# Digital Orchestration and Supply Chain Resilience in Business Process Outsourcing Networks: A Conceptual Framework

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***Abstract*—This study proposes a conceptual framework to describe the mechanisms by which digital orchestration enhances the resilience of the service supply chain in the context of Business Process Outsourcing (BPO) networks. BPO networks have become complex service ecosystems characterized by high interdependencies amid increasing cyberattacks, technological failures, and geopolitical events. Despite the growing importance of digital transformation in outsourcing relationships, the relationship between digital orchestration, service supply chains, and supply chain resilience remains underexplored. Building on the supply chain management perspective, the study conceptualizes digital orchestration as the ability to configure, coordinate, and re-configure the service supply chain involving multiple actors in the BPO network through the use of digital platforms. By integrating the different perspectives on supply chain resilience within the BPO network, the study contributes to developing a theoretical understanding of the concept.**

***Index Terms*—Digital Orchestration, Business Process Outsourcing (BPO), Network Services, Supply Chain Management, Supply Chain Resilience, Digital Platforms and Ecosystems**

## I. INTRODUCTION

Digital technologies have been changing the global business environment, as firms worldwide have been forced to adopt digital transformation to adapt to new, innovative ways of interacting and collaborating (Muka & Marnewick, 2018). Digital transformation in the BPO network is characterized by digital orchestration. The conceptualization of digital orchestration within the BPO network is underexplored (Maumder & Garg, 2025). BPO networks enable different firms to operate as a single entity; thus, the main focus is on the relationships among the firms in the network. The proposed framework is likely to solve the issues of digital orchestration in the BPO network (Darío Franco Pereyra et al., 2013).

Business process outsourcing networks are susceptible to disruptions that could eventually render their interconnected processes dysfunctional (Awate et al., 2025). Disruptions could occur at any partner in the service supply chain. Nevertheless, the performance consequences could affect the other partners. Efforts to build supply chain resilience go beyond the resilience of a single entity or the supply chain as a whole. The framework can encompass the challenges in building resilience due to the various characteristics of the supply chain and elaborate on the contribution of the proposed configuration in building supply chain resilience

## II. LITERATURE FOUNDATIONS

Various aspects of the outsourcing process have been explored in the literature. The literature on vendor selection primarily focuses on selecting the third-party vendor best suited to the processes (Kumar et al., 2014). The evaluation of the outsourcing process primarily focuses on the provider's ability to deliver the expected output under the agreed-upon conditions (Muka & Marnewick, 2018). It primarily defines the type of vendor dependency in the process. Accelerating production processes primarily captures superior production capabilities to empower outsourcing in the co-creation of inter-firm processes. The influence in the supply chain is unique to each service provision network. It is hardly ever discussed. A framework that primarily includes inter-firm dependency, inter-outsourced shared elements,

interconnectedness in the multi-sourcing environment, and the use of digital constructs has yet to be proposed for the analysis of the inter-dependency of outsourcing service co-creation. The importance of the outsourcing process and its various aspects have been discussed.

2.1. Digital Orchestration

Digital orchestration refers to the configuration of distributed digital ecosystems that enable business processes to be fully or partially managed through digital technologies. Digital orchestration leverages various digital technologies and platforms to orchestrate collaborative service supply chains and configure service networks. Digital platforms and their strategies change how firms interact with external entities and how firms collaborate (Reim et al., 2023). As a result, the concept of 'platform logic' is relevant to understanding orchestration strategies, given the significance of digital platforms and the shift towards collaborative, service-oriented business models.

Orchestration strategies are configurations of service supply chains that utilize multiple service networks to provide services across business processes, involving different service providers and various forms of outsourcing partners (Paredes Carrasco et al., 2025). As a result, service ecosystem theory is relevant in the BPO industry, where independent firms collaborate to create value and provide complex solutions to their customers in a multi-actor scenario (Franco Pereyra et al., 2013). Digital orchestration not only encompasses a service provider's internal business processes but also supplier-related processes, thereby necessitating an extension of the exploration of BPO orchestration to model outsourcing networks developed through service networks consisting of interconnected partners.

Three major interconnected perspectives on outsourcing and service delivery include Supply Chain Management, Service Networks, and Inter-organizational Coordination. These perspectives offer theoretical lenses for exploring the service supply chain of BPO services, including their definitions, relationships, dependencies, and values. The four-tier model of Supply Chain Structure and Operations offers a framework for understanding how transactions between firms are enabled through inter-firm exchanges at different levels and how service delivery is improved through collaboration with outsourcing firms. These perspectives offer incisive insights regarding the value-creating relationships between firms in the multiple-service case of outsourcing, in which a service provider oversees a relationship in which simultaneous collaboration among multiple firms occurs, while partners experience interdependencies structured by another service domain. Theoretical frameworks that discuss different coordination mechanisms and their associated modes offer incisive insights into how different forms of outsourcing service delivery are coordinated and how they can provide a better understanding of inter-organizational orchestration beyond the organization itself (Ram Mohan Roy Muddada, 2010).

