The moderator effect of balance of power on the relationships between the adoption of digital technologies in supply chain management processes and innovation performance in SMEs

Abstract: Managing supply chain (SC) relationships to deal with challenges posed by contemporary social and business environments is a difficult task that can be facilitated with the use of digital technologies. The growing complexity of supply chains, characterized by over-dependencies on geographically dispersed partners across different regions, increases risks related to managing these relationships and highlights the importance of collaboration and balancing the power dynamics between SC partners. Previous studies have shown that small and medium enterprises (SMEs) can be considered the weakest link in terms of digitization and balance of power. This article aims to analyse how buyer-seller power relations moderate the relationship between the adoption of digital technologies in supply chain management (SCM) processes and innovation performance in the context of SMEs. Data were collected from manufacturing SMEs operating in Portugal. The results support the assumption that the use of digital technologies in processes related to SCM has a positive effect on SMEs innovation performance. The results also suggest that non-mediated power and reward-mediated positively moderate the relationship between the adoption of digital technologies and innovation performance, while the impact of coercive-mediated power was not confirmed. The article contributes to theory and practice by advancing the literature and guiding managers in the challenging task of carrying out digital transformation initiatives, considering their relationship with the power dynamics in the complex context of SMEs.

Keywords: balance of power; digital supply chain; innovation; digital technologies; SMEs

1. Introduction

The instability caused by successive crises (economic, social, environmental, and health) has highlighted the pressure on businesses to develop innovative ways to meet their customers' needs and to increase operational efficiency and agility (Sabahi & Parast, 2020). Small and medium enterprises (SMEs) tend to face even greater challenges due to their limitations related to the lack of resources and their often "fragile" role in the supply chain (SC) (Alegre and Chiva 2008; Jun et al., 2022). Digital technologies have been increasingly linked to the ability of companies to drive innovation performance as well as to improve collaboration and digital maturity (Kane et al, 2017).

Managing SC relationships, especially power dynamics, plays a fundamental role in the digitalization process and, therefore, a supply chain management (SCM) focus is needed to understand further this process (Schroeder et al., 2019; Xiao et al., 2019; Hennelly et al., 2020). Nonetheless, there is still room for further investigation into this topic (Holmström et al., 2019; Seyedghorban et al., 2020). This paper aims to bridge the gaps identified in the literature by

analysing the impact of the balance of power dynamics on the relationship between the adoption of digital technologies in processes related to SCM and innovation performance in SMEs.

Business relationships and their impact on performance have seen a prolific research agenda (Pfaff et al 2023; Siemieniako et al., 2023) with a focus on SC relationship management and the quality of those relationships (Ambrose et al., 2010). Previous studies include the type of relationships established (collaborative, coopetitive, opportunistic, etc.) to develop digital business models (Scuotto et al., 2017; Xu et al, 2022) and interfering variables such as context and culture (Faruquee et al., 2021). Nevertheless, fewer studies have detailed the role of power dynamics in the digitalization of SMEs and focused on how digital transformation processes affect relationships, particularly in terms of power dynamics in a pre and post-digital SC context and the factors that affect the digital transformation in SMEs (Carson and Ghosh, 2019; Siemieniako et al., 2023; Pfaff et al 2023).

Power refers to the influence that can be exerted by companies to induce desired actions from SC partners (Ireland & Webb, 2007; Elias, 2008; Tao et al., 2022) and power dynamics have been widely used in SCM literature (Benton & Maloni, 2005; Kähkönen, 2014; Lacoste and Johnsen, 2015; Huo et al., 2017). Thus, although with mixed results, the effects of individual power bases are also not a new empirical consideration as supported by various studies (Zhao et al., 2008; Chen et al., 2016; Huo et al., 2017; Kim & Choi, 2018; Zhang et al., 2020) inclusively in SCM contexts (Benton & Maloni, 2005; Chae et al., 2017; Huo et al., 2017).

However, although previous studies acknowledge the importance of power relationships as an almost default condition in SC relationships (Obal & Lancioni, 2013; Morgan et al., 2018; Lin et al., 2021), these studies do not specify the role of different power base dynamics in digital SCs (Queiroz et al., 2021; Pfaff et al, 2023), particularly to clarify the road for SMEs (Ramdani et al., 2022; Setkute and Dibb, 2022). Moreover, previous studies have mostly focused on analysing the direct effect of the different power bases on the strength of the buyer-supplier relationship or their effects. In this study, and based on the overview of the literature, we proposed looking at power as a moderator of digitalization and innovation, more specifically aiming to understand whether the balance of power influences the relationship between the adoption of digital technologies in processes related to SCM and innovation performance in SMEs.

The literature suggests that digitalization in SMEs is still not fully understood (Hennelly et al., 2020; Rad et al., 2022; Jun et al., 2022) and that although a commonly accepted premise,

digitalization impact on innovation has also seen calls for further investigations, particularly in European SMEs (Scuotto et al., 2017; Bollweg et al., 2020; Fernández-Portillo et al., 2022). This study addresses SMEs for two main reasons: (1) they are essential contributors to job creation and global economic development, representing about 90% of businesses and more than 50% of employment worldwide (World Bank, 2022); and (2) SMEs play an important role in most SCs and are often the weakest link when it comes to power dynamics (Oliveira et al., 2021).

We aim to address the identified gaps in terms of lack of clarity for SMEs SCs (Scuotto et al., 2017; Bollweg et al., 2020; Ferreira et al., 2023) and the impact of digitalization on innovation performance using quantitative research (Hennelly et al., 2020; Jun et al., 2022). Thus, unlike previous research (Ardito et al., 2021; Tajudeen et al., 2022) that focused mostly on the individual impact of each technology or their implementation levels, this study incorporates a SCM process view when looking at adoption. We considered both the intensity and frequency of the adoption of digital technologies in processes related to SCM. Therefore, focusing mainly on the managerial aspects of these technologies, rather than their technical aspects, we considered the intensity and frequency of use by the company of nine generic technologies that are among the most explored both in literature and companies (Schumacher et al., 2016; Ghadge, et al., 2020; Stentoft et al., 2020) in the following SCM-related processes: Research & Development; Procurement; Manufacturing; Distribution; and Service, support, and recovery. Therefore, instead of looking at the separate effects of the different technologies usually considered in the digital transformation of SCs, we intend to look at the adoption of these practices as a whole and see how they impact innovation performance when combined as a set of resources.

Considering that the complexity of current SCs demands innovative ways to improve the management of relationships, this paper aims to answer the following research question: *How do buyer-seller power relationships moderate the relationship between the adoption of digital technologies in processes related to SCM and innovation performance in the context of SMEs?* The paper contributes to theory and practice by advancing the literature and providing guidance to managers in the challenging task of performing digital transformation initiatives, considering its relationship with power dynamics in the complex context of SMEs.

The rest of the paper is organised as follows: section 2 presents a literature review about the topics under analysis and provides the research hypotheses. Section 3 explains the methodology used in the study, including data collection and measurement scales. In section 4, findings are presented, followed by the discussion and conclusions in section 5.

