4.2.3 Scalability by Maturity

The evaluation routine scales with the maturity levels defined in 4.1.2. The structure remains constant, but data, methods, and cadence adapt.

- **L1 Foundational:** Evaluation can be supported by spreadsheets or basic BI tools, with documented evidence links ensuring traceability. Normalisation ensures that heterogeneous indicators are comparable.

For cost-type criteria, x, where lower values denote superior performance, normalisation is defined as:

$$x^* = \frac{\max(x) - x}{\max(x) - \min(x)} \tag{3}$$

This inversion ensures that smaller original values yield higher normalised scores, aligning cost-related indicators with the overall evaluation logic.

For benefit-type criteria, where higher values indicate stronger performance, normalisation follows:

$$x^* = \frac{x - \min(x)}{\max(x) - \min(x)} \tag{4}$$

Here, values are rescaled between 0 and 1, producing consistent and comparable scores across all criteria prior to aggregation.

BWM provides weighting with minimal cognitive load. Risk exposure can be expressed as $Probability\ \times Impact\ \times Weight$. Reviews are typically monthly.

- **L2 Intermediate:** Evaluation broadens to portfolio indices and scenario analysis, using streams such as quality events, logistics variability, ESG signals, compliance, and spend. Methods including fuzzy AHP, TOPSIS, and DEMATEL are appropriate where uncertainty or interdependencies are material, supporting segmentation matrices and resilience trends.
- **L3 Advanced:** Evaluation evolves into a resilience intelligence system. Machine learning extends capacity through anomaly detection, forecasting, and network analytics, while hybrid frameworks such as DEMATEL, TOPSIS, and VIKOR are embedded in ERP or BI platforms with version-controlled rules. Validation strengthens credibility; rank stability can be tested using the Spearman Rank Correlation Coefficient (SRCC),

$$SRCC = 1 - \frac{6\sum d_i^2}{n(n^2 - 1)} \quad (5)$$

where SRCC represents the correlation between two ranked sets, d_i the difference between paired supplier ranks, and n the total number of suppliers evaluated. Values close to +1 indicate strong rank stability, confirming that the evaluation remains consistent and reliable despite minor data or weighting variations. As priorities and dependencies consolidate, classification translates these results into a dynamic supplier portfolio aligned with organisational objectives and exposure, focusing attention and resources where resilience is most critical.

4.3 Strategic Classification and Portfolio Segmentation

Following the evaluation stage, classification translates priorities and dependency profiles into a dynamic supplier portfolio aligned with organisational objectives and proportional to exposure. Positions within the resilience-importance matrix steer oversight, collaboration, and investment, forming the basis for monitoring and re-evaluation.

4.3.1 Classification Logic and Decision Axes

The model integrates two dimensions: strategic and risk relevance. Strategic relevance reflects a supplier's contribution to long-term value, innovation, and continuity, while risk relevance captures vulnerability stemming from external pressures, performance consistency, and compliance strength. Their intersection defines four management postures: strategic/high risk, strategic/low risk, non-strategic/high risk, and non-strategic/low risk. This adapts Kraljic's portfolio logic to a resilience context, shifting emphasis from spend to continuity and impact.

As depicted in Figure 9, the matrix positions suppliers accordingly, establishing default postures (resilience-importance), review cadences, and proportionate actions. Positions are revised when material signals change, such as supply disruptions, audit findings, or variations in dependency.

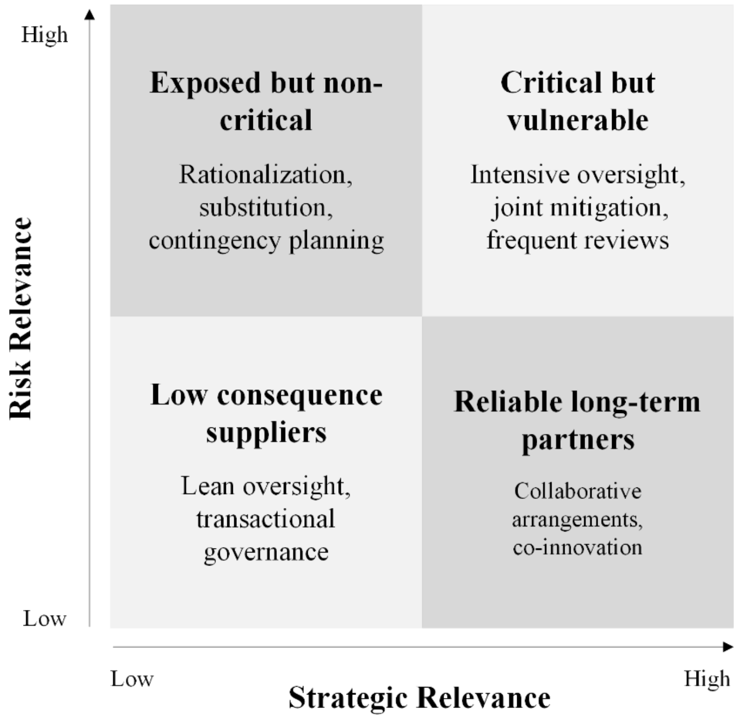

Figure 9 - Resilience-importance matrix

Source: Own Elaboration

Management implications by quadrant:

- **Strategic/high risk:** intensive oversight, targeted mitigation, and contingency planning.
- **Strategic/low risk:** partnership and continuous improvement.
- **Non-strategic/high risk:** substitution or closer monitoring where disruption outweighs value.
- **Non-strategic/low risk:** streamlined controls and minimal engagement.

Dependency and substitution difficulty modify these positions, reinforcing oversight where reliance is high and relaxing it where alternatives exist. This aligns with Baldwin & Freeman (2022) view that concentrated dependencies heighten systemic vulnerability, whereas diversification reinforces resilience.

Classification remains context-sensitive: what appears peripheral in one unit may be critical elsewhere due to regulation, technical specificity, or concentration. Local adaptations are allowed when justified and documented to maintain traceability. Versioning of inputs and rules keeps decisions auditable and consistent over time.

Maturity-scaled application:

- **L1 Foundational:** workshops and templates for manual placement, concise criteria, and documented rationale.
- **L2 Intermediate:** automated links between evaluation outputs and metadata, with prompts for reclassification.
- **L3 Advanced:** rules-driven segmentation within BI or SRM platforms, dashboards that update automatically, and alerts when thresholds are exceeded.

Governance parameters (example):

- **Owner:** Category Manager or Regional Procurement Lead.
- **Approver:** Procurement Governance Board or designated senior approver.
- **Thresholds:** triggered by material score or dependency changes.
- **Cadence:** quarterly for strategic suppliers, semi-annual for others, adjusted by risk tier.
- **Decision log:** includes dataset and rule version, rationale, approver, and next review date.
- **Escalation:** red-level breaches or repeated amber events prompt interim review.

4.3.2 Integration into Strategic Decision-Making

Classification strengthens decision quality by linking analytical outputs with managerial judgement. Within integrated information systems, portfolio positions act as decision cues, translating complex evaluation data into prioritised courses of action. This alignment bridges model-based reasoning and experiential expertise, ensuring that sourcing, investment, and collaboration choices reflect both quantitative insight and contextual understanding.

Embedded within digital workflows, classification enables adaptive decision-making. Portfolio data feed directly into planning and review cycles, allowing shifts in exposure or strategic relevance to be detected early and addressed proportionately. In this way, classification operates not as a static outcome but as a dynamic interface between analytical intelligence and strategic discretion, sustaining accurate and timely responses to evolving supply conditions.

4.4 Monitoring and Signal Detection

Once suppliers are positioned within the resilience-importance matrix, monitoring ensures that portfolio decisions remain dynamic and evidence-driven. Its role is to identify change early, interpret it consistently, and trigger proportionate responses so that supplier posture stays aligned with exposure and priority. As Christopher (2023) highlights, effective risk management depends on visibility and early-warning capabilities that allow organisations to anticipate and contain disruptions before they escalate.

4.4.1 Strategic Role and Objectives

Monitoring extends the analytical cycle by maintaining continuity between evaluation, classification, and action. Four objectives define its function. Visibility consolidates signals into a shared and current view. Timeliness reduces the gap between signal and response. Traceability links indicators, judgements, and actions to strengthen learning and accountability. Adaptability allows practices to evolve with maturity while retaining a stable decision logic (Patrucco et al., 2023). Together, these principles sustain a closed control loop that keeps the portfolio current and actionable without duplicating earlier evaluation or classification work.

4.4.2 Signal Set and Data Sources

The signal set is designed to remain focused and purposeful, linking each indicator to defined triggers, ownership, and proportionate actions. Selection follows the principles of proportionality and dependency sensitivity, concentrating analytical attention where exposure and reliance intersect most critically.

Operational performance is represented by On-Time In-Full (OTIF), calculated as

$$OTIF = \frac{Deliveries\ received\ on\ time\ and\ in\ full}{Total\ deliveries} \times 100 \qquad (6)$$

where the numerator corresponds to the number of consignments that meet both timing and completeness requirements, and the denominator reflects the total number of deliveries in the period under review. The result expresses the proportion of successful deliveries as a percentage on a scale from 0 to 100, where higher values indicate greater reliability and process stability. For critical suppliers, OTIF levels above 95 per cent are generally regarded as indicative of satisfactory performance. OTIF is complemented by the frequency of quality escapes per thousand units, supported by brief root-cause notes to distinguish isolated incidents from recurrent deficiencies.