2.2. Service Supply Chains

Service Supply Chains are networks established to satisfy service requests between two or more parties. In the context of a BPO network, the buyer sends a request to the Service Provider to fulfil service needs under pre-defined service-level agreements. The Service Provider then fulfils the request and returns the services to the buyer. In effect, the service supply chain within the context of the BPO network has the following characteristics: Supply Chain Composition, Service Requests, Pre-defined Guidelines, Value Delivery, and Dependency Structure (Wood et al., 2013).

A service supply chain is defined as "A chain of value where information, materials, services, and/or knowledge are exchanged among different entities." In the BPO network, service requests are directed to one or more SPs for execution under pre-defined contractual agreements between the buyer and the SP (Nowicki, 2018). A buyer identifies a service request, sends it to the appropriate SP or SPs to execute, receives the results, and finally, the service request is routed further or marked as complete. Every buyer may be considered an independent service supply chain. Pre-defined SLAs are responsible for guiding service request routing and completion based on each buyer's needs. SLAs may include different parameters such as information security, financial considerations, and the value of the service request itself (Ram Mohan Roy Muddada, 2010).

2.3. Resilience in Outsourcing Networks

Outsourcing, as a form of inter-organizational cooperation, has become increasingly important.

Business Process Outsourcing (BPO) networks are built on co-created values developed by partners in outsourcing collaborations to inform their business strategies. This concept extends the interest in Business Process Management to the formulation, implementation, management, and optimization of outsourcing processes. This concept expanded the scope of Business Process Management to include other aspects of B2B business processes in the outsourcing cooperation within a BPO network.

The co-creation value remains as the fundamental concept for BPO Networks. Digital Orchestration plays a key role in ensuring the associated BPO Co-creation Value and Business Process Remain Sustainable. Digital Orchestration is defined as the proactive management and re-engineering of actors, technologies, platforms, and the network's governance that results in improved real-time process monitoring, automatically generates business process intelligence, and provides actors with an empowered voice or autonomy. There are two categories of cited frameworks, with four works that fit well. A Supply Chain Model Building Shared Service Approach matches the Business Process of BPO Networks. The Resilience Model centres on Value Creation and Recovery, which aligns with the Co-Creation Value of BPO Networks.

Resilience Supply Chain literature and theory development match BPO Networks. Digital Orchestration and theory development match BPO Networks. Resilience is defined as the capacity to rapidly restore the system to its original state after a disruptive event (Ram Mohan Roy Muddada, 2010). Three dimensions offer a more distinct scope for defining resilience. Susceptibility is the ability to prepare or avoid disruption. Robustness is the ability of a process to maintain its efficiency in the face of disruptions. Rapid Restoration is the ability to return to a state of normalcy after disruption. A Resilience Enhancement Model at the Supply Chain Network Level for BPO Networks extends the definition of resilience, placing greater emphasis on the multi-tier structure and including additional pace setters. Resilient capability is the width of alternative processes (Nowicki, 2018).

## III. CONCEPTUAL FRAMEWORK

Business Process Outsourcing (BPO) operates in a transactional, dynamic, and interdependent business environment that is currently undergoing a major digital transformation, thereby becoming more prone to crises. A crisis, such as a pandemic, political instability, or a cyber attack, can cause major disruptions. The resultant chaos has a ripple effect, thereby reverberating throughout the service supply chain. This, in turn, makes the organizations more vulnerable. A lack of conceptual understanding of the crisis has been a major factor in organizations' failure to develop competitive strategies to address it. This is due to the lack of a clear conceptual understanding of the digital orchestration of the service supply chain. The existing structures of the BPO network environment have, unfortunately, been limiting the business incentives required to invest in improving resilience. As such, the organizations may find it difficult to respond to unforeseen challenges in this volatile environment.Digital Orchestration is the coordinated engagement and collaboration with a diverse ecosystem of independent service suppliers, all enabled by a robust and comprehensive digital infrastructure (Autio, 2022).

This infrastructure is instrumental in integrating a polycentric supply chain into a cohesive, unified entity. Every participant within the ecosystem is methodically organized to form a self-contained Vault that not only comprises people but also processes and systems that can work together to store, utilize, and transport vital data and information from a variety of sources to a wide spectrum of clients to ensure that everyone has access to the information required to make optimal decisions. The Supply Chain aspect of Digital Orchestration focuses on the evolution of Business Process Outsourcing relationships, moving beyond the output-based model toward a more dynamic, interdependent exchange of Value-Adding Services (VAS) (Plugge et al., 2024).

This change is specifically aimed at accelerating the delivery of Life-Cycle Services (LCS), which are critical to ensuring adaptability in a fast-paced business environment. In this evolving business environment, third parties are not only competing to ensure the scope of work stipulated in contracts is met; they are also competing fiercely to ensure their contributions to the overall end-to-end process are

delivered on time. As a result, the extended-direct and extended-indirect-value-adding frameworks have shifted their focus from providing Value-Added Services (VAS) to a single client to orchestrating an overall, comprehensive series of LCS for multiple clients. This orchestration involves bringing different stakeholders on board to ensure that all components work in harmony to meet the evolving demands of different clients in a constantly evolving business environment (Autio, 2022).