2. Literature review

2.1. Digitalization and innovation performance

Digital technologies can be categorised under three broad areas: digital technology enablers, digital systems integrators, and application technologies (Gurria, 2017). The enablers include technologies such as big data and analytics, Internet of Things (IoT), and cloud computing. Integrators include simulation, artificial intelligence, and cyber-physical systems, while the application technologies are those which the main productivity effects in the industry are likely to unfold, including additive manufacturing/3D printing, autonomous systems, robots and cobots and human-machine integration (Gurria, 2017). Thus, companies should first establish the digital enablers, followed by digital systems integrators, and then, finally, the application technologies, when dealing with SC processes (Ehie & Ferreira, 2019). This supports the idea of considering a combination of technologies instead of the impact of individual technologies on their own.

Hennelly et al (2020) emphasised the need to further research digitalization's operational feasibility, maturity and SC implementation rather than focus on 'readiness' as the majority of studies had done until that point. This is emphasized by Nasiri et al. (2022) that found that digital orientation and digital intensity on their own do not impact financial performance. Specifically, digital intensity reduced the performance effects of digital orientation and digital maturity worked as a mediator between digital orientation and financial success, as well as working as a moderator between digital intensity and the financial success of companies. However, as stated by Gökalp and Martinez (2022), although various digitalization maturity models have been suggested, there is a lack of consistency between them. In their systematic review of the literature, they found that none of the 18 existing digital transformation maturity models fully satisfied the criteria of suitability, completeness, clearness, and objectivity. Focusing on the adaptation of the organisation strategy and adequate governance, these authors prosed a holistic maturity model to assist organisations by providing current capability and maturity determination, deriving a gap analysis, and creating a comprehensive roadmap for improvement in a standardised way.

Focusing on capabilities required, Queiroz et al (2021) proposed a framework with thirteen propositions derived from the identified seven basic capabilities (ICT policies, worker policies, supplier integration, customer integration, warehouse capabilities, transportation and smart production) that shape the digital SC capabilities and six main enabler technologies

(BDA; blockchain; AI; CC; CPSs and IoT) that allow high levels of integration with other SC members. Rad et al (2022) compiled the benefits, challenges, and critical success factors of each core I4.0 technology and their individual SC performance implications.

To sum up, the digital maturity models tend to focus on a higher level of analysis that requires a strategic approach and the digital implementation studies aforementioned highlight the need to understand the combination effect of multiple technologies and the need for further solidification and interdisciplinary diffusion efforts. Given this, the present study considers digitalization in SMEs' SCM related processes and how this combination of digital steps has impacted their innovation performance.

Specifically looking at digital transformation in SMEs', Ghobakhloo and Iranmanesh (2021) identified eleven digital transformation success determinants and the order in which these should be presented. According to the authors, this enables the identification of strategic priorities based on driving and dependence power. They also argued that digital transformation is resource-intensive and complex, requiring specific capabilities (such as change management and digitalization strategic planning) to attain a certain degree of information, digital, operations and cyber maturity. As a result, SMEs tend to lag behind in terms of digitalization. Focusing on the contributions of digital technologies to environmental and social sustainability, Ferreira et al (2023) also concluded that there's still a low implementation level of digital technologies in European manufacturing multinational enterprises (MNEs) business models. This is also an issue for European SMEs (Scuotto et al., 2017), which highlights an additional research gap. For example, Eller et al (2020) established that digitalization significantly affects SME performance and found a mediating effect of information technology on performance. Fernández-Portillo et al (2022) stated that innovation moderates the relationship between business digitalisation and performance. Bollweg et al (2020) studied the digitalization drivers and barriers of SMEs and found that there were more barriers than drivers which increased the uncertainty of its implementation. The only driver was a positive attitude towards digitalization, whilst barriers included lack of available resources, low perception of external pressures, low intentions to use and low current use of digitalization. Hence, research focused on European SMEs suggests further work is still required, which further explains the focus of this research and the selected sample that considers Portuguese SMEs. SMEs in Portugal play an important role in job creation (accounting for 77,4% of employment) and in economic growth (accounting for 68,3% value added), representing 99.9% of total enterprises (European Commission, 2019).

As illustrated, the impact of digitalization on performance is fairly accepted in the literature, and digital transformation has also been previously associated with improved organizational/dynamic capabilities (e.g., Akter et al., 2021; Ghobakhloo and Iranmanesh, 2021; Guo et al., 2023), environmental performance/sustainability (Wei and Sun, 2021; Ferreira et al., 2023) and innovation (Jun et al., 2022; Troise et al., 2022). In the present era of digital advancements, the ability to attain innovation performance has emerged as a vital determinant of success for nearly all organizations (Alegre and Chiva 2008; Jun et al., 2022). Nonetheless, studies supporting the impact of digitalization on innovation have considered both its direct and interaction effects with mixed results.

Examples of direct effects of digitalization include Ferreira et al., (2019) that studied the factors that lead companies to adopt new digital processes and their consequences in terms of innovation and performance. Their results suggested that digitalization increases competitiveness and that factors such as firms "maintaining their market share", "increasing their market share", and "raising their service quality" have a statistically positive influence on the adoption of new digital processes. Similarly, companies with greater levels of product/service innovation and with higher total innovations accrue higher performance. Ardito et al (2021) empirically demonstrate that SMEs digital orientation has a positive direct effect on product and process innovation performance. This is equally supported by Tajudeen et al (2022) who found an impact of digitalization strategic orientation on process innovation capabilities. The authors understand digital orientation as making a deliberate choice to transform a company's operational functions into a digital format and argue that there is a lack of quantitative empirical studies looking at the impact of digitalization on innovation performance, mostly seen from a qualitative approach (Paiola et al., 2022).

According to Troise et al (2022), digital technologies capability, relational capability and innovation capability are the antecedents of organisational agility which will then significantly influence financial performance as well as product and process innovation. Wei and Sun (2021) also supported empirically the positive impact of manufacturing digitalization on green process innovation and firm performance. Alternatively, Pesch et al (2021) looked at formalization at the project level to determine if it could enhance digital product innovation. They found that formalization enhanced digital product innovation radicalness and digital product innovation performance but with decreasing positive marginal returns. These findings suggest a resetting of priorities in terms of the relationships developed for formalization and therefore for digital transformation.

In turn, looking at innovation performance in terms of product innovation and efficacy, Jun et al (2022) found that digital platform capability, improvisational capability and organizational readiness have a significant positive relationship with innovation performance. Moreover, they found a mediating effect of organizational readiness which suggests a link between digital maturity and the level of implementation of technology. Li et al. (2023) found that both firm digitalization and the level of regional digital industry innovation can improve firm innovation. Nonetheless, they found a negative moderating effect of the regional digital industry innovation level on the firm digitalization innovation effect. Additionally, they concluded that the impact of firm digitalization on innovation was more visible in digital-related service industries. Recently, Dahms et al (2023) results suggested that there is not one single variable that affects innovation performance but instead, it is the different combinations between organizational agility and digital capabilities (the main drivers) and competencies and embeddedness in internal and external networks (the complementary antecedents of innovation) that lead to high innovation performance levels.

