International Business Growth (IBG): The leveraging- effect of Collaborative Research Networks´ (CRN) capabilities

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Abstract

In this research one exams the capabilities built by multinational enterprises (MNEs) in a consortium and the performance implications of such capability-building on international business growth. We followed a research avenue with a sparse scholarly track, as one delved into a subset of network-types (CRNs) on a certain organizational-typology (i.e. consortiums); and furthermore exploring it within the energy sector in EU.

The methodological procedure (Content Analysis) allowed us the building of a road-map of international business competences (IBC) gained by these multinational enterprises (MNEs) and their effects on their international business growth (IBG). Open and axial coding, and an inferential exercise upon data outputs, uncovered a new form of collaborative networks (CN) amalgamating features of atomized and piloted CNs.

Keywords: Collaborative Research Networks; Dynamic Capabilities; International Business Growth; International Business Competences; Relational Innovation;

JEL: M16; O32; O52

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1. Introduction

In recent years, the European Union (EU) has devoted particular efforts on the renewal of the electric power network by deepening international partnerships; reducing import´s dependence upon external energy sources; and, increasing the green energy production (Frieden et al., 2021; Hörsch et al., 2018; Rosellón, 2003).

Nonetheless, a couple of questions keep challenging the EU´s authorities: *How swiftly may EU State-members reduce the reliance on external sources of energy supply?* And, *what is the contribution of European firms to the (hasty) achievement of this goal?* Conversely, these endeavors collide with EU´s licensing (environmental) limitations and public-investment constraints (Frieden et al., 2021).

Considering such background and problematization, our research targeted an international consortium of public-private entities, who established a research collaborative network focused on the development of electrical wires, to improve the volume and speed of transportation of current electric conductors for buried and overhead lines. One followed the footsteps of this consortium to comprehend the extent of capabilities one firm could actually build or develop while synergizing with the other affiliates in the same collaborative network or consortium.

Hence, our investigation aims to grasp the international business competences (IBC) jointly built or developed by the MNEs participating in the consortium, and subsequently, unravel the implications of those capabilities for their International Business Growth (IBG). Such research line was based on a bottom line trigger: *What the influence of transferable R&D capabilities to leverage higher IBG*? *What are the appropriable IB-benefits of R&D up/reskilling built in a context of collaborative networks*?

The dyadic contribution of this study is found on the synthesized and progressive coherence around its design. Firstly, we found little evidence on previous research in International Business (IB) research about the merits of research and development (R&D) capabilities for the consolidation of a foreign-market´s position. Likewise, collaborative networking capabilities received little attention so far, as there is an identical paradigm of sparse knowledge built in general upon the role of international

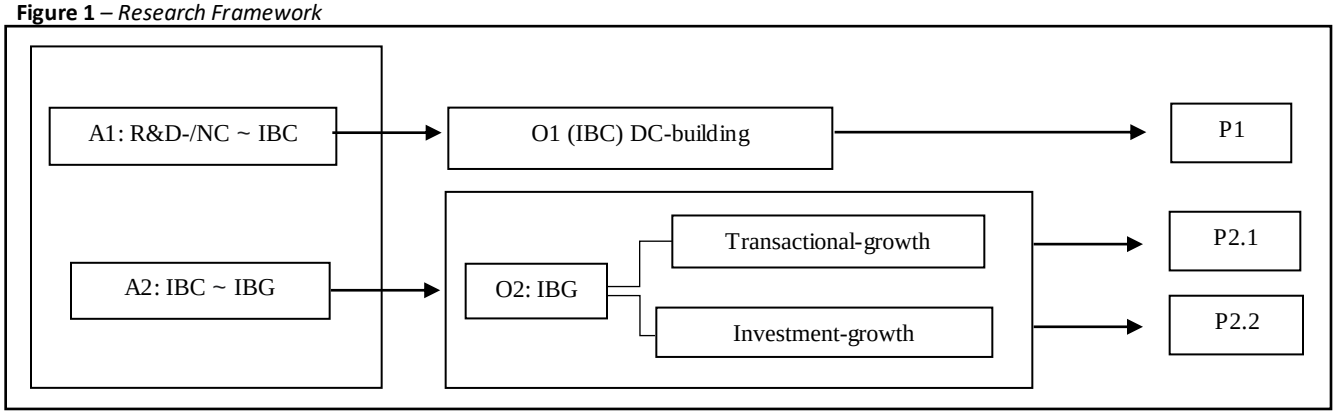
and cooperative strategies to meet the same purpose, and so, our research lands right into these issues, constituting itself a research gap emphasized by other scholars.