Review effort is prioritised using the Weighted Exception Exposure (WEE) index,

$$WEE = \frac{\sum(Exception_i \times Weight_i)}{Total\ active\ exceptions} \times 100 \tag{7}$$

where $Exception_i$ denotes the number of deviations or non-conformities of type *i,* and $Weight_i$ represents their relative severity and dependency relevance. The ratio expresses the share of weighted exceptions within the total number of active cases, providing a concise view of operational stress. Values below 20 per cent typically indicate effective control, whereas higher levels signal the need for closer oversight or corrective action.

Exposure and continuity are monitored from both external and internal perspectives. External shocks are aggregated through the Disruption Index (DI),

$$DI = \frac{\sum(Severity \times Recency)}{Normalisation} \times 100 \tag{8}$$

where *Severity* quantifies the magnitude of each event and Recency adjusts its weight according to how recently it occurred. This index combines data on ESG controversies, credit changes, cyber incidents, logistics disruptions, and geopolitical events, offering a normalised measure of their overall intensity and frequency.

Internally, dependency and concentration risk are captured through the Critical Exposure at Risk (CEaR),

$$CEaR = \frac{\sum_{critical,risk \geq 80} Spend}{\sum_{critical} Spend} \times 100 \tag{9}$$

where the numerator represents the portion of critical expenditure linked to high-risk suppliers (risk score ≥ 80), and the denominator reflects total critical spend. CEaR quantifies the proportion of vital purchases exposed to vulnerable sources. It is complemented by the Continuity Assurance Score (CAS), which weights supplier dependency by the existence, validity, and testing frequency of business-continuity plans. CAS values above 80 per cent generally indicate that continuity assurance is substantiated rather than assumed.

All indicators are expressed as ratios converted into percentages on a 0-100 scale, ensuring consistency and comparability across suppliers, categories, and review periods. This uniform representation creates a coherent analytical language through which performance, exception management, disruption exposure, and continuity assurance can be jointly interpreted. Indicative targets such as OTIF ≥ 95 per cent, WEE ≤ 20 per cent, and CAS ≥ 80 per cent serve as reference thresholds within the governance process, adjustable to each category's criticality, dependency profile, and geographical complexity.

Behavioural cues, including delayed confirmations, inconsistent data submissions, or sudden procedural deviations, are also tracked through SRM workflows, as they often precede measurable performance deterioration. Selective integration ensures that only decision-relevant indicators are consolidated from ERP, SRM, audit, and external intelligence systems, preserving focus and interpretability. Each indicator is calculated at supplier level as an aggregate of the full product portfolio delivered, ensuring that performance, exposure, and continuity reflect the totality of the relationship rather than isolated items or transactions.

By combining quantitative ratios, behavioural signals, and governed processes, the signal set transforms fragmented information into coherent intelligence. It sustains visibility, enables proportionate and timely intervention, and reinforces a continuous connection between analytical evidence and managerial action within the supplier-governance framework.

4.4.3 From Detection to Governed Action

Signals have purpose only when they lead to informed and timely action. Monitoring translates detection into response through a structured process that validates the signal, identifies its cause, and defines the appropriate course of action with a documented rationale. This ensures that every response is evidence-based, proportionate, and traceable.

Actions typically follow four pathways: reviewing the indicator, reclassifying the supplier, adjusting evaluation logic, or initiating a full re-evaluation. The level of dependency determines sensitivity, with highly relied-upon suppliers managed under tighter thresholds and faster response times, while low-dependency relationships follow lighter oversight to maintain efficiency.

Practical examples illustrate the approach. A strategic, high-risk supplier showing declining OTIF and two quality issues linked to a logistics strike prompts temporary buffers and an interim review, not reclassification. Conversely, a non-strategic but high-risk supplier receiving a credit downgrade and ESG alert triggers dual sourcing and a pause on new orders until a re-bid is completed. These responses demonstrate how detection mechanisms ensure that operational action remains aligned with exposure, dependency, and resilience priorities.

4.4.4 Operating Model and Communication by Maturity

Monitoring creates value not only through meaningful indicators but through the efficiency with which information circulates and insights translate into action. Once detection informs response, the operating model governs how signals are shared, decisions recorded, and learning reintegrated into the model. The principles remain constant, though their expression evolves with organisational maturity.

- **L1 Foundational:** monitoring uses curated Key Performance Indicator (KPI) and exposure dashboards reviewed at set intervals. Validation and escalation are logged in shared registers with assigned owners and concise action notes, embedding a culture of traceable follow-up.

- **L2 Developing:** ERP and SRM platforms introduce rule-based alerts and structured documentation of root causes. Regular cross-functional reviews align operational signals with portfolio positions, adjusting sourcing or mitigation priorities where needed.
- **L3 Advanced:** monitoring becomes predictive. Dependency-sensitive alerts and automated playbooks operate within BI or SRM systems, while analytics connect ERP, IoT, and cloud data streams to provide real-time visibility and transform operational signals into foresight that supports timely and proportionate action (Gopal et al., 2024).

Across all maturity levels, success lies in practical effect. Monitoring is most effective when indicators are focused, triggers proportionate, and feedback loops active, ensuring that lessons feed back into evaluation and classification. This keeps the Cycle coherent, adaptive, and continuously informed, linking intelligence, decision, and action in a unified process of organisational learning.

4.4.5 Illustrative Dashboard: Monitoring and Signals

An integrated Supplier Resilience Dashboard (Figure 10) consolidates performance, exposure, continuity, and behavioural signals into a unified, interactive view. Developed in Microsoft Power BI using a randomly generated model dataset, it applies a full Extract, Transform, Load (ETL) process in Power Query to structure and connect the underlying data. The example illustrates how governed analytical environments can transform supplier information into actionable intelligence and sustain continuous visibility of resilience.

Header cards summarise core indicators: OTIF reflects delivery reliability, the Exception Backlog Ratio highlights unresolved actions, and the Disruption Index captures recent external pressures across ESG, financial, and geopolitical dimensions. CEaR and CAS link supplier dependency to continuity assurance, exposing concentrations of critical risk within the portfolio.

A Supplier Event Log records controversies, downgrades, and regulatory alerts, colour-coded by severity to guide escalation. The Risk-Dependency Matrix positions suppliers by combined risk and reliance, while the GeoRisk Map visualises spend concentration against country-level exposure. Supporting charts trace delivery trends and break down composite risk into financial, quality, ESG, and geopolitical components for transparent analysis.

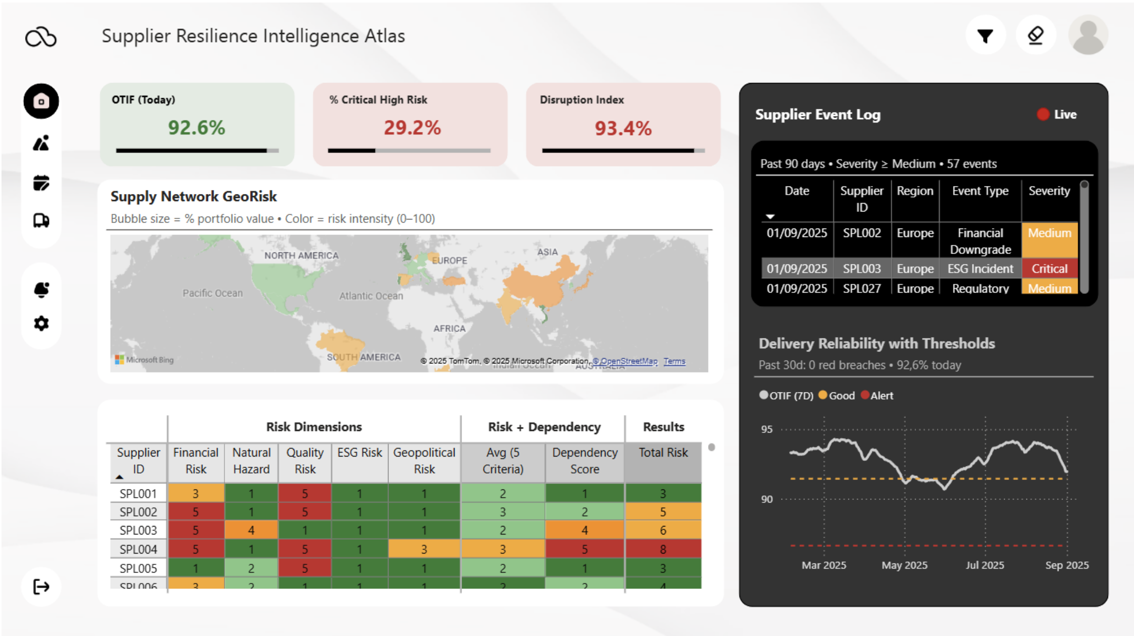

Figure 10 - Conceptual view of an integrated supplier resilience dashboard

Source: Own Elaboration

A delivery trendline compares OTIF performance against defined thresholds, converting deviations into governed signals for review. By integrating dependency, exposure, and performance data, the dashboard demonstrates how monitoring evolves from static reporting to dynamic, decision-support intelligence.