The Service Supply Chain concept fully captures the complex web of relationships in a multitude of inter-organizational exchanges in a modern service delivery network. As a result, service delivery is significantly impaired when any of these third parties is unable to provide their Value-Added Services (VAS) in a timely manner and in line with the stipulated standards. In this case, it becomes necessary to proactively incorporate additional Redundancy and Flexibility strategies, especially those centred on Availability Capabilities. Significantly, Digital Orchestration through Cross-Organizational Vaults becomes a critical recovery and adaptation mechanism in this case. It is employed not only to address disruptions in the service supply chain but also to address new service demands arising from different market conditions and evolving customer expectations.

BPO networks are highly prone to various disruptive events, mainly because of their high level of dependence on the intricate web of external partnership arrangements that characterizes their operational structure (Larsen et al., 2023). This is especially true because the nature of the partnership arrangements is characterized by a high level of interdependence, thereby creating a situation in which the disruption of one partner can affect the others. Moreover, the high level of intricacy that characterizes the service interconnection makes it highly prone to disruption. Furthermore, the widespread nature of the resources and service deployment means that a disruption at a particular point is highly likely to reverberate throughout the entire network, thereby affecting different partners at different geographical locations. In this context, the high level of disproportionate deployment of requests is highly indicative of the system's high vulnerability, thereby exacerbating workload fluctuations. In this context, the high level of potential disruption is highly indicative of a high likelihood of disruption events that are likely to affect the functionality of BPO operations.

### 3.1. Core Construct

With respect to Business Process Outsourcing (BPO) networks, the concept of Digital Orchestration implies the ability to configure and re-configure the supply chain of services with the involvement of multiple players to deliver value to end customers through the application of digital technologies, mostly in the form of business services (Franco Pereyra et al., 2013). Service supply chains are the concept of configuring multiple, potentially disjointed and dispersed service providers to deliver an integrated, complex service to an end customer, for example, an IT-enabled business service (Selamat et al., 2008). It is a multi-player model of service delivery, which is common in the service sector and has become an established approach to the creation of value; hence, the concept of end-to-end orchestration to select and engage with the supply chain of services to deliver the same would be considered an important capability for firms involved in the business services sector.

Resilience within the context of BPO networks implies the ability to avoid disruption and restore the service supply chain, delivered through resilient service supply chains, resilient service orchestration, and resilient outsourcing contracts. Resilience as a concept encompasses susceptibility, robustness, and rapid recovery from disruptions to service supply chains. Flexibility to re-configure the supply chain of outsourced services is an important enabler of resilience and orchestration.

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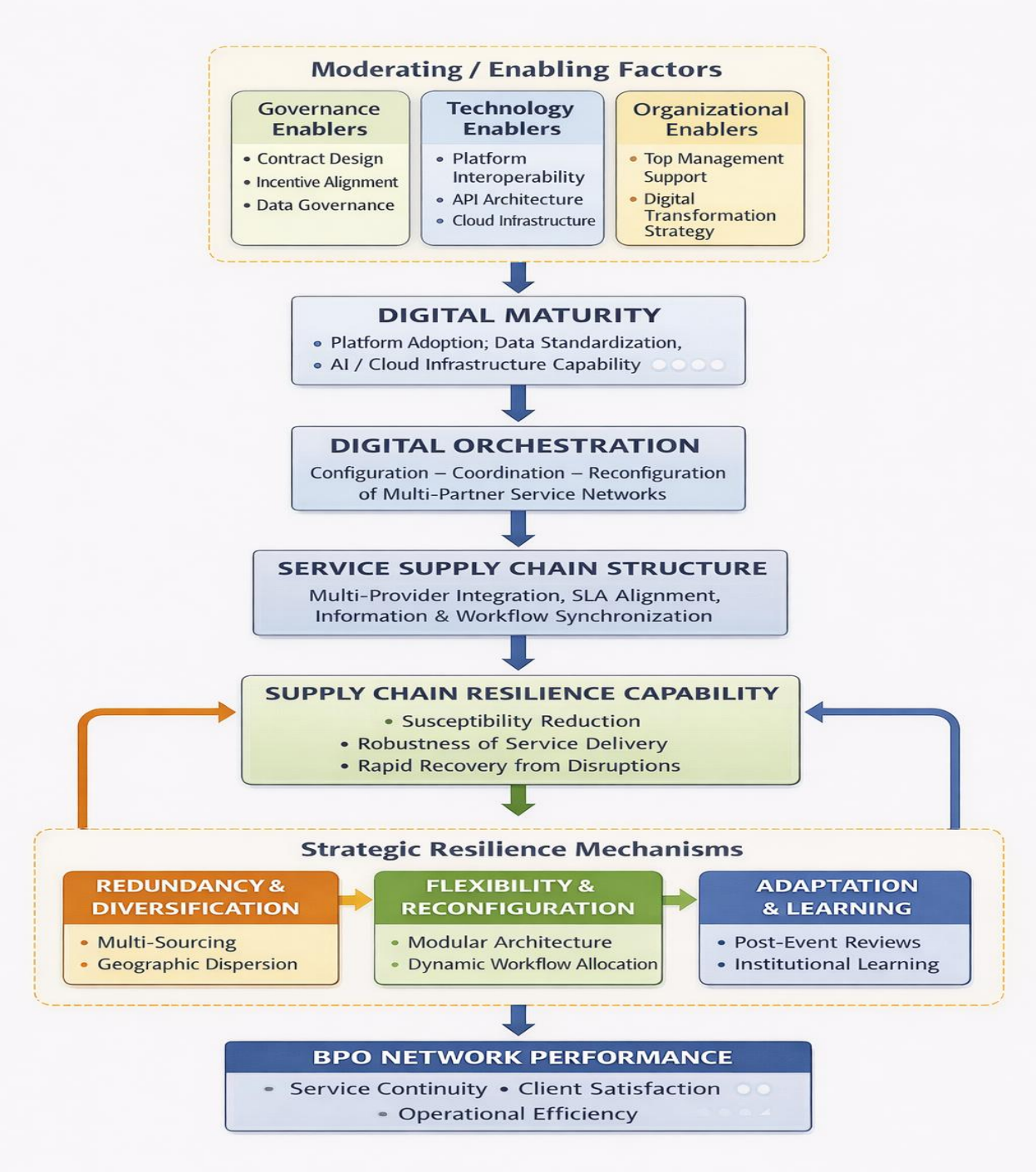
Diagram 1: BPO Digital Orchestration Framework