> *"There is little evidence of the extent of the benefit [to internationalisation] and its dependence on both research and development (R&D) intensity and collaborative intensity…" (Frederich, Gudergan and Boucken, 2022, p. 611).*

Secondly, previous scholarly insights connecting IBC and IBG are mostly found on the realm of Resource-based Theory, and usually explored by theorists centered on dynamic Capabilities (DC) who have come to a crucial understanding of the importance of innovation-related capabilities (including research and networking capabilities) to enhance international performance targets. On IB theory, studies on IBG-effectiveness anchored on collaboratively-built R&D capabilities remain fairly untapped (Abrantes, Preto and António, 2022, 2021). Hence, a scrutiny of the implications of capability-transference in an IB context is paramount for MNEs operating in global industries.

Consequently, we have established the following general aims objectives. Firstly, to grasp the International Business Competences´ (IBC) acquired or developed within the consortium (Aim 1, or A1). Hence, an specific objective was deduced from the A1, to build a roadmap from the gathered evidence of research and development capabilities (R&D-C) and networking capabilities (NC), gained or consolidated by the MNEs (Objective One or O1). Then, to determine the connection between IBC-realization and International Business Growth (IBG) (Aim Two, or A2) one set another objective, to determine the type and/or extent of IBG achieved by the firms in the consortium, as a result of R&D/networking capabilities´ acquisition or development (Objective 2 or O2). In a nutshell, A1 intends to respond to a precursory general focus research question: *What have MNEs learnt, with their participation in the consortium (IBC)?* The A2 to, *how did the learning (or capabilities-built), influenced the international business growth (IBG)?* The chart below outlines the research framework:

Figure 1 – *Research Framework*



(Notes: DC - Dynamic Capabilities; IBC - International Business Competences; IBG – International Business Growth; NC-Networking Capability; R&D-C – Research and development capability)

Source: Own elaboration

Accordingly, a set of propositions (P_n) were devised from the research questions (RQ_n) above. Firstly, *What type of dynamic capabilities were developed on two categories:* [DC_{-type1}: R&D-C] *and/or* [$DC_{-type\ 2}$: NC]*?* (RQ1). In RQ1, it was tested the assumption that both categories (DC-type 1 and 2) grew

either in number[1] (i.e. new capabilities) or in attributes[2] (strengthening existing capabilities). Then, we fashioned a second question, *how does IBC (through research and networking DC-building) may contribute to International Business Growth*? (RQ2). This latter RQ was bifurcated into two propositions. We assumed in proposition 2.1 (P2.1), that IBG might be transactional by the variation of two major ratios: (i) revenue abroad (RA); and/or, (ii) export intensity (EI). Likewise, in proposition 2.2 (P2.2) one gauged: (i) the consolidation of Assets Abroad (AA); and/or the number of Employees Abroad (EA).

The article proceeds with a revision of literature centered on the Dynamic Capabilities View (DCV), Collaborative Networking (CN) and International Business (IB) theory, followed by the methodological design in use for this case investigation. Then, one immerses into issues of qual coding, data mining and the displaying of the results. The inferences made from the data outputs, constituted a dyadic framework of Sense-Making and Sense-Giving one have used to disclose the findings. The latter (findings) were cross-observed against the current literature on Dynamic Capabilities and International Business (in section 5), creating the baseline for the establishment of the conclusions of this study.