This overview of the literature suggests that digitalization in SMEs, especially in the context of SCM, is still not fully understood and that although a commonly accepted premise, digitalization's impact on innovation has also seen calls for further investigations. Thus, this study incorporates the SCM process view when looking at digitalization, gathering the perceptions of SMEs concerning relationships and digitalization of different processes related to SCM. Hence the following hypothesis is proposed:

H1: There is a positive relationship between the company's adoption of digital technologies, and their use in processes related to SCM, and its innovation performance.

The general trend towards the increased use of technology and what the literature names digitalization is due not only to the individual technologies that have become available and the rate of digital innovation, but also due to the increasing demands regarding SC transparency, real time analytics and partner coordination (Handfield, 2019; Seyedghorban et al., 2020; Pfaff et al., 2023).

Therefore, the increasing dependence of B2B relationships on technology and vice-versa is not new, and the importance of the relationships established between firms for SC technology alignment has been frequently emphasized (Baraldi and Nadin, 2006; Obal and Lancioni, 2013; Runfola et al., 2023). Runfola et al (2023) established that environmental uncertainty generates a strengthening of existing buyer-supplier relationships which leads to

relationship resilience. Thus, they also identified the adoption of digital tools as one of the five pre-existing conditions that can assist relationship resilience under uncertainty. Underpinned by the dynamic capabilities and the relational view of organizations, Dubey et al (2021) found that alliance management capability enhances operational and financial performance, and this relationship is mediated by artificial intelligence-powered SC analytics capability. They also found that alliance management capability had a significant effect on artificial intelligence-powered SC analytics capability, and this was moderated by environmental dynamism. Adding to this, Tian et al. (2021) established that digitalization has increased collaborative platforms usage and therefore altered the dynamic between SC actors, discussing the conditions for co-evolution and value creation. Karki et al (2021) found support for the existence of hierarchical power relationships between organisations in the SC, despite close collaboration. In turn, Mosch et al (2022) identified four network roles (enabler, extender, transformer, orchestrator) alluding to the different roles played by different actors in technology adoptions/implementation and they developed a specific classification framework for data-driven start-ups.

These examples suggest that there are clear power dynamic changes that occur when implementing a digital transformation process or selecting the technologies to be adopted. Nonetheless, the phenomenon of digitalization and digital SCs in themselves still offer much room for investigation, before delving into its impact on other constructs. Handfield (2019, p. 194) states that "although interpersonal buyer-seller relationships will remain important, digital transformation is changing the nature of how these will unfold." This is supported by studies such as Faruquee et al (2021) that explored digital transformation as a substitute for trust, for example. Investigating the digitalization of cultural heritage, Nyhlén and Gidlund (2019) argued that digitalization could potentially reinforce existing power structures and exclude practices rather than defy or transform them.

Therefore, even though the field of business relationships and their performance impact has seen a prolific research agenda (Pfaff et al 2023; Siemieniako et al., 2023), fewer studies have detailed how digital transformation processes affect relationships, particularly in terms of power dynamics in a pre and post-digital SC context and the factors that affect the digital transformation in SME's (Carson and Ghosh, 2019; Siemieniako et al., 2023; Pfaff et al 2023). Subsequently, this is the main gap we aim to address with the proposed research model where the balance of power is seen as a moderating variable.

2.2.Balance of power as a moderator

Power is a multi-dimensional element that refers to the influence that can be exerted by companies to evoke desired actions from SC partners (Ireland & Webb, 2007; Tao et al., 2022). It is a fundamental aspect of understanding buyer-supplier relationships and behaviours (Cox, 2004; Kähkönen, 2014; Morgan et al., 2018; Lin et al., 2021). As argued by Rehme et al (2016), the power balance is dynamic, so power positions need to be constantly re-evaluated. Focused on how power relates to hegemony, Johnsen et al. (2020) further support this dynamic characteristic by proposing a conceptual framework, 'the hegemonic triangle', identifying a hegemonic approach to customer-supplier relationships involving dominance, mastery, and authority. Power has been measured in different studies in many ways, such as the 14 sources of power by Morgan (1997); Salancik and Pfeffer's (1977) strategic-contingency model (political vs institutionalized); restrictive versus promotive control (Elias, 2008; Scholl, 1999); and Pfeffer and Fong (2005) focus on power process. However, the most commonly used taxonomy is French and Raven's (1959, 1993)[1] classification of power bases to analyse the effect of the buyer-supplier power relationship – the focus of this study and literature overview.

French and Raven's (1959, 1993) classification has been widely used in SCM research (e.g., Benton & Maloni, 2005; Kähkönen, 2014; Lacoste and Johnsen, 2015; Rehme et al., 2016; Chae et al., 2017; Huo et al., 2017), distinguishing between mediated and non-mediated power dynamics and containing five types of power bases: reward power, coercive power, expert power, referent power, and legal legitimate power. Although with mixed results, the effects of individual power bases are not a new empirical consideration as supported by various studies (Zhao et al., 2008; Nyaga et al., 2013; Liu et al., 2015; Chen et al., 2016; Huo et al., 2017; Kim & Choi, 2018; Zhang et al., 2020) inclusively in SCM contexts (e.g., Benton & Maloni, 2005; Chae et al., 2017; Huo et al., 2017).

Expert and referent powers are considered non-mediated powers, which depend on the context (Brito & Miguel, 2017). Non-mediated powers are related to more implicit actions, and usually, the recipient company can decide whether and how it will be influenced by the partner that is using the power (Zhao et al., 2008). Rehme et al (2016) highlighted the possibility of exerting a non-coercive power resource, such as information asymmetry, to increase relative power. They also state that being open about the power position between a buyer and a seller can foster efficient collaboration. Focused on information sharing, Bodendorf and Franke (2022) found no effect of different power structures on information-sharing preferences, stating

[1] For a review of this taxonomy see Elias (2008) and for a review on organisational power see Clegg et al. (2006).

that information exchange preferences stay the same if the supplier has more power and may thus influence the transfer price more (i.e., transfer price gets higher) and if the manufacturer has more power (i.e., transfer price becomes lower).

Reward, coercive and legitimate powers are considered mediated powers that buyers may use whenever and however they want (Handley & Benton, 2012; Reimann & Ketchen Jr., 2017). Mediated power concerns the intentional and explicit attempt of a company to exert influence over an SC partner (for instance, by offering a reward or threatening punishment). Whilst non-mediated powers (expert and referent) seem to exert positive influences on buyer-supplier relationships, empirical evidence of the effect of mediated powers (including reward and coercive) on buyer-supplier relationships is mixed. Hence, Benton and Maloni (2005), Liu et al. (2015) and Chae et al. (2017) further distinguish between two types of mediated powers in their research, namely coercive-mediated power (coercive and legal legitimate) and reward-mediated power (reward), thus the separate consideration of both in our study.

Although demonstrating inconsistent findings, previous studies acknowledge the importance of power relationships as an almost default condition in SC relationships (Obal and Lancioni, 2013; Kähkönen, 2014; Morgan et al., 2018; Siemieniako & Mitręga, 2018; Lin et al., 2021). However, they do not specify the role of different power base dynamics in digital SCs (Queiroz et al., 2021; Keegan et al., 2022; Pfaff et al, 2023), particularly to clarify the road for SMEs (Ramdani et al., 2022; Setkute and Dibb, 2022).