The same logic scales with maturity. Foundational systems rely on ERP data and external indices for periodic reviews, while advanced implementations integrate ERP, IoT, and cloud platforms for real-time visibility and predictive alerts (Gopal et al., 2024). Embedded in governed dashboards, monitoring functions as a live control mechanism that adjusts portfolio positions as evidence accumulates or thresholds are reached. Recording both signals and responses preserves visibility, accountability, and organisational learning. As Christopher (2023) highlights, visibility and early warning underpin proactive risk management, and as Patrucco et al. (2023) observe, analytics generate value only when embedded in disciplined routines that transform information into informed and adaptive action.

4.5 Adaptive Re-Evaluation and Strategic Adjustment

Re-evaluation preserves the model as a dynamic and continuously informed system. Evaluation establishes priorities, classification defines posture, and monitoring supplies intelligence; re-evaluation then transforms this evidence into timely adjustments to eligibility rules, portfolio positions, and mitigation measures, ensuring that decisions evolve in line with changing exposure and strategic intent.

4.5.1 When to Re-evaluate

Re-evaluation is activated when substantive change alters the balance of exposure or confidence in supplier performance. Triggers may include sustained deviations in quality or delivery, shifts in dependency or substitution difficulty, regulatory findings, or external disruptions that challenge the assumptions underpinning previous assessments. Thresholds are proportionate to reliance, directing closer scrutiny to relationships where concentration risk is greatest. High-dependency suppliers therefore warrant tighter triggers and accelerated responses, while diversified or low-reliance portfolios maintain lighter oversight to preserve efficiency. As Baldwin & Freeman (2022) observe, concentrated dependencies heighten systemic fragility, reinforcing the need for re-evaluation frameworks that adapt sensitivity to the structural realities of interdependence and the pursuit of balanced resilience.

4.5.2 How to Adjust Proportionately

Re-evaluation follows a concise and disciplined sequence designed to balance responsiveness with stability.

1. **Reconfirm scope and evidence:** validate the signal, consolidate the relevant data and rule versions, and define clear review boundaries to maintain traceability.

2. **Reassess inputs and assumptions:** verify data integrity, update weighting to reflect current strategic priorities, and document expert judgement to sustain legitimacy. Decision frameworks must adapt to evolving geopolitical and policy conditions to remain robust (Zahoor et al., 2023).
3. **Select and implement the adjustment:** determine the appropriate course of action, record the rationale, and apply the change with a defined effective date.

Figure 11 illustrates four potential adjustment pathways, increasing in scale and impact:

- **Indicator Review** refines a KPI or threshold without altering posture.
- **Logic Adjustment** updates evaluation criteria or weighting to reflect new insight.
- **Strategic Reclassification** repositions a supplier within the resilience–importance matrix when the balance between risk and relevance shifts.
- **Full Re-evaluation** reapplies the entire framework following a major disruption or clear evidence of systemic drift.

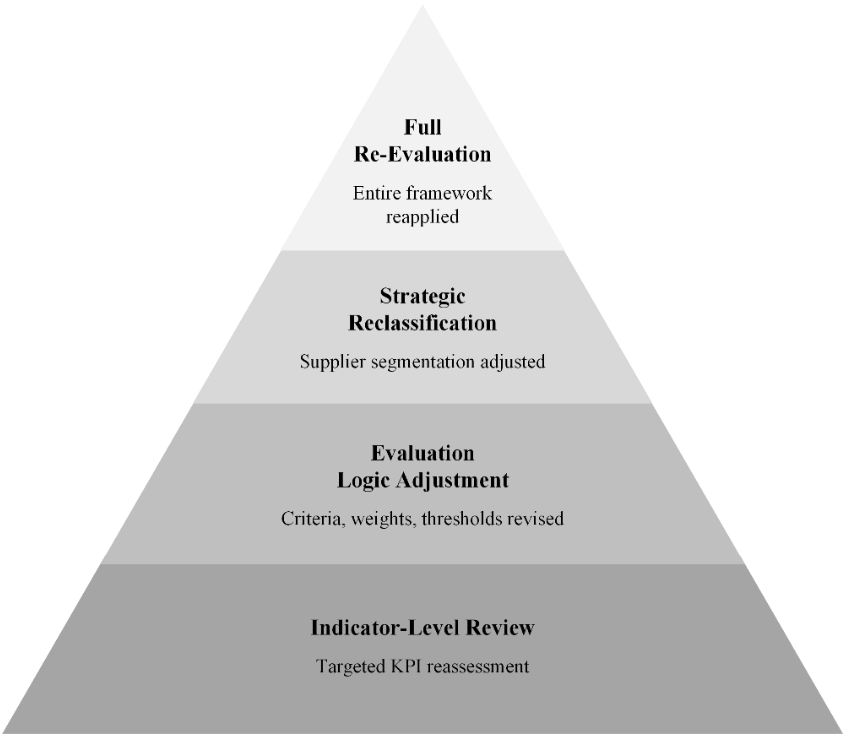

Figure 11 - Re-evaluation decision pyramid

Source: Own Elaboration

When deterioration is local rather than systemic, targeted reclassification or limited safeguards usually suffice. Posture tightens, continuity clauses activate, and weighting on critical risk factors such as route fragility or supplier dependency is recalibrated to maintain control while avoiding overreaction.

4.5.3 Learning, Integrity, and Maturity in Adaptive Re-Evaluation

Adaptive re-evaluation strengthens both decision quality and model integrity by transforming operational experience into structured learning. Three complementary routines sustain its reliability: back-testing compares past classifications with realised outcomes to refine thresholds, sensitivity checks assess the robustness of results against data variation, and exception analysis converts recurring workarounds into formal rules. These mechanisms ensure that the framework evolves with evidence and remains aligned with its operating environment.

As Patrucco et al. (2023) emphasise, data-driven systems deliver value only when supported by learning mechanisms that assimilate experience and refine analytical practice. Adaptive re-evaluation thus functions as both a corrective and developmental process, reinforcing the credibility of the model while improving its capacity for informed and adaptive decision-making. Its integration with monitoring creates a continuous learning loop, where each signal contributes to refining decision logic and strengthening the coherence of governance routines.

- **L1 Foundational:** learning occurs through manual KPI reviews and scheduled reassessments, translating monitoring insights into quarterly updates. Evidence from ERP and SRM systems supports a concise decision log recording trigger, analysis, action, owner, and next review date, ensuring traceability and accountability.
- **L2 Developing:** BI and SRM platforms enable rule-based alerts and structured reassessment workflows. Logic adjustments are tested before deployment, and dependency determines both the speed and depth of the response, allowing attention to concentrate where exposure is highest.

- **L3 Advanced:** predictive analytics and simulation tools enable near real-time re-evaluation within integrated environments. Dependency-sensitive alerts connect detection and action, supported by automated audit trails and governed version control, sustaining transparency and consistency in decision-making (Gopal et al., 2024).

Across all levels, effectiveness depends less on technological sophistication than on disciplined learning. When insights are captured systematically, triggers remain proportionate, and feedback informs future judgement, the model becomes a self-correcting system. In doing so, supplier management evolves into a continuously improving, intelligence-driven framework that connects analysis, adaptation, and strategic foresight.

4.5.4 Closing the Loop

Re-evaluation completes the feedback arc, ensuring that the model remains active and forward-looking. Each iteration refines eligibility criteria, portfolio positions, and response playbooks, maintaining alignment between decisions, data, and strategic exposure. Intelligence, evaluation, classification, monitoring, and re-evaluation flow as a single, connected process in which insight is continually translated into proportionate and traceable action.

The model endures through continuity rather than conclusion. As evidence accumulates, it reshapes thresholds, redefines priorities, and strengthens the coherence between analysis and response. Its value lies in this ongoing rhythm of interpretation and adjustment, where information becomes knowledge and knowledge becomes decision. The model thus embodies resilience as a continuous state of readiness, one sustained by learning, precision, and the discipline of constant renewal.

5 Artefact Evaluation and Discussion

Within the DSR methodology, evaluation represents both validation and exploration. It verifies whether the artefact fulfils its intended purpose and examines how it performs within the realities of organisational practice. The RO-SMC was evaluated through a bilingual (English-Portuguese) Microsoft Forms instrument (Appendix 1 – RO-SMC Evaluation Form), carefully structured to reflect its five stages and assess its conceptual clarity, operational coherence, and practical feasibility.

The form was developed to capture perspectives from professionals in procurement, logistics, and supplier governance, as well as experts in MIS whose work intersects with supply chain intelligence and digital decision support. Respondents were drawn from large and medium-sized organisations across industrial and service sectors, ensuring that the feedback reflected both operational insight and technological awareness. Participation was voluntary and anonymous, conducted under institutional ethical standards and data protection requirements.

The evaluation aimed to establish a holistic understanding of the artefact's clarity, governance alignment, data readiness, integration feasibility, and perceived contribution to continuity and resilience. It combined scaled questions with open reflections, generating complementary quantitative and qualitative evidence. Ten complete responses were obtained, representing a satisfactory yet limited sample of professionals experienced in managing data-driven supplier processes and governance systems of differing digital maturity.