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3.2. Interactions and Mechanisms

Inter-organizational interactions and mechanisms are critical in ensuring the adaptation and evolution of

complex systems (Nowicki, 2018). In business services and outsourcing networks, they are developed through inter-firm interactions, and the level of coupling defines the nature of relationships and value co-creation (Franco Pereyra et al., 2013). The mechanisms of the thus-defined Conceptual Framework are centred on the interactions and influence of digital orchestration and the service supply chain.

3.3. Enablers and Constraints

There are various enablers at different levels that impact digital orchestration in BPO and help mitigate threats to service supply chain resilience. It is critical for organizations must use appropriate resources to support their preparation, recovery, and learning. At the governance level, organizational enablers are largely organizational support and a digital transformation strategy (Ahmad Al-Omari et al., 2022). It is organizational support from top management that forms the foundation upon which levels of commitment are determined for different organizational resources and groups to the digital orchestration evolution process. Despite it being a lengthy process in developing an organizational digital transformation strategy, it is encouraged that a potential strategy be communicated to different organizational resources and groups in BPO contracts, indicating a vision of how the organization intends to utilize digital technologies in general terms in order to improve commitment levels and resources in evolving the concept of digital orchestration.

On the technical side, data standardization is critical for an organization to benefit from coordination (Rai et al., 2006). Past support from top management is critical in developing the required data standardization capabilities. Platform availability is positively related to service supply chain resilience, as it promotes the adoption of digital assistance and extends the service supply chain's perspective in developing a response strategy. High platform availability means that data from a BPO contractor can be provided to a requesting contractor using the digital orchestration platform, even when the service supply chain is partially or disconnected. In addition, access control enables an organization to balance demand for platform resources with security concerns. In the absence of access controls, contractors of a requesting organization may not have access to the information they need to respond to an incident in time due to organization-wide restrictions on their access to data from other contractors.

## IV. GOVERNANCE AND ARCHITECTURE OF BPO NETWORKS

A network of interconnected partners who share resources, knowledge, and capabilities to create value collectively defines a business process outsourcing (BPO) network (W. Whitaker et al., 2011). Developing a comprehensive understanding of the governance of a BPO network requires understanding the role of digital orchestration platforms, the coordination mechanisms between partners, and the data architecture that supports orchestration. Researchers have already explored various network arrangements under different nomenclatures and domains. However, literature on BPO networks is limited. Some researchers have specifically focused on multi-outsourcing supply chain networks but have not presented the choice as a formal governance framework.

Digital orchestration platforms assume a central role in network governance by enabling service brokerage between clients and various outsourcing partners. These platforms employ unique governance models to determine data ownership among clients, service providers, and the platforms themselves. To support the service brokerage effectively, interoperability between providers requires the development of a unique data architecture. These requirements include developing data and semantic standards, specifying metadata, developing the application programming interface (API), and ensuring semantic alignment. However, to enable the proper functioning of digital orchestration, service co-creation should be effectively coordinated among the different partners involved.

Given the shared responsibilities among outsourcing partners, the principal-agent dilemma arises at the network level, where the client must align each partner's incentives to enforce compliance with the requisite orchestration processes. In some instances, specific governance models like agency, relational contracts, and pay-per-use can effectively mitigate the principal-agent dilemma. Coordination mechanisms involve the distribution of decision rights, the types of engagement contracts used in transactions between

different partners, and the incentives that address the principal-agent dilemma.

Inter-organizational interactions in BPO networks involve the exchange of digital information among partners involved in the process. Considering the requirement to enable transactions based on service requests and bids between different partners involved in the process, they should be able to share a common understanding of the information involved. Considering different semantics, the information involved in the process extends beyond business process-related information and includes details about partners, surroundings, and other actors. As such, the need to provide specifications for different data components is critical for enabling inter-organizational transactions in general and orchestration queries in particular. The proposed framework provides an understanding of the importance of digital orchestration and the critical aspects involved in the context of BPO networks.