2. Innovation, overseas´ deployment and endogenous growth

2.1. International orientation and performance

Neoclassic studies of international business (IB) established for decades, across Western-European and North American companies, the bedrock assumption of a positive relation between *multinationality* and *performance* (Douglas and Craig, 1983; Vernon, 1971). However, a forthright association of these two constructs is, in recent literature, shattered by a lack of scholarly consensus between the causal links of the first (multinationality) and the second (performance) (Abrantes, Preto and António, 2020; Abrantes, 2020; Wieserma and Bowen, 2011; Lu and Beamish, 2004).

An empirical review conducted over 800 multinationals showed, innovative firms driven by a desire to create high-tech products are rewarded with the yielding of higher returns than others players of lower technological intensity (Douglas and Craig, 1983, p. 56). Such study, unraveled, tech-centered firms possess two other success factors, i.e. the constant focus on "*product R&D";* and *"product quality*". Thus, these scholars foresaw these two additional success factors as stronger predictors of higher performance than multinationality.

Others iterative studies in the 21st century accentuated such reasoning (Abrantes, Preto and António, 2022; Abrantes and Ostergaard, 2022; Abrantes, 2020; Rajapathirana and Hui, 2018; Geldes, Felzensztein and Palacios-Fenech, 2017; Contractor, Kundu and Chin-Chun, 2003). For instance, Contractor, Kundu and Chin-Chun´s (2003) tracking over 200 US-based companies ascertained that *R&D capabilities* accentuate the understanding of a performance gap between medium/high-tech firms against other non-knowledge-driven or tech-prone firms. In addition, Geldes, Felzensztein and Palacios-Fenech (2017, p. 57) in a study over 198 South-American multinationals, argued, that

[1] Evidence of *acquisition* of new research and development (> DC-type 1) or networking capabilities (> DC-type 2);

[2] Evidence of *development*, or growing in attributes of an existing capability (DC-type 1 or 2), whether through the *learning* of new components, or the *reconfiguration* of possessed attributes (partial modification); or *renewal* (total modification) of it knowledge-bundle.

alliance learning capabilities are key mediators of *relational innovation* spill-overs in the form of higher returns.

However, the 21st century ushered also a second-tier of studies surrounding product-innovation and international performance (Kandampully, 2002). The study of Hagen et al. (2012) – *vide* "Online Appendix 5" - opened horizons for projecting a wider relation of the phenomenon of international performance with *strategic behaviours (SB).* Firstly, they defined s*trategic behaviour* (SB) as an overall set of attitude/s, which decisions derives from the firm´s ability to action; thus, the bundle of capabilities molding one´s decisions. These scholar´s vision of performance *(P)* foresaw s*trategic orientation (SO)* as an essential meta-capability determining a firm´s overall international performance. For them, the bottom line is, strategic-orientation of an MNE should not restrict itself to focus solely on Douglas and Craig´s (2003) two innovation-capabilities aforementioned. These scholars defined strategic orientation as a general ability to set a competitive design abroad; and furthermore, drew rather attention for the deployment of resources across a few behavioral clusters explanatory of one´s effective strategic orientation: *entrepreneurial (EO); innovation (IO); market (MO); and, product (PO)*.

$$SO^{t=1} = \frac{EO\,(x)}{(1 - EOy)} + \frac{\mathrm{IO(x)}}{(1 - IOy)} + \frac{\mathrm{MO(x)}}{(1 - MOy)} + \frac{\mathrm{PO(x)}}{(1 - POy)}$$

The rationale of the model Hagen et al. (2012) is that the relation between these four (4) SO-domains and the observable SB-actions ought to be moderated by a control system, as a critical apparatus of SO-SB equilibrium. The design of such system, determining one´s *commitment abroad (CA)* is mediated, cumulatively, by the four categories of capabilities (EO; IO; MO; PO) accumulated in the MNE.