5.1 Findings and Interpretation

The evaluation confirmed that the RO-SMC constitutes a coherent and well-structured governance framework that effectively bridges analytical and managerial dimensions. Respondents consistently described it as a continuous and integrative system rather than a static assessment tool, recognising its ability to connect supplier intelligence, evaluation, segmentation, monitoring, and adaptive review within a single, traceable logic. This perception demonstrates that the artefact successfully translates resilience principles into a form that is both intelligible and actionable in managerial contexts. As shown in Figure 12, respondents expressed consistently high levels of agreement across all evaluation statements, with average scores exceeding four on a five-point scale. These results affirm that the RO-SMC is perceived as conceptually clear, operationally coherent, and capable of enhancing decision quality within supplier-governance processes.

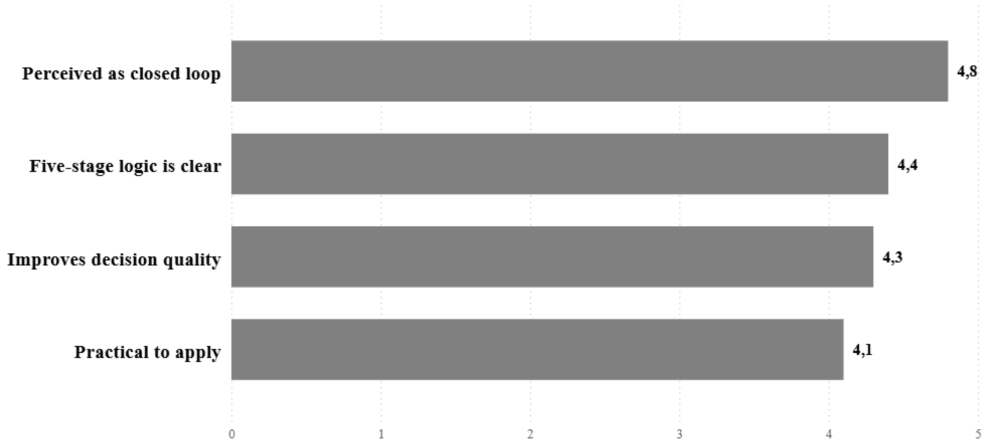

Figure 12 - Perceived Clarity and Practicality of the RO-SMC

Source: Own Elaboration, based on integrated Microsoft Forms evaluation responses (2025).

Beyond the artefact itself, the evaluation provided insight into the organisational environments in which it would operate. The maturity profiles revealed that most organisations function between the defined and managed levels of governance and data capability. While data quality and decision traceability were considered relatively well established, integration across ERP, SRM, BI, and risk management platforms remains partial. This imbalance reflects a common reality in which governance discipline develops faster than the technological and analytical infrastructure that sustains it. Figure 13 illustrates this relationship: the upward trend confirms a positive correlation between governance and data maturity, yet the concentration of points below the trend line indicates that governance practices often outpace data integration. This pattern suggests that although formal governance structures are maturing, the consolidation of resilient supplier management still depends on strengthening data interoperability, analytical reliability, and system alignment.

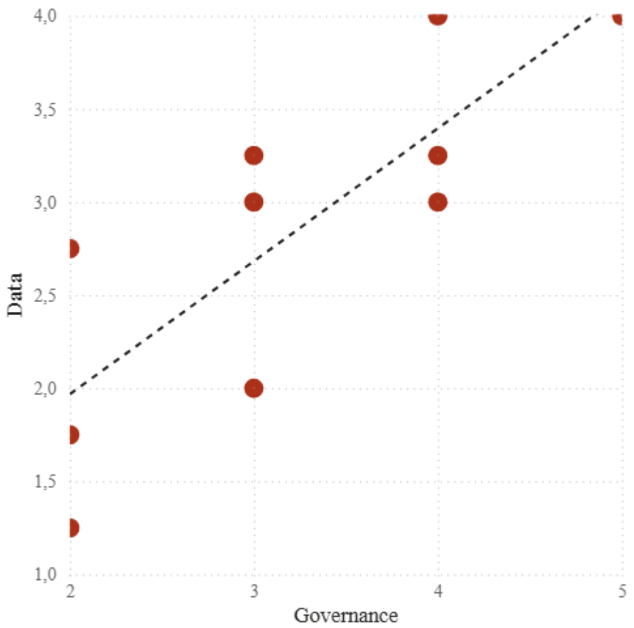

Figure 13 - Governance and Data-Maturity Distribution

Source: Own Elaboration, based on integrated Microsoft Forms evaluation responses (2025).

When assessing the artefact's individual stages, Supplier Intelligence and Evaluation emerged as the most mature and consistently applied components, supported by structured data and defined criteria. In contrast, Monitoring and Adaptive Re-evaluation revealed lower readiness, indicating that while supplier data are collected effectively, their transformation into sustained learning remains limited. Figure 14 captures this pattern clearly: usefulness is recognised across all modules, yet operational readiness declines in the later stages. This divergence shows that organisations acknowledge the value of advanced governance routines but have yet to institutionalise the feedback mechanisms and data integration required to sustain them.

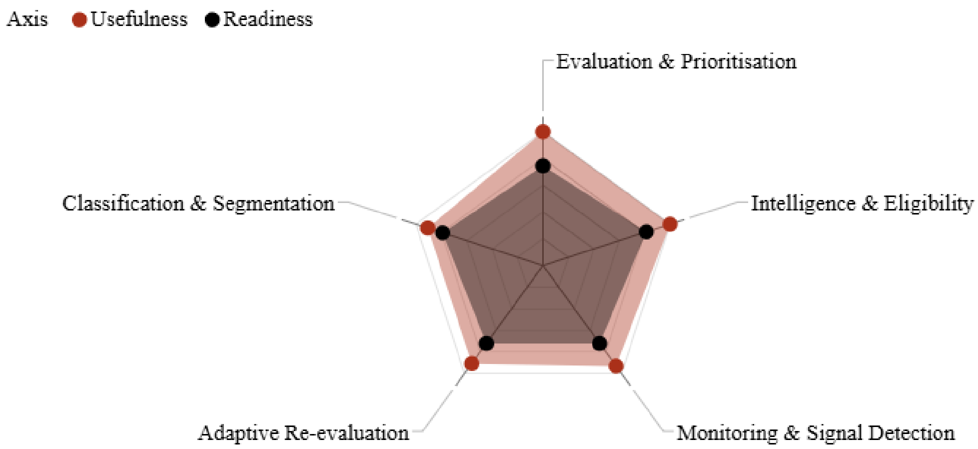

Figure 14 - Stage-Wise Usefulness and Data Readiness of the RO-SMC

Source: Own Elaboration, based on integrated Microsoft Forms evaluation responses (2025).

Respondents also emphasised the artefact's scalability and compatibility with existing systems, noting that it can be implemented within current infrastructures with proportionate effort. This adaptability was regarded as one of its defining strengths, enabling progressive adoption across different maturity levels, from governed spreadsheet routines to digitally integrated BI or ERP environments. The qualitative feedback provided further depth to the evaluation. Several participants suggested incorporating visual mapping of supplier dependencies and key materials to enhance transparency and improve prioritisation. Others recommended expanding the final stage to include more collaborative mechanisms, such as post-incident learning and supplier development plans that strengthen mutual accountability. These perspectives enrich the artefact's interpretation and confirm its versatility, demonstrating how its structure can accommodate broader integration across governance, data intelligence, and supplier partnerships.

The results presented in Figure 15 further substantiate these findings, showing that most respondents expect the artefact to deliver a significant contribution to organisational resilience within the next twelve months, with responses concentrated in the high and very high categories.

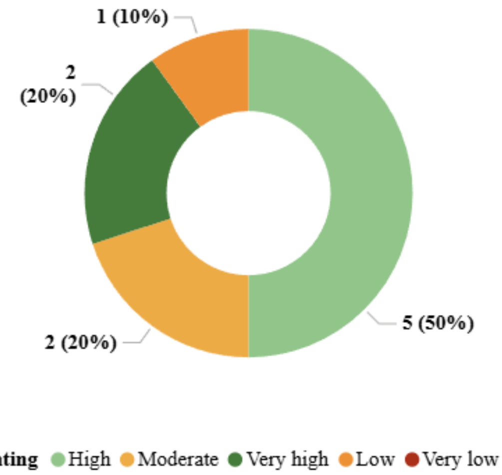

Figure 15 - Expected Contribution to Organisational Resilience within 12 months

Source: Own Elaboration, based on integrated Microsoft Forms evaluation responses (2025).

This optimism is tempered by a smaller number of moderate assessments, which highlight the organisational conditions required to translate design potential into measurable impact. Consistent data quality, managerial commitment, and embedded learning routines remain critical enablers of sustained performance. When considered alongside the separate overall verdict, in which all respondents identified the artefact as a credible and valuable guide for procurement governance and SCR, the results reflect both confidence in its conceptual robustness and awareness of the effort required for its full operationalisation. Rather than implying immediate transformation, they suggest a realistic trajectory in which the artefact provides a stable foundation for resilience that strengthens progressively through disciplined application and institutional learning.