4.1. Digital Platform Roles

Digital platforms hold a key position in service supply chains, facilitating the coordination of mutually profitable interfirm exchanges that may encompass both operational and strategic engagement. Business Process Outsourcing (BPO) networks employ digital platforms as orchestrators of extensive systems of arrangement, adhering to the 4PL logic, or as facilitators of the interconnectivity of intermediary agents, according to the 3PL logic. This results in the development of different modes of governance and scenarios of data ownership, depending on the nodal position and the orchestration objective pursued by the contracting firms. A notable trend is the development of the many-to-many mode of exchange, in which multiple intermediate service providers concurrently interact with large sets of upstream and downstream firms (Schramm et al., 2019).

The modes of governance depend on the adopted orchestration modality (R. Harmon & G. Castro-Leon, 2018). Regardless of control over the digital platform, there is considerable room for developing formal rules, informal norms, and digital controls. Contractual agreements define the terms of data sharing and modes of use, while the incentive system ensures firms' compliance. Due to the inevitability of data transfer for transaction automation, concerns persist about managing transactional data after the exchange and about the internal sharing of data among the contracting firms. Addressing such data-ownership concerns is an important area of organizational research.

4.2. Coordination Mechanisms

"Coordination represents the orientation of a joint activity within a given business relationship" (Hernández et al., 2014). Mechanisms of coordination determine how joint activities or planning occur between two or more parties. These mechanisms can create coordination delays or inefficiencies (Franco Pereyra et al., 2013). To counteract the effects of coordination delays or inefficiencies, many firms implement mechanisms across all interactions within a BPO, service supply chain, or outsourcing network, such as along-the-line processes, contracts, or pricing models. Along-the-line coordination is significantly influenced by a firm's supply chain position or negotiating power.

4.3. Data and Interoperability Standards

Data and interoperability standards describe how information is shared between partnering firms (Hernández et al., 2014). A data standard defines the format or structure of information sharing between firms, while an interoperability standard defines the mechanisms or protocols by which that sharing occurs, ensuring interpretability. Provisions should be made for the components of the data and interoperability standards deemed crucial for orchestrating a BPO service supply chain.

For digital orchestration of service supply chains across enterprises to occur, the process architectures must be compatible. To achieve this compatibility, oraganizations have to define supplementary architectures for networked services, processes, or data (Sahdeo, 2018). Though a centralized definition of processes or data can be useful for shaping overarching architectures, the dispersion of knowledge across various enterprises or platforms makes it difficult to investigate them. Moreover, the specification of service-oriented architectures can be useful in these cases. Complementary metadata arithmetic enables the mathematical treatment of collaborative architecture modelling. With this possibility, the exchange or reconciliation of service or data rules can be achieved during the co-definition of enterprise process landscapes.

Though the co-definition of services or data sets is crucial for the orchestration of the supply chain, interface alignment across the various platforms is crucial for the enterprise or enterprises involved. Inter-organizational design signatures at the interface level can serve as a satisfactory compromise. However, semantic alignment guidance is equally important. Apart from coding the specifications for the complete and formal encapsulation of the models, the deployment of ontologies influences the setting of business, service, and enterprise modelling paradigms. Several enterprise interoperability frameworks highlight this level of alignment (Agostinho et al., 2016). Co-designed frameworks that depend on the positioning of extra-enterprise process and data-oriented service contours deserve special consideration.

## V. RESILIENCE STRATEGIES IN PRACTICE

By addressing disruptions from the time of their formation, BPO networks seek to build resilience and unlock service potential. This factor has been more emphasized due to the post-COVID environment (Yao & Meurier, 2012). Organizations seek strategies to avoid disruptions, maintain operations during disruptions, and restore the pre-disruption state as quickly as possible (Nowicki, 2018). They implement decisions geared toward developing forward-looking strategies, with greater emphasis on learning and adapting by leveraging information available after the disruption, which is useful for modifying routines. However, the importance of alternative solutions, contracts, and partners varies depending on the nature of the engagement.

Anticipating and reacting to external signals signaling emerging disruptions, monitoring high-risk events, and integrating expanded information from diverse sources are pertinent to the sense dimension. Enhanced capacity is built through strengthening relationships and gaining a comprehensive understanding of the supplier's expectations as the supply chain or network expands. Organizations observe and modify functions within physical systems or cross-firm environments when disruptions are recognized. The time required to restore the system's original efficiency following a disruption is a key measure of superior capacity. Therefore, proactive external signals indicate the need to enhance awareness of forthcoming events or occurrences that prompt additional action.

### 5.1. Sensing and Anticipation

Outsourcing partners must anticipate and react to external signals signaling disruptions and environmental changes. Sensing capabilities facilitate the identification of external signals through systematic monitoring, proactive horizon scanning, and the exploration of implications for interdependencies. External signals vary in the time period over which they are expected to influence the BPO network, with some exerting real-time influence and others signalling contextual changes over weeks to months. Frameworks supporting horizon scanning, including weak signal processing and the Create approach, facilitate the identification of relevant external signals to the BPO network. Organizations also engage in environmental scanning to acquire insights into changes within the industry and ecosystem. The integration of insights from subsectors facilitates the exploration of the direct and indirect implications for the BPO network. External signals are derived from the marketplace, technology, regulations, competition, and workforce and signal potential threats and opportunities to the company and its suppliers.