A stronger buyer-supplier relationship has the potential to provide multiple benefits such as reduced uncertainty for both buyers and suppliers, cost-saving from economies of scale, decreased switching costs, and integration of the same technologies and processes (Maloni & Benton, 2000). Benton et al. (2020) findings support that bilateral communication and cooperation increase supplier performance, although they did not connect this effect to individual power bases. As highlighted by Cox (1999), the structure of power within SCs depends on the context, and managers need to understand the nature of their SCs before implementing a particular strategy in the relationship with partners. Hence the focus of this research is on the context of SMEs' digitalization.

Moreover, previous studies have mostly focused on analysing the direct effect of the different power bases on the strength of the buyer-supplier relationship or their effects. In this study, instead of direct effects, we propose looking at power as a moderator of digital SC adoption.

2.2.1. Non-mediated powers

Non-mediated power sources (expert and referent) have been found to have positive effects on buyer-supplier relationships, competence, and mutual trust (Benton & Maloni, 2005; Liu et al., 2015). For example, Siemieniako and Mitręga (2018) empirically demonstrated how supplier tactics influence benefits acquired by suppliers through different power sources, specifically non-mediated power sources (referent, informational and expert power). These authors suggested a dual tactical and complementary approach towards business partners that includes the dedication of resources but also developing their competencies and openness to new associates.

Expert power is related to the knowledge asymmetry between the buyer and the supplier, and the interest of the less knowledgeable firm to learn from the other (Zhao et al., 2008). Firms' interaction with other companies more competent than them may bring additional value, and as such firms may invest more time and resources to strengthen and maintain the relationship (Palmatier et al., 2006). However, benefits obtained from such a relationship may experience a U-shaped relationship, being the highest either for weak or strong ties, and the lowest for moderate ties (Kim & Choi, 2018). In turn, referent power refers to the situation where the weaker partner wants to be associated or identified with the stronger partner, for instance, to gain reputation (Huo et al., 2017).

Non-mediated power may also increase the supplier's normative relationship commitment (Zhao et al., 2008). In particular, expert power may foster knowledge integration, the establishment of knowledge sharing systems, and facilitate conflict resolution (Huo et al., 2017; Matheus et al., 2017). Concerning referent power, Terpent and Ashenbaum (2012) found that it positively affected supplier performance in terms of innovation, flexibility, quality, cost, and delivery, but this effect attenuated as the supplier network size increased.

Jin and Shao (2022) used the resource-based view and resource dependence theory to understand how firms can come up with more breakthrough innovations by leveraging network power (in terms of knowledge and relational power). These authors empirically demonstrated that both knowledge and relational power (as independent variables) have inverted U-shaped relationships with breakthrough innovation, and knowledge integration partially mediates the above relationships.

Thus, following the predominant perspective that suggests that non-mediated power has a positive impact on relationships and performance, it is hypothesized that:

H2: Non-mediated power moderates the relationship between the adoption of digital technologies in processes related to SCM and innovation performance.

2.2.2. Coercive-mediated power

Looking into mediated and non-mediated power, Kumar, Jebarajakirthy and Das (2022) found that expert and reward power sources enhanced trust in channel leaders while affective commitment mediated the effects of all the non-coercive power sources on trust. In turn, coercive power weakened the effects of expert power on trust. Zhao et al. (2008) found that reward power and coercive power increased instrumental relationship commitment, which was not based on mutual commitment and sharing, but on compliance with the hope of receiving something in exchange from the other party.

Exploring coercive and non-coercive power, Feng et al. (2020) found that manufacturers' IT capability weakens the negative effect of exercising coercive power and the positive effect of exercising non-coercive power on interfirm cooperation. Aligned with this, Gupta et al. (2020) found that coercive pressure plays a significant role in moderating the relationship between the type of orientation and adoption intention for digital SC. Thus, looking into green supplier integration, Zhang et al. (2020) found that coercive power undermined normative commitment, while non-coercive power promoted normative and instrumental commitments. These authors argued that companies need to carefully balance coercive and non-coercive powers to encourage firms to maintain good relationships with suppliers and be aware of the impact of trust and dependence in those relationships. Aligned with this, Bouncken et al.'s (2020) research confirmed the negative effect of coercive power on innovation performance in both the short and long term but highlighted the importance of contractual arrangements in this effect, with complete contracts protecting against higher dependence at the beginning of the collaboration, but with incomplete contracts enhancing the innovation performance in the long term (possibly complemented with trust).

Pulles et al. (2014) found no significant effect of coercive power on suppliers' physical and innovation resource allocation. However, coercive power showed a negative relationship related to goodwill trust (Pulles et al., 2014). Liu et al. (2015) results also suggested that coercive power may damage trust but found no effect of reward power. Chen et al. (2016) stated that coercive power may have a negative effect on knowledge sharing. Considering that power holders may influence their targets via third parties, Low (2018) details how four coercive power tactics are exercised through two-step manoeuvres, and what differences are between power exercise in the dyads and that in the triads. The study suggests that the shift of power source from a dyad to a triad impacts on the target firm's behaviour and overall network performance.

Despite the differences in the findings, coercive and legal legitimate power are consistently seen as more relationship-damaging than reward power in previous studies (Benton & Maloni, 2005; Liu et al., 2015; Nyaga et al., 2013; Zhang et al., 2020). Hence it is hypothesized that:

H3: Coercive-mediated power moderates the relationship between the adoption of digital technologies in processes related to SCM and innovation performance.

2.2.3. Reward-mediated power

Pulles et al. (2014) find that reward power is positively associated with suppliers' allocation of physical and innovation resources. However, Benton & Maloni (2005) established that reward power, while having a positive effect on buyer-supplier relationships, is less significant than the other power effects.

Wang et al (2015) concluded that increasing the reward–penalty intensity can improve the electrical and electronic equipment collection and lower product prices which they use to suggest different levels of responsibility between manufacturers and government-imposed sanctions. Grant and Preston (2019) investigated the use of social power to mobilise the SC into knowledge sharing. They found that power and influence played a powerful role in supporting knowledge sharing even in typically competitive SCs where information and knowledge exchange are usually guarded.

Investigating corporate social responsibility (CSR), Harness et al (2018) highlighted the central role that different forms of power exercised by large firms, investigating power as a negative (via coercion) or positive force (through expert or reward benefits). Results suggested that the application of both expert power and reward power generates a significant positive change in SME CSR behaviour. Their findings confirm the strength of the influence of larger firms particularly when positively using power.

Additionally, Gao et al (2023) also emphasized the importance of cooperation quality demonstrating that highly digitized or large-scale enterprises can reduce the negative impact of agent heterogeneity on innovation performance. Nonetheless, in small-scale enterprises or companies with lower digitalization levels, cooperation quality was key for improving performance. Guo et al.'s (2023) study of digital new ventures also suggested that there was a positive effect of coopetition on innovation performance, and this was mediated by entrepreneurial and adaptive agility. Thus, the last hypothesis of this study is:

H4: Reward-mediated power moderates the relationship between the adoption of digital technologies in processes related to SCM and innovation performance.