5.2 Synthesis and Implications

The evaluation confirms that the RO-SMC fulfils its purpose within the DSR paradigm, demonstrating conceptual integrity, operational feasibility, and adaptability across varied organisational and technological contexts. By structuring supplier management around governed feedback loops and traceable intelligence, the artefact transforms resilience from a reactive intention into a systematic, measurable capability embedded in decision governance.

The findings also illuminate the evolution of practice. Limited maturity in monitoring and adaptive re-evaluation indicates that resilience depends as much on learning and collaboration as on analytical sophistication. Reflections reveal a growing recognition that continuity and resilience are sustained through collective intelligence, shared foresight, and post-incident learning. The proposed integration of dependency mapping and supplier development planning points to a more relational interpretation of resilience, where insight becomes a shared resource and improvement a coordinated endeavour. The artefact provides the foundation for this transition, supporting both internal governance and inter-organisational intelligence.

Variations in technological readiness underline the need for maturity-based adoption. The RO-SMC's modular design enables such flexibility, allowing implementation to progress in line with data and governance capability. Developing concise adoption pathways or maturity-specific guidance would further enhance accessibility and ensure consistent embedding across contexts.

Beyond its immediate application, the artefact opens meaningful avenues for further research. Longitudinal evaluations could assess its sustained impact on decision quality and continuity performance, while cross-sector studies may test its transferability to industries with distinct governance structures. Exploration of automation-ready interfaces with analytics and risk-intelligence platforms could extend its analytical reach, evolving the RO-SMC into a digitally augmented decision environment. Strengthening its collaborative dimension may also advance it into a multi-tier framework for co-resilience, where organisations and suppliers share indicators, lessons, and development objectives.

Ultimately, the RO-SMC unites analysis, governance, and adaptation in an evolving system that strengthens both organisational learning and supply continuity. It exemplifies the essence of DSR: rigorous in design, relevant in context, and transformative in practice. By institutionalising resilience through the purposeful integration of governance discipline, data intelligence, and reflective learning, the artefact contributes both a practical blueprint for supplier management and a theoretical advancement in embedding resilience as a continuous organisational capability.

CONCLUSION

Resilience has become the defining competence of contemporary supply chains. This study advanced that understanding by exploring how organisations can transform analytical potential into governed and adaptive practice. It began with the recognition that, although digitalisation and analytics have multiplied the availability of supplier information, many organisations still face the challenge of converting that data into coherent, resilience-oriented decisions. The question was therefore not one of access to information but of how MIS could be structured and governed to support timely, proportionate, and strategic action.

Guided by the DSR methodology, the dissertation developed the RO-SMC, a framework that unites intelligence, governance, and learning within a continuous decision system. Addressing RQ1, the study demonstrates that data-driven governance operationalises resilience in supplier management by integrating intelligence, evaluation, classification, monitoring, and adaptive re-evaluation into a governed feedback loop that keeps decisions transparent and evidence-based. In response to RQ2, it shows that risk-intelligence, supported by MIS, enhances decision quality and capability development by transforming fragmented data into foresight and enabling adaptive, proportionate responses across global supply networks.

The research contributes to academic and managerial knowledge by reframing SCR as a governed, data-enabled capability that evolves through design and organisational maturity. It advances the DSR discourse by showing how artefact creation can unite theoretical insight with practical application within a single, adaptive model. The evaluation confirmed the RO-SMC's coherence, adaptability, and scalability across varied organisational contexts, underscoring that resilience strengthens through collaborative learning, shared intelligence, and proportionate governance.

Nonetheless, the study recognises boundaries that invite further exploration. Its interpretive evaluation, based on expert contexts, highlights the need for longitudinal and cross-sector studies to examine how the artefact performs under different operational and technological conditions. Future research should expand on this foundation through pilot implementations, assessing the model's influence on decision quality, data integration, and re-assessment logic. Deeper analysis of the references informing the design would also refine understanding of model selection, maturity assessment, and technology alignment, helping to identify which analytical and governance configurations most effectively sustain resilience.

The RO-SMC should therefore be viewed as both a guide and a foundation: a framework that consolidates the essential dimensions of resilient supplier governance while allowing contextual adaptation and empirical evolution. Advancing this line of inquiry will require systematic testing of its components, comparative analysis across industries, and closer integration with emerging analytical technologies that expand its reach, precision, and transformative potential.

Ultimately, this dissertation demonstrates that resilience is neither an abstract concept nor a reaction to disruption but a discipline of governance sustained by intelligence, collaboration, and learning. When MIS are designed and managed as instruments of foresight, supplier management becomes a living system of continuity and adaptation. The RO-SMC embodies this philosophy, offering a framework through which organisations can transform uncertainty into strategic renewal and resilience into an enduring source of competitive strength.

REFERENCES

Abdulla, A., & Baryannis, G. (2024). A hybrid multi-criteria decision-making and machine learning approach for explainable supplier selection. *Supply Chain Analytics*, *7*, 100074. https://doi.org/https://doi.org/10.1016/j.sca.2024.100074

Acev, D., Biyani, S., Rieder, F., Aldenhoff, T. T., Blazevic, M., Riehle, D. M., & Wimmer, M. A. (2025). Systematic analysis of data governance frameworks and their relevance to data trusts. *Management Review Quarterly*. https://doi.org/10.1007/s11301-025-00545-1

Aljabhan, B., & Abeyie, M. (2022). Big Data Analytics in Supply Chain Management: A Qualitative Study. *Computational Intelligence and Neuroscience*, *2022*, 1–10. https://doi.org/10.1155/2022/9573669

Baldwin, R., & Freeman, R. (2022). Risks and Global Supply Chains: What We Know and What We Need to Know. In *Annual Review of Economics* (Vol. 14, pp. 153–180). Annual Reviews Inc. https://doi.org/10.3386/w29444

Barbieri, P., Paulraj, A., Eltantawy, R., & Prodi, G. (2022). Understanding the governance of high-performing international buyer-supplier relationships in China using complexity-based contingencies. *Journal of Purchasing and Supply Management*, *28*(4), 100794. https://doi.org/https://doi.org/10.1016/j.pursup.2022.100794

Bližnák, K., Munk, M., & Pilková, A. (2024). A Systematic Review of Recent Literature on Data Governance (2017–2023). *IEEE Access*, *12*, 149875–149888. https://doi.org/10.1109/ACCESS.2024.3476373

Buitelaar, R. (2018). *Building the Data-Driven Organization: a Maturity Model and Assessment*. https://api.semanticscholar.org/CorpusID:86743391

Chen, C.-H. (2020). A Novel Multi-Criteria Decision-Making Model for Building Material Supplier Selection Based on Entropy-AHP Weighted TOPSIS. *Entropy*, *22*(2). https://doi.org/10.3390/e22020259

Christopher, M. (2023). *Logistics and Supply Chain Management*. Pearson Education. https://books.google.pt/books?id=oRLQEAAAQBAJ

Chukwuka, O. J., Ren, J., Wang, J., & Paraskevadakis, D. (2023). A comprehensive research on analyzing risk factors in emergency supply chains. *Journal of Humanitarian Logistics and Supply Chain Management*, *13*(3), 249–292. https://doi.org/10.1108/JHLSCM-10-2022-0108

Corsini, F., De Bernardi, C., Gusmerotti, N. M., & Frey, M. (2024). Introducing the circular assessment of suppliers (CAoS) tool: A Kraljic matrix-based tool to facilitate circular procurement in private organizations. *Journal of Cleaner Production*, *452*, 142085. https://doi.org/https://doi.org/10.1016/j.jclepro.2024.142085

Elsner, M., Atkinson, G., & Zahidi, S. (2025). *Global Risks Report 2025*. https://reports.weforum.org/docs/WEF_Global_Risks_Report_2025.pdf

Evans, J. R. (2020). *Business Analytics, Global Edition*. Pearson Education. https://books.google.pt/books?id=3b4oEAAAQBAJ

Gopal, P. R. C., Rana, N. P., Krishna, T. V., & Ramkumar, M. (2024). Impact of big data analytics on supply chain performance: an analysis of influencing factors. *Annals of Operations Research*, *333*(2), 769–797. https://doi.org/10.1007/s10479-022-04749-6

Guida, M., Caniato, F., Moretto, A., & Ronchi, S. (2023). The role of artificial intelligence in the procurement process: State of the art and research agenda. *Journal of Purchasing and Supply Management*, *29*(2), 100823. https://doi.org/https://doi.org/10.1016/j.pursup.2023.100823

Hasan, R., Kamal, M. M., Daowd, A., Eldabi, T., Koliousis, I., & Papadopoulos, T. (2024). Critical analysis of the impact of big data analytics on supply chain operations. *Production Planning & Control*, *35*(1), 46–70. https://doi.org/10.1080/09537287.2022.2047237

Huma, S., Ahmed, W., & Najmi, A. (2020). Understanding the impact of supply-side decisions and practices on supply risk management. *Benchmarking: An International Journal*, *27*(5), 1769–1792. https://doi.org/10.1108/BIJ-06-2019-0272