Instead of relying on individuals or a small group, outsourcing partners can form teams or committees to oversee the process. Dedicated forces can reduce the risk of missing important information due to attention deficit or organizational distractions. For instance, multinational corporations often invest in dedicated management teams to oversee long-term developmental processes, such as technology or business model evolution, at the organizational, business, or subsidiary level (Sahdeo, 2018). Periodic reports can be communicated to members or partners after internal or external evaluation. In addition, reports can be communicated to partners after evaluating external sources or by sharing previously disseminated reports with the members. A tool can be developed to identify threats early in the supply chain and to communicate them to members so they can formulate alternative strategies. The suggested framework can be used to improve the resilience of diverse supply chain networks. Identifying disruption information can improve the recovery process, and the classification can eliminate ambiguity when defining

the structure of the supply chain network (Ram Mohan Roy Muddada, 2010).

5.2. Response and Recovery

BPO networks are subject to various uncertainties, risks, and disruptions that may jeopardize business continuity and increase service-delivery costs (Ram Mohan Roy Muddada, 2010). Outsourcing firms are likely to experience unexpected service disruptions owing to unexpected demands, unexpected situations, and other exogenous factors. To address these adverse situations, BPO networks require service supply chain resilience, including the ability to respond to disruptions and recover from them efficiently. Response and recovery strategies play a pivotal role in building resilience in service supply chains, thus enabling prompt recovery of service delivery after a disruption (Yao & Meurier, 2012). Proper management of these strategies is crucial for minimizing business impact and preventing potential revenue losses. This section discusses response and recovery processes and differentiates response and recovery strategies to build resilience in service supply chains.

The first response and recovery process involves incident management to resume service supply. The timeline of this process includes the duration of the service disruption, its classification by time, and pre-emptive strategies to avoid or mitigate it. During incident management, service disruption is identified, escalation criteria to initiate recovery are established, and workarounds and prevention strategies are proposed. Strategies that make restoration possible and the resumption of normal operations as soon as possible are vital to ensuring resilience. Three sets of recovery strategies that improve resilience in service supply chains are identified: redundancy and diversification; flexibility and reconfiguration; and adaptation and learning.

5.2.1. Redundancy and Diversification

Redundancy and diversification strategies include multi-sourcing, geographic dispersion, and resource buffers to reduce dependence on a single third-party supplier and minimise exposure to disruption. Multi-sourcing of outsourced processes, applications, and other business services enables firms to switch to secondary suppliers when service disruptions occur. Geographic dispersion of suppliers helps protect against disruption risk by reducing dependence on third-party suppliers in a given region or areas that may experience disruption or disaster risk. Resource buffers involve maintaining excess resources or capabilities to meet demand through secondary service providers (Ram Mohan Roy Muddada, 2010).

In the context of BPO firms, redundancy and diversification involve using multiple, heterogeneous outsourcing suppliers to deliver identical services, including sourcing human resource management services from multiple, independent BPO firms located in different regions (J. Gallivan & Oh, 1998). In addition, diversification can mean including secondary services, such as non-core processes encompassing emergency response and customer relations, that are outsourced to different suppliers from the outsourcer of core processes (Franco Pereyra et al., 2013).

5.2.2. Flexibility and Reconfiguration

Flexibility and reconfigurability enable the creation, adaptation, and dismantling of service supply chains in response to evolving demands, situations, and opportunities. Modular architectures help in this regard by specifying boundaries between components, thus enabling the selective modification of service flows, service instances, and supporting processes within service supply chains while ensuring overall interoperability and integrity (W. P. J. Grefen & M. Dijkman, 2013). Adaptive workflow management leverages these architectural features to dynamically control service supply chains, thereby adjusting their configuration in response to current demands (Marappa, 2008). Dynamic allocation of resources among different partners helps respond agilely to increased demand for particular service components, ensuring continuity of supply after a supplier becomes impaired or disrupted.

5.3. Adaptation and Learning

Business Process Outsourcing (BPO) networks are complex structures that provide services such as information technology (IT) and are highly prone to unforeseen disruptions at any point in the value chain. This calls for the concept of 'resilience' as proposed by Franco Pereyra et al. (2013). In other words, it calls for 'agility' to adapt to new changes with minimum time lag and to incorporate new alignments even after

disruptions or stress events (Ardagna et al., 2011). Digital orchestration is proposed as a viable option for these types of networks.

Adaptation and learning are important aspects of agility in the context of BPO networks. This is especially true in the context of disruptive or stress events. Sensing, anticipatory monitoring, response actions, post-response actions, and learning actions during ongoing BPO engagements are critical considerations. Long-term sustainability of 'resilience' can be ensured by continuous monitoring of overall 'resilience' performance, including progress in digital maturity and orchestration levels, and by using post-event analysis techniques to improve aspects of ongoing BPO processes.

Post-event analysis is also called 'after-action reviews' or 'debriefing sessions.' It is an appraisal process that includes reviewing an event or situation in terms of causes, responses, and outcomes. It is widely used in different professional settings. An 'institutional memory' capability is proposed to retain learning from post-event analysis and possibly apply it in future situations as well. Action-Response Histories (ARHs) and learning histories are proposed as instruments to enable institutional memory capabilities. ARHs entail learning the actions taken during the BPO process in response to specific events or situations, while learning histories entail learning more about different aspects of BPO processes over time.