EO capabilities are anchored on two key-dimensions of resources intensity (RI) utilized abroad, as the CA bifurcates into the allocation of assets, which one may measure through the ratio of *assets abroad* (AA) over the *total* number of *assets* (TA) of the firm, and also the allocation of *employees abroad* (EA) which ratio is measured against the *total* number of *employees* (TE).

$$RI(i) = \sum_{n=1}^{\infty} \left(\frac{AA}{TA} + \frac{EA}{TE} \right)$$

The current bundle of possessed capabilities, particularly, with regard to the key-dimensions of EO and IO, are perceived to enhance a preparatory status (*absorptive capacity*) for hasty and deeper learning and consequently for one´s upskilling, as the MNC are dependent on their combinative set of *knowledge, skills and abilities (KSA)* as an inner *ex-ante* scenario for, both, target-accomplishment and innovation-launching (Abrantes, Preto and António, 2022; Frederich, Gudergan and Bouncken, 2022; Arasti, Mokhtarzadeh and Jafarpanah, 2021; Anser et al. 2020).

In the context of SMEs, where the total ownership of resources is sparser than in large enterprises, firms are summoned to devote rather attention to competences´ updateness and so use inter-firm strategic cooperation in R&D as a lever of constant renewal of their *International Business Competence* (IBC) framework, crucial for deepening their international involvement (Knight and Kim, 2009; Holtbrügge, 2004).

In sum, competence-building on R&D, particularly anchored on networking, is key to the international growth of SMEs (Knight and Kim, 2009). This constitutes an essential apparatus for attenuating the inequality of possessed resources, comparatively with large-enterprises. Considering the importance credited to organizational learning and knowledge-based competition to the acquisition/development of *dynamic capabilities* (DC), particularly the interplay of networking and innovation capabilities, as a preparatory status of higher absorptive capacity and realized status for conquering (or maintaining) firm-specific advantages (FSA), thus, the next section will depict the inherent aspects of DC deployment in the international arena.

2.3. The Dynamic Capabilities (DCs) and the firm´s performance

In the contemporary world, *capabilities* are a universally recognized mean to achieve a subsequent explanandum (Kurtmollaiev, 2020). The foundational literature on Resource-based Theory went beyond the gauging of the interwoven between capability-possession and performance-attainment, striving to devise, among other aspects, the nature and deployment of this phenomenon,

Herein, *dynamic capabilities*, conceived as an ability to renew other organizational capabilities and recombine resource-bundles, became increasingly touted for yielding firm-specific advantages in markets with accelerated or more sophisticated competition dynamics (Cardeal, Abecassis-Moedas and António, 2014). The elevation of DCs to an upper status, over ordinary capabilities (with a non-dynamic nature) arose from their inner ability to recalibrate other capabilities, thus, being perceived as a "holy grail" for the formation of competitive-gains, in turn, stretching the competitive boundaries of the firm, endowing it with an added strategic flexibility, and inherently, contributing to better performance outputs. Hence other definitions of a DC encompassed also the agility to respond and adapt to the changing market conditions (Helfat et al., 2007; Adner and Helfat, 2003; Eisenhardt and Martin, 2000; Teece, Pisano and Shuen, 1997). This is manifested in the definition below of the dominant approach (or *Teecian*) in this field:

> "*The firm's ability to integrate, build and reconfigure internal and external competences to address rapidly changing environments"* (Teece, Pisano and Shuen, 1997, p. 516).

Over the last two decades several scholars attempted to re-conceptualize it, and provide a more extensive roadmap of its potential attributes or benefits. In turn, a myriad of other definitions emerged, some rather focused on new attributes (beyond *integration*, *building* or *reconfiguration)*, giving rise to a scenery of conceptual heterogeneity, scope-extension, and subsequently, to the opening of a new research avenue, the Dynamic Capabilities View (DCV).