Javed, S. A., Gunasekaran, A., & Mahmoudi, A. (2022). DGRA: Multi-sourcing and supplier classification through Dynamic Grey Relational Analysis method. *Computers & Industrial Engineering*, *173*, 108674. https://doi.org/https://doi.org/10.1016/j.cie.2022.108674

Joel, O., Oyewole, A., Odunaiya, O., & Soyombo, O. (2024). LEVERAGING ARTIFICIAL INTELLIGENCE FOR ENHANCED SUPPLY CHAIN OPTIMIZATION: A COMPREHENSIVE REVIEW OF CURRENT PRACTICES AND FUTURE POTENTIALS. *International Journal of Management & Entrepreneurship Research*, *6*, 707–721. https://doi.org/10.51594/ijmer.v6i3.882

Jones, J. (2025). *A Systematic Literature Review on Supplier Relationship Management in the Context of Global Supply Chains*. https://doi.org/Jones, Jennifer, A Systematic Literature Review on Supplier Relationship Management in the Context of Global Supply Chains (December 21, 2024). Available at SSRN: https://ssrn.com/abstract=5067643 or http://dx.doi.org/10.2139/ssrn.5067643

Kalaiarasan, R., Olhager, J., Agrawal, T. K., & Wiktorsson, M. (2022). The ABCDE of supply chain visibility: A systematic literature review and framework. *International Journal of Production Economics*, *248*, 108464. https://doi.org/https://doi.org/10.1016/j.ijpe.2022.108464

Laguir, I., Modgil, S., Bose, I., Gupta, S., & Stekelorum, R. (2023). Performance effects of analytics capability, disruption orientation, and resilience in the supply chain under environmental uncertainty. *Annals of Operations Research*, *324*(1), 1269–1293. https://doi.org/10.1007/s10479-021-04484-4

Langer, B. (2025). Understanding Data & Analytics Maturity: A Systematic Review of Maturity Model Composition. *Schmalenbach Journal of Business Research*. https://doi.org/10.1007/s41471-024-00205-2

Leong, W. Y., Wong, K. Y., & Wong, W. P. (2022). A New Integrated Multi-Criteria Decision-Making Model for Resilient Supplier Selection. *Applied System Innovation*, *5*(1). https://doi.org/10.3390/asi5010008

Liu, W., He, Y., Dong, J., & Cao, Y. (2023). Disruptive technologies for advancing supply chain resilience. *Frontiers of Engineering Management*, *10*(2), 360–366. https://doi.org/10.1007/s42524-023-0257-1

Lotfi, R., Khanbaba, A., Ali Alkhazaleh, H., Changizi, M., Kadłubek, M., Aghakhani, S., & SamarAli, S. (2024). A viable supplier selection with order allocation by considering robustness, risk-averse and blockchain technology. *Computers & Industrial Engineering*, *193*, 110319. https://doi.org/https://doi.org/10.1016/j.cie.2024.110319

Marttinen, K., Kähkönen, A. K., & Marshall, D. (2024). Exploring the use of governance mechanisms in multi-tier sustainable supply chains. *Production Planning and Control*, *35*(16), 2178–2197. https://doi.org/10.1080/09537287.2023.2248931

Mirzaee, H., & Ashtab, S. (2024). Sustainability, Resiliency, and Artificial Intelligence in Supplier Selection: A Triple-Themed Review. *Sustainability*, *16*(19). https://doi.org/10.3390/su16198325

Modares, A., Emroozi, V. B., Roozkhosh, P., & Modares, A. (2025). A Bayesian best-worst approach with blockchain integration for optimizing supply chain efficiency through supplier selection. *Supply Chain Analytics*, *9*, 100100. https://doi.org/https://doi.org/10.1016/j.sca.2024.100100

Mohammed, A., Yazdani, M., Oukil, A., & Santibanez Gonzalez, E. D. R. (2021). A Hybrid MCDM Approach towards Resilient Sourcing. *Sustainability*, *13*(5). https://doi.org/10.3390/su13052695

Mohammed, I. A. (2023). Artificial Intelligence In Supplier Selection And Performance Monitoring: A Framework For Supply Chain Managers. *Educational Administration: Theory and Practice*, *29*. https://doi.org/10.53555/kuey.v29i3.8650

Nayeri, S., Khoei, M. A., Rouhani-Tazangi, M. R., GhanavatiNejad, M., Rahmani, M., & Tirkolaee, E. B. (2023). A data-driven model for sustainable and resilient supplier selection and order allocation problem in a responsive supply chain: A case study of healthcare system. *Engineering Applications of Artificial Intelligence*, *124*, 106511. https://doi.org/https://doi.org/10.1016/j.engappai.2023.106511

Parast, M. M., & Subramanian, N. (2021). An examination of the effect of supply chain disruption risk drivers on organizational performance: evidence from Chinese supply chains. *Supply Chain Management: An International Journal*, *26*(4), 548–562. https://doi.org/10.1108/SCM-07-2020-0313

Patrucco, A. S., Marzi, G., & Trabucchi, D. (2023). The role of absorptive capacity and big data analytics in strategic purchasing and supply chain management decisions. *Technovation*, *126*, 102814. https://doi.org/https://doi.org/10.1016/j.technovation.2023.102814

Peffers, K., Tuunanen, T., Gengler, C. E., Rossi, M., Hui, W., Virtanen, V., & Bragge, J. (2020). Design Science Research Process: A Model for Producing and Presenting Information Systems Research. *ArXiv*, *abs/2006.02763*. https://api.semanticscholar.org/CorpusID:57819632

Pramanik, D., Mondal, S. C., & Haldar, A. (2020). Resilient supplier selection to mitigate uncertainty: soft-computing approach. *Journal of Modelling in Management*, *15*(4), 1339–1361. https://doi.org/10.1108/JM2-01-2019-0027

Quan, Y., Pothen, A., Xie, Y., & Montreuil, B. (2024, October). *Predictive Demand Disruption Signals for Supply Chain Networks*. https://doi.org/10.35090/gatech/11068

Rane, N., & Choudhary, S. (2023). Fuzzy AHP and Fuzzy TOPSIS as an effective and powerful Multi-Criteria Decision-Making (MCDM) method for subjective judgements in selection process. *International Research Journal of Modernization in Engineering Technology and Science*, *5*, 3786–3799. https://doi.org/10.56726/IRJMETS36629

Sadeghi R., J. K., Azadegan, A., Ojha, D., & Ogden, J. A. (2022). Benefiting from supplier business continuity: The role of supplier monitoring and buyer power. *Industrial Marketing Management*, *106*, 432–443. https://doi.org/https://doi.org/10.1016/j.indmarman.2022.09.009

Sharma, M., & Joshi, S. (2023). Digital supplier selection reinforcing supply chain quality management systems to enhance firm's performance. *The TQM Journal*, *35*(1), 102–130. https://doi.org/10.1108/TQM-07-2020-0160

Sivanagaraju Pitchaiah, D., Hussaian, M., & Govardhan, D. (2021). A review on multi attribute decision making for evaluation and selection of supplier for materials. *Materials Today: Proceedings*, *39*, 296–300. https://doi.org/https://doi.org/10.1016/j.matpr.2020.07.201

Sonar, H., Gunasekaran, A., Agrawal, S., & Roy, M. (2022). Role of lean, agile, resilient, green, and sustainable paradigm in supplier selection. *Cleaner Logistics and Supply Chain*, *4*, 100059. https://doi.org/https://doi.org/10.1016/j.clscn.2022.100059

Stekelorum, R., Laguir, I., Lai, K., Gupta, S., & Kumar, A. (2021). Responsible governance mechanisms and the role of suppliers' ambidexterity and big data predictive analytics capabilities in circular economy practices improvements. *Transportation Research Part E: Logistics and Transportation Review*, *155*, 102510. https://doi.org/https://doi.org/10.1016/j.tre.2021.102510

Wissuwa, F., Durach, C. F., & Choi, T. Y. (2022). Selecting resilient suppliers: Supplier complexity and buyer disruption. *International Journal of Production Economics*, *253*, 108601. https://doi.org/https://doi.org/10.1016/j.ijpe.2022.108601

Wu, Q., Zhu, J., & Cheng, Y. (2023). The effect of cross-organizational governance on supply chain resilience: A mediating and moderating model. *Journal of Purchasing and Supply Management*, *29*(1), 100817. https://doi.org/https://doi.org/10.1016/j.pursup.2023.100817

Zahoor, N., Wu, J., Khan, H., & Khan, Z. (2023). De-globalization, International Trade Protectionism, and the Reconfigurations of Global Value Chains. *Management International Review*, *63*(5), 823–859. https://doi.org/10.1007/s11575-023-00522-4

Zhang, T., Lauras, M., Zacharewicz, G., Rabah, S., & Benaben, F. (2024). Coupling simulation and machine learning for predictive analytics in supply chain management. *International Journal of Production Research*, *62*(23), 8397–8414. https://doi.org/10.1080/00207543.2024.2342019

APPENDICES

Appendix 1 – RO-SMC Evaluation Form

This appendix presents the instrument used to evaluate the RO-SMC, capturing expert feedback on its conceptual clarity, practical coherence, and applicability across organisational contexts.