2.3. Research Framework

This paper aims to bridge the research gaps identified in the literature through the model presented in Figure 1, which represents the direct effect of the adoption of digital technologies in processes related to SCM on innovation performance, as well as the moderator effect of balance of power dimensions on these relationships. The model reflects the concept of fit as moderation, where the adoption of digital technologies in the SC is the predictor variable, innovation performance is the criterion variable and balance of power is the moderator variable.

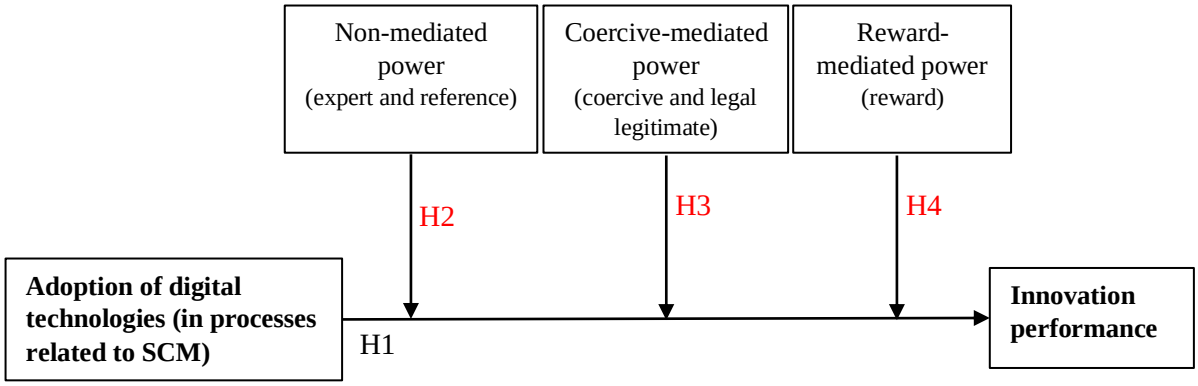

Figure 1. Research model and hypotheses

3. Methodology

3.1. Sample and data collection

To test the model proposed in this study, a questionnaire was developed and applied. Once developed, the questionnaire was assessed by five researchers with experience in the SCM field. Their feedback generated small changes in the questionnaire. This version, written in English, was translated into Portuguese and back-translated into English. The resultant version was then checked against the original one. The questionnaire was then pilot tested in five companies to verify if the items were clearly understood by the respondents, resulting in some minor modifications. After these changes, the final version was reviewed by two academic experts and was made available on the online platform Qualtrics. The combination of these procedures supports the reliability and validity of the measurement method applied in the research (Chen et al., 2016).

Data were collected from SMEs operating in Portugal. SMEs were identified based on the EU definition, which is determined by staff headcount (less than 250 people), annual turnover (less than EUR 50 million), and/or balance sheet total (less than EUR 43 million) (EC, 2020). The manufacturing sector was defined according to the statistical classification of economic activities in the European Community (NACE, 2021) and the final sample incorporates companies from various sectors, such as automotive and parts, construction and materials, food and beverages, industrial materials, machinery and plant construction and textiles and apparel. The focus of this study is not on the products or services themselves provided by SMEs, but instead, the emphasis is on the SC processes and how they are managed by adopting and implementing a range of digital technologies.

The target population was identified using the database SABI (System for the Analysis of Iberic Balances) which contains business information on Portuguese and Spanish companies. Once the database was cleaned (removal of companies with no contact details or those that had ceased business), the companies were filtered by the number of employees (less than 250) and with an annual turnover below EUR 50 million, and a final sampling pool of 1000 companies was randomly defined. A first contact was made to identify the key respondent in each company (the person best suited to answer the questions), to whom an email was sent with the necessary information. In companies where it was not possible to obtain the email of that person, the questionnaire was sent to the company's general email. The email was composed of a brief explanation of the purpose of the study, a note about anonymity, and a link to the questionnaire. Follow-up emails were sent twice and some of the companies were then contacted via telephone to increase the number of responses obtained. From this, 109 valid responses were retrieved and analysed, which constitutes a response rate of 11%. This response rate is considered adequate, particularly considering the difficulties imposed on companies during the COVID-19 pandemic which became a barrier to collecting data.

Table 1 presents specific characteristics of the sample in terms of sector of activity, companies' foundation year, the number of employees, and annual turnover. The sample included companies from different sectors and most companies were created before 1990, which indicates a long period of operations. This is important in our analysis because it demonstrates that the sample represents established companies in the country whilst not excluding newer start-ups.

Table 1. Sample composition

	Sample	Sample (%)
Sector of activity		
Food and beverages	24	22,02
Textiles and apparel	16	14,69
Construction and materials	12	11,01
Automotive and parts	11	10,09
Industrial metals	7	6,42
Machinery and plant construction	6	5,50
Chemical	3	2,75
Electronic and electrical equipment	3	2,75
Household goods and personal care	2	1,83
Oil and gas	2	1,83
Pharmaceuticals and biotechnology	2	1,83
Other	21	19,28
Companies' foundation year		
Before 1970s	20	18,35
1971 to 1980	20	18,35
1981 to 1990	18	16,51
1991 to 2000	25	22,94
2001 to 2010	18	16,51
2011 to 2019	8	7,34
Number of employees		
Less than 10	5	4,59
10 to 49	58	53,21
50 to 250	46	42,20
Annual turnover (EUR)		
< 1Million	16	14,68
1Million < 2Million	16	14,68
2Million < 10Million	48	44,03
10Million < 50Million	29	26,61

A sample of 20 non-respondents was randomly selected and contacted to evaluate non-response bias. They were asked to respond to a set of non-demographic questions, whose answers were compared to the main sample. No significant differences were detected between the answers of respondents and non-respondents (Mentzer & Flint, 1997). Aiming to reduce potential common-method bias, the respondents' anonymity was protected, and the respondents were assured that there were no right or wrong answers.

3.2.Measures

The questionnaire included Likert scale options that were developed based on previous work to measure the level of adoption of digital technologies, the balance of power, and innovation performance.

The adoption of digital technologies was measured by combining the level of adoption of digital technologies and the frequency these technologies are applied in SCM-related

processes. The scales were adapted from previous studies by Schumacher et al. (2016), Druehl et al. (2018), Ghadge, et al. (2020) and Stentoft et al., (2020). To assess the level of adoption of digital technologies we considered nine generic technologies that are among the most explored both in literature and companies: big data analytics, autonomous robots, cloud computing, simulation technologies, Internet-of-things (IoT), additive manufacturing (3D printing), augmented reality, business intelligence and cybersecurity. The respondents were asked to inform the level that the company adopts the aforementioned digital technologies, using the following seven-point Likert scale: (1) The technology is not used in the company at all; (2) Initial level – the adoption/implementation is at an initial stage (ad hoc, "chaotic", emerging, lack of understanding); (3) Repeatable – the technology is documented sufficiently (there is an established methodology to implementation, the technology implementation has being controlled and coordinated, reactive); (4) Defined – the technology is implemented but its contributions are still very limited (standardized and documented, proactive); (5) Managed – the technology is implemented but its contributions are limited (quality metrics have been established, the technology is reliable); (6) Optimized – the technology is fully implemented and contributes to processes optimization/improvement (continuous improvement); and (7) Consolidated – the technology is fully implemented, has proven its contributions and is consolidated in the companies processes and culture (share of knowledge and information). Additionally, respondents were asked to indicate the frequency that the company applied digital technologies in the following SCM-related areas: Research & Development; Procurement; Manufacturing; Distribution; and Service, support, and recovery.