Various scholars explored new definitions with focus on morphology and rather centered on *motion attributes* while others focused on their advantages or *motion benefits*. For instance, some conceptualized it as the *bundling/integration,* and inherently, their ability to *reconfiguration* or *renewal* of them (Kurtmollaiev, 2020; McKelvie and Davidson, 2009; Andreeva and Chaika, 2006; Teece, Pisano and Shuen, 1997;); generating *changes in operating routines* and *operational effectiveness* practices (Bygdas 2006; Zollo and Winter, 2002); governance of ordinary capabilities (Al-Aali and Teece, 2014); *problem-solving* (Li and Liu, 2014; Teece, 2009; Barreto, 2010); *seizing opportunities* (Teece, 2007); *rapid innovation* (Collis, 1994); or *responding to change* (Helfat *et al.*, 2007; Wang and Ahmed, 2007; Eisenhardt and Martin, 2000).

Indisputably, these definitions encompass merits falling either into one sphere of *dynamic managerial* (or *cognitive) capabilities*, and utterly, recognize the existence of a hierarchy of organizational capabilities, according to their relevance to the firm´s competitive and performance purposes. On the bottom tier one may find the zero-order capabilities, also designated as functional or ordinary. Then, different classifications appeared accounting, consecutively, key capabilities or core-competences, then dynamic capabilities and subsequently the meta-capabilities (Al-Ali and Teece, 2014; Ambrosini, Bowman and Collier, 2009; Wang and Ahmed, 2007).

Indeed, these various definitions did not remain static, uncovering both an "*evolutionary path*" in the scholar´s own understanding of their morphology and utility, but also, accentuating the existence of a hierarchy (of capabilities) (Teece, 2007, p. 1323). Looking at the *Teecian* notion of a DC over time, one may certainly recognize an evolution in reasoning. It is incontestable an *instrumental* theorization exercise associating DCs with the *explanandum* of adaptation to change and higher economic rents. Yet, evolving in nature, it transformed itself into a *political* type of theorization (first paradigm shift), clearly noticed on the MNCs and internalization context (Bogers et al. 2019; Al-Aali and Teece, 2014). It moved away from the specifics of deployment of capabilities in rapid changing markets; and instead, immerses into the realm of the corporate institutionalism and surrounding external influences (as *"the regulators, standard-setting bodies, laws, social mores, and business ethics")* (Teece, 2007, p. 1323).

Consequently, the *Dynamic Capabilities Framework (DCF)* approximated itself to the field of International Entrepreneurship and constituting a second paradigmatic shift. Still revealing traits of instrumental theorization ("… *to explain the sources of enterprise-level competitive advantage over time*"), nonetheless hybridized with political, ethical and entrepreneurial concerns towards capability-building (Teece, 2007, p. 1320). This blending of those theoretical anchors (instrumental; political and entrepreneurial), reveals traits of becoming an *integrative* theoretical reasoning, demonstrating a widening its sphere of interest, from DC-functionality to DC-geographical dispersion, and so shifting interest to the phenomenon of *global dynamic capabilities (GDC)*.

The DCF, seems to be designed as a guiding tool for managers to avoid zero profit tendencies, the DCF is a roadmap for enhancing international competitive advantages and generate international business growth. Yet, this framework places entrepreneurial-management capabilities on the epicenter of success (Teece, 2018), hence diminishing the remaining three domains of Hagen et al´s (2012) international strategic orientation. Entrepreneurial action is, for David Teece a process, and so, entrepreneurial capabilities ought to be fulfilled, likewise, through a three-step process approach, of *sense*, *seizing* and *transform* as (stepwise) sub-categories of entrepreneurial DCs to be acquired and embedded into one´s international business operations and spin-offs of foreign direct-invested new ventures (FDINV) (Abrantes, Preto and António, 2022; Al-Aali and Teece, 2014).

2.4. Collaborative Research Network (CRN) capabilities

Unquestionably, over the last decades, organizations have shown evidences of cross-organizational cooperation and therein, in the establishment of multiple forms of alliances (Todeva and Knoke, 2005), partnerships, joint-ventures, supply chain networks (Cislaghi, Wegner and Vieira, 2022), strategic and collaborative networks (Gulati, Nohria and Zaheer, 2000) to access and develop resources, foster innovation, and generate relational rents.