Another type of adaptation is deliberate capability development in BPO. There are two prominent sub-capabilities of this type of capability, which are: (i) "the achievement of general capability development, including mastery of general principles of BPO as well as acquisition of specific processes, platforms, tools, knowledge, or interactions related to specific BPO engagements"; and (ii) "the improvement of capability or maturity in a particular area that is already established within an organization."

## VI. MEASUREMENT AND EVALUATION

It is found that after applying the framework, there is considerable variability, thereby indicating its flexibility in tackling different challenges. It directly assists in measuring resilience across different operational complexities, thereby specifying its scope. Concurrent measurement of digital maturity enables engagement by other actors within the BPO network.

Digital orchestration in global service supply chain networks has received increased focus as enterprises undergo digital transformation. Outsourcing involves service supply chain networks, in which independent, specialized organizations are connected to create integrated value for end-customers through a core service. Supply chains in digital orchestration, consisting of connected platforms, technologies, data, processes, and information for service and value co-creation, create a direction for future research.

Resilience measures the level of disruption risk and the ability to operate or quickly recover. A triad of service attractiveness, quality, and cost-effectiveness underlies the global outsourcing need to fill capability and budget gaps. Constant evaluation of adaptation options is necessary to prepare organizations to build resilience. The conceptual framework relates digital orchestration to digital maturity and resilience. Moving through the different digital maturity levels builds the ability to orchestrate services that use cross-enterprise resources and supply chain interdependencies, and to build resilience. Launching a connected supply chain of services is necessary for orchestration, thereby extending the outsourcing network's supply chain interdependencies. Parallel changes in digital maturity and resilience levels affect the presence in the connected supply chain and contingent factors at the enterprise level or the supply chain network level.

Specific metrics for measuring the premise are available to support empirical investigation of the concept, thereby contributing to the scientific evaluation of the framework. Resilience metrics measure reliability, recovery time, and flexibility during specific service supply chain disruptions. Correspondingly, digital maturity and orchestration metrics measure the progress of implementing connected platforms, data exchange, and process coordination within the network. Digital orchestration has gained greater attention as the concept of value and service co-creation among multiple partners and firms within the supply chain has risen. The focus has shifted rapidly to business process outsourcing within interconnected supply chains and platforms. However, the identification of the role of supplementary services, which provide context for transactions, often overlooks the orchestration of capacity, budget, skills, and technology across multiple firms and at the partner and network levels (Sahdeo, 2018).

6.1. Resilience Metrics

Business Process Outsourcing (BPO) networks are service supply networks through which outsourcing firms connect to the supply chains for services provided by BPO vendors, cloud service providers, and low-code development platforms. Digital orchestration is the integration of digital platforms and platform technologies into BPO networks to improve the orchestration of processes and services within the supply chain. The BPO industry has become more complex due to third-party involvement in delivering core services and the rapid adoption of new digital technologies, platforms, and systems across the supply chain. Resilience refers to the ability to survive, adapt, and grow through turbulence and changing environments.

During the provision of BPO services, the organization must coordinate multiple partner contributions through cloud computing, digital twins, and application programming interfaces (APIs). Resilience within the context of the service supply network includes three key aspects: susceptibility, robustness, and rapid recovery during the period of the disruptions (Yao & Meurier, 2012). BPO firms must employ multiple strategies to enhance resilience during periods of system disruptions, including redundancy and diversification of the architectural design, flexibility and reconfigurability, and adaptation and learning within the organization (Ram Mohan Roy Muddada, 2010).

6.2. Digital Maturity and Orchestration Metrics

In the context of the BPO model, the DSS supply chain is becoming increasingly popular for orchestrating service supply chains to satisfy customer demands through digital platforms. As a result, the BPO networks aim to support each collaboration in improving its digital maturity, especially with respect to orchestration. Digital maturity represents the extent to which a firm exploits digital technologies. Additionally, it can be evaluated using various orchestration metrics (Queiroz et al., 2018). For instance, the use of digital platforms represents a higher level of orchestration maturity than the sharing of unstructured documents (Guerrero et al., 2022). Moreover, the level of orchestration maturity can be evaluated using the metrics presented in the Conceptual Framework to identify gaps in orchestration and enhance resilience. Each collaboration partner can apply the relevant metrics to identify specific gaps in the orchestration of BPO networks and the level of digital maturity. Following the evaluation of the relevant aspects, the necessary steps can be taken to enhance them in a stepwise manner.

## VII. IMPLICATIONS FOR PRACTITIONERS AND POLICY

The Conceptual Framework offers governance, architectural, and strategic perspectives that practitioners and policymakers can adopt to enhance resilience in BPO networks. In the aftermath of the disruptions the outsourcing industry has undergone due to the COVID-19 pandemic, the proposed framework highlights the importance of digital orchestration, service supply chains, and resilience in BPO networks. Digital orchestration points to the platform-mediated coordination of service- and transaction-oriented processes involving various actors in the outsourcing industry. Service supply chains are composed of various service systems that address heterogeneities in outsourced processes while creating direct and indirect dependencies among providers. Resilience refers to the capacity to withstand, adapt to, and recover from adverse events within both domestic and international networks over both short- and long-term periods. Service supply chain resilience is a critical factor that must be addressed to ensure the viability of BPO networks, given the current uncertainty around delivery modes, technology options, service geography, and client engagement strategies.