Balance of power was assessed by adapting the scale proposed by Chae, Choi and Hur (2017), which includes the five perspectives proposed by French and Raven (1959): reward power, coercive power, expert power, referent power, and legitimate power. The respondents were asked to indicate the extent to which they agreed or disagreed with 24 statements regarding the relationship of the company with its major customer. A seven-point Likert scale (with 1 = strongly disagree and 7 = strongly agree) was used as the measurement scale.

The innovation performance of SMEs was measured based on items used by Shu, et al. (2012) which included product and process-related items, using a seven-point Likert scale (with 1 = strongly disagree and 7 = strongly agree).

4. Results

4.1.Reliability and validity

Exploratory factor analyses (EFA) were conducted for the constructs. Discriminant validity was tested using factor correlation matrices, while reliability was assessed by means of Cronbach's alpha analyses, as it helps to evaluate the internal consistency of the constructs (Hair et al., 2010; Peng & Lai, 2012). The first analysis was performed considering the different types of power. All items were maintained as they presented factor loadings greater than 0.5 in the factors they were supposed to measure, as shown in Table 2. Cronbach's alpha results are greater than 0.7, indicating acceptable reliability (Peng & Lai, 2012).

Table 2 – EFA for the different types of power

Item Please indicate the extent to which you agree or disagree with the following statements (1 = Strongly Disagree; 7 = Strongly Agree).	**Non-mediated Cronbach's alpha: 0.87**	**Coercive-mediated Cronbach's alpha: 0.77**	**Reward-mediated Cronbach's alpha: 0.71**
Reward Power 1 - If we do not do what our major customer asks, we will not receive very good treatment from it.	-0.080	0.281	**0.524**
Reward Power 2 - We feel that, by going along with our major customer, we will be favoured by it on some other occasions.	0.127	0.028	**0.753**
Reward Power 3 - By going along with our major customer's requests, we have avoided some of the problems other suppliers face.	0.190	0.254	**0.781**
Reward Power 4 - Our major customer often rewards us, in order to get our company to go along with its wishes.	0.207	0.005	**0.629**
Coercive Power 1 - Our major customer's personnel will somehow get back at us if they discover that we did not do as they asked.	0.091	**0.696**	0.189
Coercive Power 2 - Our major customer often hints that it will take certain actions that will reduce our profits if we do not go along with its requests.	0.038	**0.567**	0.051
Coercive Power 3 - Our major customer might withdraw certain needed services from us if we do not go along with its requests.	-0.094	**0.760**	0.060
Coercive Power 4 - If our company does not agree to its suggestions, our	-0.001	**0.768**	-0.010

Item Please indicate the extent to which you agree or disagree with the following statements (1 = Strongly Disagree; 7 = Strongly Agree).	**Non-mediated Cronbach's alpha: 0.87**	**Coercive-mediated Cronbach's alpha: 0.77**	**Reward-mediated Cronbach's alpha: 0.71**
major customer could make things more difficult for us.			
Expert Power 1 - Our major customer's business expertise makes it likely to suggest the proper thing to do.	**0.600**	0.073	-0.077
Expert Power 2 - The people in our major customer's organization know what they are doing.	**0.729**	-0.002	0.052
Expert Power 3 - We usually get good advice from our major customer.	**0.778**	-0.043	0.044
Expert Power 4 - Our major customer has specially trained people who really know what has to be done.	**0.810**	-0.156	0.142
Reference Power 1 - We really admire the way our major customer runs its business, so we try to follow its lead.	**0.772**	0.124	0.260
Reference Power 2 - We generally want to operate our company in a way that is very similar to the way we think our major customer would.	**0.655**	0.082	0.288
Reference Power 3 - Our company does what our major customer wants because we have very similar feelings about the way a business should be run.	**0.683**	-0.072	0.327
Legal legitimate Power 1 - It is our duty to do as our major customer requests.	-0.017	**0.404**	-0.006
Legal legitimate Power 2 - We have an obligation to do what our major customer wants, even though it isn't a part of the contract.	0.137	**-0.039**	-0.268
Legal legitimate Power 3 - Since it is the customer, we accept our major customer's recommendations.	0.181	**0.038**	-0.135
Legal legitimate Power 4 - Our major customer has the right to expect us to go along with its requests	-0.038	**0.057**	0.266

The next analysis was conducted on the items that measure digital technology SC adoption level (Table 3). All items presented factor loadings greater than 0.5. Cronbach's alpha results are greater than 0.8, suggesting good reliability.

Table 3 – EFA for digital technologies adoption

Items	**Digital technology SC adoption level Cronbach's alpha: 0.85**
Please indicate the level that your company adopts/implements the following digital technologies (1 = Not used at all; 2 = Initial level; 3 = Repeatable; 4 = Defined; 5 = Managed; 6 = Optimized; 7 = Consolidated)	
Big data	**0.669**
Robots	**0.547**
Cloud computing	**0.578**
Simulation	**0.780**
IoT	**0.550**
3D printing	**0.599**
Augmented reality	**0.714**
Business intelligence	**0.730**
Cybersecurity	**0.648**
Frequency of use: Please indicate the frequency that your company applies the aforementioned digital technologies in the following supply chain management areas (1 = Never; 7 =Always (daily)	
R&D	**0.597**
Procurement	**0.815**
Production	**0.782**
Distribution	**0.851**
Service, Support and recovery	**0.857**

The last analysis was performed for innovation performance. All seven items were maintained, as presented in Table 4. Cronbach's alpha result is greater than 0.7, suggesting acceptable reliability.

Table 4 – EFA for innovation performance

Items Please indicate below the extent to which you agree or disagree with the following statements (1 = Strongly Disagree; 7 = Strongly Agree).	**Innovation performance Cronbach's alpha: 0.83**
The number of new products/services introduced in the past three years by our company increased steadily.	**0.690**
Our company continuously improves the quality of its products.	**0.606**
Our company continuously introduces new products and develops new markets.	**0.771**

Our company cares a great deal about the new technology breakthroughs.	**0.768**
Our company is a pioneer in developing new markets.	**0.687**
Our company has frequently improved manufacturing or operational processes.	**0.861**
Our company has endeavoured to economize resource consumption.	**0.603**

Confirmatory factor analysis (CFA), by means of structural equation modelling performed in the software AMOS 26, was used to examine the measurement models (Hair et al., 2010; Byrne, 2001). The fit indices of the structural model were tested, and the results ($p < 0.001$, IFI = 0.923, TLI = 0.914, CFI = 0.919 and RMSEA = 0.053) provide support for the validity of the structural model.