Collaborative networks represent one other form of interorganizational strategies adopted by MNEs to go further in ventures, reaching outcomes one could not achieve competing as solo-players (Todeva, 2006).

> "*a network consisting of a variety of entities (...) that are largely autonomous, geographically distributed, and heterogeneous in terms of their operating environment, culture, social capital, and goals, but that collaborate to achieve common or compatible goals better, thus jointly generating value*" (Camarinha-Matos et al., 2009, p. 4).

While the partners remain legally independent, they develop joint strategies and collaborate to reach relational benefits that others competitors might hardly imitate (Dyer, Singh & Hesterly, 2018). In this regard, a clarification is appropriate. C*ollaborative networks* and *Research networks* are two distinct phenomena. A research network might assume a structural configuration of a *collaborative research network* (CRN), and only in this case, a research network it becomes a subtype of a collaborative network, with a specific mission (research) underlying its constitution. Yet, based on this premise, one might ask: *Is there any non-collaborative research networks?*

One is required to look at the breadth of the interaction among agencies involved in the collaborative network to answer such answer. Collaborative networks assume one of four different forms of collaboration: *social, intelectual, methodological* and *technological*. Hence, the motivations that shape the strategic orientation, and subsequently determine the fluxes of social exchange within the network-members, is the answer for the realization of a collaborative strive.

These research partnerships, whenever a subset of collaborative networks (or CRNs), hold two positive-spillovers. Firstly, they influence the formation of individual knowledge-gains, opening the horizon for broader or deeper learning, extending the scope of the realized absorptive capacity (RACAP) one MNE could reach by its own means and aligning with the virtues of open systems in Innovation theory (Chesborough, 2003). Secondly, as they assume knowledge a common good of public utility, yield further societal knowledge-developments, typically through regional clusters, with inherent benefit innovation-wise on product-launching (Boekel, 2015; Adams, 2012).

CRNs differ from the other types of research networks on two fundamental premises: (i) *utilitarian view* (serving a public purpose); and, (ii) involve *multi-stakeholder commitment* (Balland, Boschma and Ravet, 2019). They are instilled by public policies which their formation have origin on the seeking of larger solutions to the benefit of a whole community. Several theoretical approaches aim to explain why organizations engage in collaborative networks. Early research suggests that reducing transaction costs is a major reason for hybrid organizational forms such as networks and alliances (Williamson, 1991).

A *Social Perspective* claims that organizations connect to other players due to the social networks of their executives and their embeddedness in social relations (Gulati, 1998). Recently these approaches have been complemented by a new perspective whose main argument is that organizations collaborate to combine idiosyncratic resources and reach relational rents that competitors cannot replicate (Dyer & Singh, 1998). This perspective (*Relational View)* proposes that resource complementarity is the primary reason for collaboration and the success of collaborative strategies (Dyer, Singh & Hesterly, 2018). According to this perspective, organizations collaborate to reach relational rents, i.e., a supernormal profit created through a collaborative endeavor (Dyer & Singh, 1998). Zhang, Li and Li (2017, p. 315) expanded the concept as the

> "*relational benefits that are comprised of those economic gains, soft power and S&T output that are only jointly created in an inter-organizational relationship, through the joint idiosyncratic contributions of both partners*."

Although plenty of studies explain why organizations form collaborative networks and which benefits they provide, there remain relevant gaps regarding how to make collaboration work (Wegner and Verschoore, 2022). Partner selection is among the topics widely addressed as essential to reduce risks and create synergies among partners (Moeller, 2010). By selecting partners with a cultural, organizational, and strategic fit, organizations increase the chance of finding complementarities and reaching collective goals. Trust among partners is also an element previous studies consider a sine qua non for collaboration (Bachmann and Inkpen, 2011). Empirical studies show that trust reduces transaction costs and works as a lubricant between the parties (Massaro et al., 2019). Besides partner selection and the role of trust, several studies have been developed to explain how collaborative networks can be governed, managed, and orchestrated (Dhanaraj and Parkhe, 2006; Faccin, Wegner and Balestrin, 2020) to foster relational rents.