Modelo de Gestão de Fornecedores
Orientado à Resiliência

Coimbra Business School | ISCAC

Parecer de Especialista sobre uma dissertação de Mestrado em Sistemas de Informação de Gestão.
Autor: André Costeira.
Título: Embedding Risk Intelligence into Supplier Management.
A sua análise avalia um modelo de governação prática para a gestão de fornecedores resiliente.

Section 1

Idioma / Language

Bem-vindo(a). Por favor, escolha o idioma em que pretende responder.
Welcome. Please choose the language you prefer to answer in.

Ao selecionar **Português** verá a versão em português. Ao selecionar **English** verá o inquérito em inglês.
Selecting **Português** shows the Portuguese version. Selecting **English** shows the survey in English.

Poderá voltar atrás para alterar a sua escolha, se necessário.
You may go back to change your choice if needed.

1

Idioma preferido / Preferred language *

- Português
- English

Section 2

Informações e consentimento

Acesso por convite
Uso restrito; pedimos que não reencaminhe o link.

Objetivo
Avaliar o **Modelo de Gestão de Fornecedores Orientado à Resiliência** como abordagem de governação contínua. Após um vídeo de 3 minutos, responderá a questões breves sobre clareza, coerência, utilidade prática, integração com sistemas, prontidão dos dados e contributo esperado para resiliência e continuidade. Duração: 8–10 minutos.

Confidencialidade
Não são recolhidos identificadores pessoais. A participação é voluntária e pode sair antes de submeter. As respostas serão guardadas em sistemas institucionais, usadas apenas para avaliação académica, reportadas de forma agregada e mantidas até à conclusão da dissertação e outputs associados, seguindo a política institucional de arquivo/anonimização.

2

Li a informação e consinto a minha participação. *

- Sim
- Não

Section 3 ...

Introdução ao Modelo: O que Está a Avaliar

Como prefere avançar
Pode ver o vídeo de 3 minutos ou, se preferir, ler a síntese abaixo e seguir para as perguntas.

Contexto e objetivo
As cadeias de abastecimento vivem volatilidade e assimetria de risco. Avaliações pontuais perdem atualidade e dificultam decisões comparáveis. Esta dissertação propõe um modelo de governação que transforma a gestão de fornecedores num processo contínuo, traçando também caminhos de adoção ajustados à maturidade de cada organização.

O modelo em síntese
O **Modelo de Gestão de Fornecedores Orientado à Resiliência** gere o fornecedor como um ciclo fechado, governado como um só sistema. Integra cinco etapas inter-dependentes:
• **Inteligência e Elegibilidade** consolida desempenho, exposição e alinhamento estratégico para definir regras de entrada, com exceções registadas e justificadas.
• **Avaliação e Priorização** compara fornecedores com critérios e ponderações transparentes, usando métodos estruturados quando há incerteza.
• **Classificação e Segmentação** converte resultados em estratégia de portfólio, calibrando supervisão e cadência ao risco, relevância e dependência do comprador.
• **Monitorização e Deteção de Sinais** acompanha indicadores e alertas precoces com limiares que acionam resposta.
• **Reavaliação Adaptativa** revê conclusões quando o contexto muda, ajustando classificações ou critérios e registando a decisão.

Estrutura de governação
Fica claro quem decide e quem aprova, quando escalar, com que cadência rever por nível de risco e como cada decisão fica registada de forma simples e rastreável. O modelo escala de folhas de cálculo rigorosas para integrações com ERP, SRM, soluções de *business intelligence* e ferramentas com inteligência artificial.

Section 4 ...

O seu contexto e maturidade

Como responder
Responda com base na área que conhece melhor. Se as práticas variarem, reflita a realidade predominante.

Escalas
Concordância: 1 Discordo totalmente | 2 Discordo | 3 Nem concordo nem discordo | 4 Concordo | 5 Concordo totalmente
Maturidade: 1 Ad hoc | 2 Emergente | 3 Definida | 4 Gerida | 5 Líder

Níveis de maturidade, em síntese

- Ad hoc: atuação reativa; dados dispersos; regras informais.
- Emergente: existem modelos básicos; aplicação irregular; integração parcial.
- Definida: políticas e critérios documentados; processos repetíveis; papéis atribuídos.
- Gerida: desempenho e risco monitorizados por metas; limiares aplicados; decisões registadas.
- Líder: análises preditivas e cenários atualizados; alertas automatizados; melhoria contínua e governação integrada.

3

Função principal *

- Governação e políticas de Aprovisionamento
- Gestão de categorias e Aprovisionamento estratégico
- Risco e resiliência (fornecedores/terceiros)
- Gestão da cadeia de abastecimento e Logística
- Consultoria
- Outro

4

Anos de experiência na função *

Please enter a whole number

5

Setor *

- Indústria transformadora
- Farmacêutica e saúde
- Tecnologia
- Bens de consumo e retalho
- Energia e utilidades
- Serviços financeiros
- Setor público
- Outro

6

Dimensão da organização *

- 1-10
- 11-50
- 51-250
- >250
- Outro

7

Sistemas em utilização na gestão de fornecedores *

- [ ] ERP
- [ ] SRM (Gestão de Relacionamento com Fornecedores)
- [ ] *Business intelligence* / analítica (ex.: Power BI, Tableau)
- [ ] Plataforma GRC (Governação, Risco e Conformidade)
- [ ] TPRM (Gestão de Risco de Terceiros, ex.: Interos, Everstream, Riskmethods)
- [ ] Qualidade ou PLM (Gestão do Ciclo de Vida do Produto)
- [ ] Outro

8

Maturidade global de governação em Aprovisionamento *

	Ad hoc	Emergente	Definida	Gerida	Líder
Níveis de maturidade	○	○	○	○	○

9

Pulso de maturidade de dados *

	Ad hoc	Emergente	Definida	Gerida	Líder
A qualidade e a proveniência dos dados estão definidas e são confiáveis	○	○	○	○	○
Os dados dos fornecedores estão integrados entre ERPs, SRMs, as ferramentas de *business intelligence* e as de gestão de risco	○	○	○	○	○
A analítica suporta a avaliação multicritério e a análise de cenários	○	○	○	○	○
A rastreabilidade das decisões é uma prática corrente, incluindo justificação, versões e registos	○	○	○	○	○

Section 5 ...

A sua leitura do modelo

10

Avalie cada item utilizando a escala de concordância *

	Discordo totalmente	Discordo	Nem concordo nem discordo	Concordo	Concordo totalmente
A lógica das cinco etapas é clara e de fácil compreensão	○	○	○	○	○
O modelo é percebido como um circuito fechado, e não como um processo pontual	○	○	○	○	○
O modelo é aplicável à minha realidade	○	○	○	○	○
Face à prática atual, o modelo melhoraria a qualidade e a consistência das decisões	○	○	○	○	○

Section 6

Utilidade por etapa

11

Avalie a utilidade no seu contexto atual, utilizando a escala de concordância *

	Discordo totalmente	Discordo	Nem concordo nem discordo	Concordo	Concordo totalmente
As regras de entrada de **Inteligência e Elegibilidade** são sensíveis ao risco, com exceções devidamente registadas e justificadas	○	○	○	○	○
Em **Avaliação e Priorização**, os critérios e ponderações são transparentes, recorrendo-se a métodos multicritério quando a incerteza é elevada	○	○	○	○	○
Em **Classificação e Segmentação**, a supervisão e a cadência de revisão estão alinhadas com o risco de resiliência, a relevância estratégica e a dependência do comprador	○	○	○	○	○
Em **Monitorização e Deteção de Sinais**, os indicadores-chave e alertas precoces desencadeiam ações	○	○	○	○	○
Em **Reavaliação Adaptativa**, existem vias estruturadas para rever indicadores, reclassificar, ajustar a lógica de avaliação ou realizar uma reavaliação completa	○	○	○	○	○

Section 7

Nível de definição da governação

12

Indique o que já está definido na sua organização *

	Não definido	Ligeiramente definido	Parcialmente definido	Maioritariamente definido	Totalmente definido
Regras de elegibilidade e critérios de admissão	○	○	○	○	○
Avaliação multicritério e lógica de ponderação	○	○	○	○	○
Classificação baseada em risco e frequência de revisão do portfólio	○	○	○	○	○
Indicadores de monitorização e regras de alerta	○	○	○	○	○
Procedimentos e limiares para reavaliação	○	○	○	○	○
Registo de decisões e garantia de rastreabilidade	○	○	○	○	○

Section 8

Integração com sistemas e prontidão de dados

Avalie a viabilidade de integração e a prontidão dos dados.

13

Viabilidade de integração com os sistemas *

	Discordo totalmente	Discordo	Nem concordo nem discordo	Concordo	Concordo totalmente
O modelo pode ser integrado na estrutura tecnológica existente com um esforço proporcional, assegurando interoperabilidade com os ERPs, SRM, soluções de business intelligence e plataformas de risco de terceiros, quando aplicável	○	○	○	○	○

14

Prontidão de dados por etapa *

	Muito baixa	Baixa	Moderada	Elevada	Muito elevada
Em **Inteligência e Elegibilidade**, os dados são suficientes e fornecidos de forma atempada	○	○	○	○	○
Em **Avaliação e Priorização**, os inputs são mensuráveis e comparáveis, provenientes de fontes internas e externas	○	○	○	○	○
Em **Classificação e Segmentação**, os fatores de risco, relevância e dependência estão atualizados	○	○	○	○	○
Em **Monitorização e Deteção de Sinais**, os indicadores são fiáveis e incluem alertas, com exemplos como OTIF, Trabalho em Exceção (WEE), Índice de Disrupção (DI), Exposição Crítica em Risco (CEaR) e Índice de Garantia de Continuidade (CAS)	○	○	○	○	○
Em **Reavaliação Adaptativa**, a evidência é acessível e versionada, incluindo registos e versões de datasets e critérios	○	○	○	○	○

Section 9 ...