4.2.Hypotheses testing

Linear regression analysis was applied to test hypothesis 1 and hierarchical regression analysis (following Aguinis and Gottfredson, 2010) was used to test hypotheses 2, 3 and 4. First, innovation performance was included as the dependent variable. The adoption of digital technologies was placed as the independent variable, representing the direct effect in Model 1. In model 2 the effects of power relationships were examined with the inclusion of the three relationships to be tested: digital technologies SC adoption level x non-mediated power (H2); digital technologies SC adoption level x coercive-mediated power (H3); and digital technologies SC adoption level x reward-mediated power (H4).

The results obtained support hypothesis H1 ($\beta = 0.295$; $p < 0.001$), that the adoption of digital technologies in processes related to SCM has a positive effect on innovation performance (Model 1). Model 2 tested the effects of balance of power on the relationship between the adoption of digital technologies and innovation performance. The data supported H2, that non-mediated power positively moderates the relationship between the adoption of digital technologies and innovation performance ($\beta = 0.210$; $p < 0.005$); and H4, that reward-mediated power positively moderates the relationship between the adoption of digital technologies and innovation performance ($\beta = 0.326$; $p < 0.001$). On the other hand, the data does not confirm H3, that coercive-mediated power positively moderates the relationship between the adoption of digital technologies and innovation performance ($\beta = -0.064$; $p > 0.05$).

Besides the hypotheses testing, a cluster analysis on the different levels of the adoption of digital technologies in processes related to SCM was performed, as presented in Table 5, to increase the understanding of the phenomena under study.

Table 5 – The impact of different levels of adoption of digital technologies

	Digital technologies SC adoption level			
	Low (n=64)	**Medium (n=36)**	**High (n=9)**	**Total (n=109)**
Innovation performance	2.65 (2.43)	2.83 (2.57)	3,04 (3.14)	2.73 (2.57)
Non-mediated power	2.82 (2.81)	3.01 (3.04)	3.32 (3.38)	2.92 (2.92)
Coercive-mediated power	2.74 (2.63)	2.66 (2.50)	2.46 (2.38)	2.70 (2.50)
Reward-mediated power	2.34 (2.38)	2.56 (2.55)	3.04 (3.00)	2.46 (2.50)

Note: Means and medians (between parentheses) are presented.

The results show that 59% of the companies (64) present a low level of adoption of digital technologies in SCM-related processes, while 33% (36) present a medium level and only 8% (9) present a high level. The companies with higher levels of adoption of digital technologies present innovation performance 15% higher than those with the lowest levels. In terms of power, the results suggest that the companies with higher levels of digital technology adoption identified the presence of higher levels of non-mediated power and reward-mediated power and lower levels of coercive-mediate power when compared to companies with lower levels of adoption of digital technologies.

5. Discussion

Addressing the calls for further empirical studies on the impact of digitalization on innovation performance using quantitative research (Hennelly et al., 2020; Paiola et al., 2022; Tajudeen et al., 2022), we were able to empirically confirm the theorized positive effect of the adoption of digital technologies in processes related to SCM on innovation performance (H1). In line with the previous literature that explored the impact of digitalization on innovation performance (Jun et al., 2022; Paiola et al, 2022; Troise et al., 2022), our cluster analysis further revealed that companies with higher levels of adoption of digital technologies accrued a 15% higher innovation performance than those with the lowest levels.

Moreover, while previous research focused mostly on the impact of individual technologies (Büyüközkan and Göçer, 2018; Druehl et al., 2018; Hartley and Sawaya, 2019; Holmström et al., 2019; Seyedghorban et al., 2020), we have adopted an exploratory holistic view of the digitalization process. We considered not only multiple technologies but also analysed the extent to which they have been applied to SCM-related processes using an empirical quantitative approach. The literature suggests that the combination of several technologies (big data, IoT, robotics, etc) may help create integrated and self-optimizing SC systems that allow faster response to customer needs (Büyüközkan and Göçer, 2018) and we wanted to test this with regards to innovation performance.

Our results also show how the moderating effect of power differs across types of power bases. According to the transaction cost economics theory, suppliers would tend to seek rewards and avoid punishments (Nyaga et al., 2013). Buyers, on their end, may resort to mediated power more often when experiencing contract management difficulties, and less frequently when there exists higher dependency on the supplier or higher switching costs (Handley & Benton, 2012). We have been able to confirm that non-mediated power (H2), and reward-mediated power (H4), both moderate the relationship between the adoption of digital technologies and innovation performance. This seems to align with previous findings for example on the supplier benefits through non-mediated power sources (Siemieniako and Mitręga, 2018), the effect of the manufacturer's IT capability on weakening the negative effect of exercising coercive power and the positive effect of exercising noncoercive power on interfirm cooperation (Feng et al., 2020). Our results are consistent with previous work which suggest that non-mediated power sources have been found to have positive effects on buyer-supplier relationships, competence, and mutual trust (Benton & Maloni, 2005; Liu et al., 2015). In our sample, non-mediated measures are the most predominant power basis among companies with the highest level of digital technology adoption. Given that non-mediated power may also increase the supplier's normative relationship commitment (Zhao et al., 2008), foster the establishment of knowledge sharing systems, and facilitate conflict resolution (Huo et al., 2017), this may suggest that SCs adopting a self-reinforcing virtuous loop which fosters further digitalization. This knowledge sharing infrastructure should decrease the amount of resources suppliers need to innovate.

However, unlike Gupta et al. (2020) who found that coercive pressure moderated the relationship between the type of orientation and adoption intention for digital SC, we have not been able to confirm that coercive-mediated power (H3) could act as a moderator. In fact, our cluster analysis suggests that coercive measures are mostly predominant in companies with the lowest level of digitalization in our sample. This seems to align more with the findings from Guo et al. (2023) and Gao et al (2023) that established that cooperation quality was key for improving performance in small-scale enterprises or companies with lower digitalization levels, hence per default excluding coercive measures**.**

There are several factors which could explain why coercive-mediated power behaves differently with respect to the other power bases. Pulles et al. (2014) find that reward power might be positively related to goodwill trust, while coercive power shows a negative relationship. Other works also suggest that coercive power may damage buyer-supplier relationships and erodes suppliers' sense of competence and autonomy, while reward power

tends to strengthen them (Benton & Maloni, 2005; Liu et al., 2015; Nyaga et al., 2013). Coercive power may even have a negative effect on knowledge sharing (Chen et al., 2016), therefore adding additional barriers to innovation. Moreover, it might generate information sharing price/cost differences depending on who holds the power (Bodendorf and Franke, 2022).

In addition, it is unclear whether coercive power does not moderate the relationship between the adoption of digital technologies and innovation performance due to their lack of financial and human resources (typical in SMEs), or because of the attitude of their managers when they face situations of non-compliance with contractual terms. If the former, reward measures might be more effective than coercive measures as they help tackle directly one of the root causes of the problem. If the latter, poor managerial choices over the long term may endanger firms' financial sustainability, which could lead to a survivor bias in our sample.

5.1.Theoretical and managerial implications

Previous research has established the importance of power relationships (Obal and Lancioni, 2013; Kähkönen, 2014; Morgan et al., 2018; Lin et al., 2021), but the role of different power base dynamics in digital SCs has not been fully explored (Queiroz et al., 2021; Keegan et al., 2022; Pfaff et al, 2023), particularly for SMEs (Ramdani et al., 2022; Setkute and Dibb, 2022). This study contributes to the literature by providing trends in terms of power dynamics and the adoption of digital technologies in the context of SMEs' SCs.