By formalizing the structure and dynamics of BPO networks, the framework provides an understanding of how orchestration and supply chains impact network resilience, and how digital orchestration and service supply chains evolve over time alongside the network as a whole. This serves to reiterate the need to budget for orchestration capabilities before entering into any process of continued decision-making regarding platform selection, data ownership, and governance, to ensure the continued viability of the service supply chain under conditions of cascading edge supply chain disintegration (Ahmad Al-Omari et al., 2022). The emerging trend towards remote delivery as an alternative to on-site service delivery (the traditional

Geography of Outsourcing) serves to heighten these concerns. The framework delineates the intricate, often counterintuitive relationships between internal and external parameters that impact network resilience in BPO networks. Research undertaken through the lens of the proposed framework can be achieved through a wide variety of structured longitudinal case studies involving a single or multiple firms within complementary service domains (e.g., Finance, Information Technology, HR).

## VIII. RESEARCH GAPS AND FUTURE DIRECTIONS

In the current literature on BPO networks, the constructs of digital orchestration, service supply chains, and network resilience rarely appear together. In the current literature on BPO networks, the dominant themes are partner selection for outsourcing and the effective management of the outsourcing relationship. However, what is often overlooked is how these networks create and share service value through the implementation of service supply chains. Digital orchestration and service supply chains represent distinct areas of research, with digital orchestration often viewed as part of the manufacturing supply chain and rarely applied to service-oriented BPO networks. Resilience has been represented in the body of literature on BPO networks, but with a focus on process resilience rather than network resilience, as digital orchestration and service supply chains are not considered part of the network analysis.

Service-oriented supply chains provide the foundation for implementing digital orchestration (Gambal et al., 2022). However, the implementation of value-added service bundles and service supply chains receives insufficient academic attention. Further clarification of the relationship between digital orchestration and resilience from the perspective of service supply chain management is also needed. A comprehensive understanding of the phenomenon of digital multiplexity from the technical, social, and economic dimensions at the micro, meso, and macro levels represents a major theoretical research gap (Muka & Marnewick, 2018); service supply chain management also represents an area that receives insufficient academic attention from the perspective of digital multiplexity.

Network theory application to BPO networks also represents an area that receives insufficient academic attention. Testable propositions for the relationship between constructs need to be formulated. Datasets for measuring the application of concepts of orchestration, service supply chain management, and resilience in the context of BPO networks need to be identified, and event- or enterprise-wide theories need to be formulated. Although the analysis of digital orchestration across the technical and social dimensions has received sufficient academic attention, the economic dimension remains underexplored. With respect to the application of the Positive Research Approach, the constructs of orchestration-conceptual, service supply chain management, and resilience-constructs were defined across various disciplines. However, the articulation of the constructs receives insufficient academic attention, especially in service-oriented supply chains involving BPO networks.

## IX. CONCLUSION

Digital transformation signifies not only a competitive challenge but also a survival challenge. Technological advancements have significantly altered business processes, organizational models, and controllership. Digital orchestration is the intelligent integration of end-to-end business processes with digital technologies. Digital orchestration in Business Process Outsourcing (BPO) networks, which are characterized by high volumes of outsourcing activities, plays a critical role in enabling rapid adaptability of business process schemes involving numerous business process outsourcers and business process managers by anticipating potential digital disruptions. Digital orchestration provides a high-level perspective that identifies the key actors, technologies, platforms, and governance approaches within the architecture and governance of BPO networks.

The actors in Digital Orchestration can be divided into four groups with distinct objectives and approaches to digital transformation. These include Business Process Outsourcers (BPOs), Business Process Managers (BPMs), End Customers, and Societal Stakeholders. For a smooth transition from BPMs to BPOs as well as between different BPOs, Artificial Intelligence (AI), Robotic Process Automation (RPA), Business

Process Mining (BPM), and Cloud Computing are required. Digital orchestration becomes complex due to the presence of service supply chains within BPO networks, driven by increased enterprise cooperation, regulation, governance, and digitalization.

A service supply chain (SSC) is a collection of service activities that combine the resources of two or more organizations to deliver services to the end customer. BPO networks have four major SSCs: information technology, accounting, human resources, and generic services. Resilience in BPO networks is the capacity to anticipate, absorb, and recover from disruptions.

Resilience maturity has been described as having three aspects: susceptibility, which measures the extent to which the organization is negatively impacted during a disruption; robustness, which measures the capacity to withstand the disruption without a significant impact on performance; and rapid recovery, which measures the capacity to bounce back to normal conditions. The business continuity of BPO networks in the face of digital disruption will affect BPO service supply chains.

Therefore, the first research question that can be formed is: What are the actors, technologies, platforms, and governance structures, and how does the entire construct come together in the digital orchestration of BPO networks? The second research question would be: What service supply chains make up the BPO networks? What are the elements of service supply chains in various BPMs and BPOs? How are the service supply chains shaped? The third research question would be: What makes up the concept of resilience in BPO networks? What are the different aspects of the concept of resilience maturity in BPO networks? In the modern business environment characterized by rapid technological change, BPO networks are undergoing a digital transformation. Thus, the fourth research question would be: What is the current state of the digital transformation in BPO networks? What drives the concept of digital transformation?

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