Impacto esperado e apreciação global

15

Contributo esperado para a resiliência nos próximos 12 meses *

	Muito baixo	Baixo	Moderado	Elevado	Muito elevado
O modelo reduziria a exposição a disrupções, aumentaria a velocidade de recuperação e reforçaria a continuidade	○	○	○	○	○

16

Apreciação global *

	Muito baixa	Baixa	Moderada	Elevada	Muito elevada
Globalmente, o modelo constitui um guia credível e valioso para a governação de Aprovisionamento e para a resiliência da cadeia de abastecimento	○	○	○	○	○

17

Sugira uma melhoria que aumente a aplicabilidade no seu contexto

Enter your answer

Section 10 ...

Information and Consent

Invitation-only access
Private link; please do not forward.

Purpose
To assess the *Resilience-Oriented Supplier Management Cycle* as a continuous, governance-first approach. After a 3-minute primer, you will answer short items on clarity, coherence, practical utility, systems integration, data readiness, and expected contribution to resilience and continuity. Estimated time: 8–10 minutes.

Confidentiality
No personal identifiers are requested. Participation is voluntary; you may exit before submitting. Responses are stored on institutional systems, used only for academic evaluation, reported in aggregate, and retained until the dissertation and related outputs are completed, then archived/anonymised according to institutional policy.

18

I have read the information and consent to participate. *

○ Yes

○ No

Section 11

Primer on the Artifact: What You Are Evaluating

How you'd like to proceed
You can watch the 3-minute video or, if you prefer, read the short summary below and move on.

Context and objective
Supply networks face persistent volatility and asymmetric risk. Snapshot assessments lose relevance quickly and make decisions hard to compare. This dissertation proposes a practical, governance-first artifact that turns supplier management into a continuous process, with adoption paths that scale to different maturity levels.

The artifact in brief
The *Resilience-Oriented Supplier Management Cycle* runs as a closed loop governed as one system. It links five interdependent stages:
- **Intelligence and Eligibility** consolidate internal performance, external exposure, and strategic fit into clear entry rules, with any exceptions recorded and justified.
- **Evaluation and Prioritization** compare suppliers with transparent criteria and weights, using structured methods when information is uncertain.
- **Classification and Segmentation** turn results into portfolio strategy, calibrating oversight and review cadence to resilience risk, strategic relevance, and buyer dependency.
- **Monitoring and Signal Detection** track a focused set of indicators and early warnings with thresholds that trigger action.
- **Adaptive Re-Evaluation** revisit conclusions as conditions change, update classifications or criteria, and record the rationale so learning endures.

Governance structure
Clarifies who decides and who approves, what thresholds require escalation, the risk-tiered review cadence, how feedback flows between stages, and how each decision is logged for traceability. The Model scales from disciplined spreadsheets to integrations with ERP, SRM, business intelligence, and AI-enabled tools.

Section 12

Your context and maturity

How to answer
Respond for the area you know best. If practices differ across units, reflect the predominant reality.

Agreement: 1 Strongly disagree | 2 Disagree | 3 Neither | 4 Agree | 5 Strongly agree
Maturity: 1 Ad hoc | 2 Emerging | 3 Defined | 4 Managed | 5 Leading

Maturity levels at a glance

- Ad hoc: Activity is reactive; data is scattered; rules are informal.
- Emerging: Basic templates exist; application is uneven; integration is partial.
- Defined: Policies and criteria are documented; workflows are repeatable; roles are assigned.
- Managed: Performance and risk are monitored against targets; thresholds are applied; decisions are recorded.
- Leading: Predictive analytics and scenarios are routine; alerts are automated; continuous improvement and governance are embedded at scale.

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Primary role *

- ○ Procurement governance and policy
- ○ Category management and sourcing
- ○ Risk and resilience (supplier/third-party)
- ○ Supply chain and logistics operations
- ○ Consulting or advisory
- ○ Other

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Years of experience in this role *

Please enter a whole number

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Sector *

- ○ Manufacturing
- ○ Pharmaceuticals and healthcare
- ○ Technology
- ○ Consumer goods and retail
- ○ Energy and utilities
- ○ Financial services
- ○ Public sector
- ○ Other

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Organization size *

- ○ 1-10
- ○ 11-50
- ○ 51-250
- ○ >250
- ○ Other

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Systems in active use for supplier management *

- ☐ ERP (Enterprise Resource Planning)
- ☐ SRM (Supplier Relationship Management)
- ☐ BI or analytics (Business Intelligence tools such as Power BI or Tableau)
- ☐ GRC platform (Governance, Risk, and Compliance)
- ☐ TPRM (Third-Party Risk Management, e.g., Interos, Everstream, Riskmethods)
- ☐ Quality or PLM (Product Lifecycle Management)
- ☐ Other

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Overall procurement-governance maturity *

	Ad hoc	Emerging	Defined	Managed	Leading
Maturity level	○	○	○	○	○

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Mini data-maturity pulse *

	Ad hoc	Emerging	Defined	Managed	Leading
Data quality and lineage are defined and trusted	○	○	○	○	○
Supplier data is integrated across core systems ERP, SRM, BI, risk	○	○	○	○	○
Analytics supports multi-criteria evaluation and scenario analysis	○	○	○	○	○
Decision traceability is standard rationale, versions, and logs	○	○	○	○	○

Section 13 ...

Your view of the Model

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Rate each item using the Agreement scale *

	Strongly disagree	Disagree	Neither	Agree	Strongly agree
The five-stage logic is clear and easy to follow	○	○	○	○	○
The Model reads as a closed loop rather than a one-off process	○	○	○	○	○
The artifact is practical to apply in my context	○	○	○	○	○
Compared with current practice, the Model would improve decision quality and consistency	○	○	○	○	○

Section 14 ...

Usefulness by stage

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Rate usefulness in your current context using the Agreement scale *

	Strongly disagree	Disagree	Neither	Agree	Strongly agree
Intelligence and Eligibility Risk-aware entry rules with exceptions and justification recorded	○	○	○	○	○
Evaluation and Prioritization Transparent criteria and weights, with MCDM or fuzzy methods when uncertainty is high	○	○	○	○	○
Classification and Segmentation Oversight and review cadence aligned to resilience risk, strategic relevance, and buyer dependency	○	○	○	○	○
Monitoring and Signal Detection KPIs and early warnings that trigger action	○	○	○	○	○
Adaptive Re-Evaluation Structured pathways for indicator review, reclassification, evaluation-logic adjustment, or full re-evaluation	○	○	○	○	○

Section 15

Governance definition status

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Indicate what is already established in your organization *

	Not defined	Lightly defined	Partially defined	Mostly defined	Fully defined
Eligibility rules and entry criteria	○	○	○	○	○
Multi-criteria evaluation and weighting logic	○	○	○	○	○
Risk-based classification and portfolio review cadence	○	○	○	○	○
Monitoring indicators and alert logic	○	○	○	○	○
Re-evaluation pathways and thresholds	○	○	○	○	○
Decision logging and traceability	○	○	○	○	○

Section 16

MIS Integration and Data Readiness

Assess feasibility and data readiness using the Agreement and Readiness scales

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MIS integration feasibility *

	Strongly disagree	Disagree	Neither	Agree	Strongly agree
The Model can be embedded in our systems landscape with proportionate effort ERP, SRM, BI, GRC, and third-party risk platforms where applicable	○	○	○	○	○

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Stage-wise data readiness *

	Very poor	Poor	Adequate	Good	Excellent
Intelligence and Eligibility data are sufficient and timely;	○	○	○	○	○
Evaluation and Prioritization inputs are measurable and comparable, including internal and external indicators	○	○	○	○	○
Classification and Segmentation drivers are current, covering resilience risk, strategic relevance, and buyer dependency	○	○	○	○	○
Monitoring and Signal Detection indicators are reliable and alerting, for example OTIF, Work-in-Exception, Disruption Index, Conditional Exposure at Risk, and Continuity Assurance	○	○	○	○	○
Adaptive Re-Evaluation evidence is accessible and versioned, including logs and dataset or criteria versions	○	○	○	○	○

Section 17 ...

Expected impact and overall verdict

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Expected contribution to resilience within 12 months *

	Very low	Low	Moderate	High	Very high
The Model would reduce exposure to disruption, improve recovery speed, and strengthen continuity within the next 12 months	○	○	○	○	○

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Overall verdict *

	Very low	Low	Moderate	High	Very high
Overall, the artifact is a credible and valuable guide for procurement governance and supply chain resilience	○	○	○	○	○

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Suggest an improvement to enhance applicability in your context

Enter your answer