Limited research has focused on how digital transformation processes affect relationships, particularly in terms of power dynamics in a pre and post-digital SC context and the factors that affect the digital transformation in SMEs (Sinkovics and Sinkovics, 2020; Siemieniako et al., 2023). Hartley and Sawaya (2019) argued that to successfully implement digital technologies, companies needed to develop a digital roadmap for SC processes which was common in larger organisations, but not typical in smaller companies. Moreover, in SMEs' digital transformation (the focus of this study), the management of relationship dynamics has been deemed key to successfully navigating the digital transformation journey (Pfeffer and Salancik, 2003; Foerstl et al., 2015; Hein et al., 2017; Schroeder et al., 2019; Xiao et al., 2019; Oliveira et al., 2021).

This study explores technology application combinations throughout SC processes which symbolise in our view a broader extent of technology dissemination. This view is supported by Büyüközkan and Göçer (2018) who recognise that independently of whether your product or service is digital or not, what is relevant in the digital SC transformation is how SC

processes are managed with a wide variety of innovative technologies. This is also supported by Gurria (2017) and Ehie & Ferreira (2019) that explain companies must first establish the digital enablers, followed by digital systems integrators, and then, finally, the application technologies, when dealing with SC processes.

Digitalization has redefined what strategic resources look like given the ease of access to information and knowledge and the flexibility in how this can be shared (Oliveira et al., 2021). This has changed the balance of power between companies and how SMEs harness value even when they would be in a traditional sense at a disadvantage. From a theoretical standpoint, this paper helps explain the power dynamics that come to play in SCM processes that may influence SMEs' performance (Oliveira et al., 2021). As companies become more dependent on one another, both parties (buyer and supplier) will pursue stability in the relationship to minimize their risks (Foerstl, et al., 2015). Hence, we can assume that the higher the level of digitalization, the higher the autonomy/independence a company develops which has a subsequent effect on power levels.

To be competitive in complex business environments, companies cannot act as isolated institutions. The increasing complexity of business conditions has led to a significant increase in the risks and requirements associated with managing relationships with customers, suppliers and other partners (Fan et al., 2013; Schroeder et al., 2019; Swift, Guide Jr. & Muthulingam, 2019; Xiao et al., 2019), making collaboration and the balance of power dynamics between SC partners even more relevant. Business relationships with SMEs bring additional risks due to their limited resources, making it particularly important to be involved in aspects related to innovation and the adoption of new technologies (Stank et al., 2019). Our findings suggest that buyers may find rewards and non-mediated power more effective than coercive measures, which pose the risk of causing additional damage to existing business relationships and limit the level of digitalization SMEs may achieve in the long term. Suppliers, on their end, may be willing to make relationship-specific investments, as long as they perceive they can learn and improve their core capabilities in the long term (Siemieniako and Mitręga, 2018).

In the case of SMEs, the power asymmetries between buyers and suppliers are exacerbated by the characteristic lack of resources of small enterprises. Previous studies have shown how SMEs lack not only financial resources but also the technical knowledge and managerial competencies to digitally transform their businesses (Ghobakhloo et al., 2021). Buyers should understand the barriers particular to each of their suppliers before arranging the conditions of their contracts. In cases where financial considerations are the most relevant hurdles to digitalization, establishing reward mechanisms can be effective. Conversely, in the

case of suppliers for which the lack of technical knowledge is the most relevant barrier, providing access to technical expertise might be more effective than offering financial incentives.

5.2.Limitations and future research

This study has focused on the role of focal firms, therefore a true SC approach that goes beyond the dyad is required in future studies and data collection. This is complex to achieve as it requires access to various elements in the same SC, but it would shed some light on the perceived roles and dependencies from various angles. Mosch et al (2022) identified four network roles (enabler, extender, transformer, orchestrator) that could be considered in future studies to classify the different participants and explore their power dynamics in the digital SC context.

Another limitation refers to the use of French and Raven's (1959, 1993) taxonomy which has been subsequently criticized in the literature and various other measures have been proposed. We wanted to use established accepted measures to solidify our points in the field of SMEs' digital SCs. Furthermore, we used an adaptation of French and Raven's power bases used in SCM by Chae et al. (2017).

A final limitation refers to the sample in terms of size and participants. In terms of size, most manufacturing companies at the time of data collection were dealing with Covid and its impact on their production and therefore many refused to engage with academic research which resulted in a lower sample size than desired. Nonetheless, we believe this study provides important research directions for SMEs given the identified trends. In terms of participants, although the overall results of this study align with other studies conducted in other Western countries (Benton & Maloni, 2005; Nyaga et al., 2013; Liu et al., 2015; Chen et al., 2016; Chae et al., 2017; Harness et al, 2018), our sample includes only Portuguese manufacturers. This raises the question as to whether these effects are context specific or not. While our data is limited to Portuguese firms, the study by Chae et al. (2017) suggests that the differences in the attitude towards reward and coercive measures are consistent across countries. Nonetheless, further replication and examination of this phenomenon in other countries is required, also considering in future research the differences inherent to developing and developed countries with regards to their digitalization maturity levels and therefore power imbalances, particularly in terms of global SCs.

Given the positive impact of the implementation of digital technologies on innovation performance, this paper supports the idea of the importance of coordination within the SC and offers some avenues for future research. Further work should try to delve into the role of coercive measures in SCM processes, under which conditions they could potentially work, and why.

6. Conclusion

SC digitalization is fundamental as it assists companies' resilience under uncertainty (Runfola et al., 2023), increasing collaboration through non-mediated power as supported by previous research (Siemieniako and Mitręga, 2018; Feng et al., 2020; Guo et al., 2023; Gao et al., 2023). But it also changes the dynamic between SC actors (Handfield, 2019; Faruquee et al., 2021; Tian et al., 2021; Mosch et al., 2022), so it would be naïve to think otherwise or pretend that the selection of one technology is a common denominator that evens the playing field when in certain instances it can reinforce existing power structures and exclude practices rather than defy or transform them. Moreover, different power dynamics generate different innovation outcomes as suggested in this study. Therefore, SMEs should not adopt individual technologies blindly and should be prepared to deal with the unexpected effects of digitalization in their SC relationships. Moreover, our study suggests that a combination of different technologies should be adopted and considered in SME SCs to accrue higher innovation performance outcomes.

Overall, our findings reinforce the idea that digital transformation requires the combination of both technology and social systems (Sony & Naik, 2020; Imran et al., 2021), that is, this idea that to innovate you need close relationships in the SC to share knowledge and relational power (Jin and Shao, 2022; Gao et al., 2023; Guo et al., 2023). Moreover, this study suggests that a higher level of adoption of a combination of digital technologies in SCM processes has a higher impact on innovation performance. Digital SCs may bring increased transparency in the relationships among members of the SC, as well as generate value in their products and services. As such, SMEs with a higher position in the digitalization ladder can respond faster to the needs of today's digital economy, and therefore hold a competitive advantage over less-digitalized companies.

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