The design of governance rules is critical for the effectiveness of collaborative networks (Provan and Kenis, 2008). The key role of governance is to produce an internal environment that fosters collaboration and joint action among partners. Provan and Kenis (2008) present three distinct governance modes of collaborative networks may adopt according to specific contingency factors. The simplest mode is *shared governance*, where a group of organizations works as a collaborative network despite not possessing a structure of exclusive and formal management. The second mode is the *lead organization´s governance*. It occurs, typically, in relationships coordinated by a more prominent organization and a set of weaker firms (Provan and Kenis, 2008). The third mode is the *network administrative organization*, where an administrative entity is created to manage the collaborative network and its activities. This governance mode used to be adopted by collaborative networks and strategic networks composed of SMEs (Wegner et al., 2022). Four contextual factors are key predictors of the effectiveness of network governance modes: the level of trust among network members, the number of participants, the level of goal consensus, and the need for network-level competencies. The relationship between these predictors should enable the identification of the mode of governance best suited to the collaborative network, as no one mode of governance is necessarily superior in every situation (Provan and Kenis, 2008).

Studies show that network leaders have the difficult task of designing governance rules that foster collaboration and direct the participants toward joint actions (Wegner and Verschoore, 2022). For instance, Wegner, Sarturi and Klein (2022) analyzed 338 Brazilian firms participating in collaborative networks and identified three clusters of firms partnered with collaborative networks that follow different governance configurations. The highest level of performance has been found in young and small collaborative networks that combine high levels of formal and relational governance. Wegner et al. (2022) investigated 73 Brazilian collaborative networks and identified two configurations of governance adopted by high-performing networks. *Piloted collaborative networks* (PCN) rely on specialized working teams, have structured decision-making processes, and avoid using incentives. Conversely, *atomized collaborative networks* (ACN) run on incentives and control while eschewing specialization and rigid decision-making procedures.

The vast array of benefits provided by collaborative strategies does not mean they come without challenges and problems. Several studies show the 'dark side of interorganizational relationships'

(Oliveira and Lumineau, 2019). It refers to damaging aspects of interorganizational relationships driven by competence or integrity issues. Conflict, opportunism, and unethical practices represent most of the 178 articles on the dark side of IORs reviewed by Oliveira and Lumineau (2019). Opportunistic behavior is a major concern for the participants of collaborative networks (Jap and Anderson, 2003). Free riders may access the collective benefits without offering the expected efforts or may access their partners' knowledge to get private advantages (Lane and Lubatkin, 1998). Even when there is no opportunism, collaborative networks are subject to conflicts that make joint work difficult and can prevent achieving collective results (Mo, Booth and Wang, 2012). Above all, one participating in a CRN ought to recall that a collaborative network is an instrument of higher common interest of public-policy making (Balland, Boschma and Ravet, 2019).

These scholars have identified five major virtues for the application of CRNs in the context of public governance. Firstly, the tackling of the problem of *fragmentation* in research. Typically, smaller initial problematization/s and general-focus research question/s are spread across a fairly disconnected scholarly community (Balland, Boschma and Ravet, 2019). The CRN has the ability to gather larger questions and divide them across multiple actors within the research partnership and overall research framework. Secondly, having these actors aligned in a common research ground gives room for economies of scope and learning through the *optimization* of resources and inherent savings in the cost of research. Thirdly, is the avoidance of *overlapping* efforts and the *duplication* of same projects (inside of the CRN scope). Fourthly, the *facilitation* of findings and knowledge-spillovers more easily and rapidly disseminated across different societal quadrants (of several economic sectors and local authorities in functional and geographically dispersed regions). Fifthly, the effect of *stimulation*. These CRNs have the virtue of enhancing the cross-fertilization of ideas.

3. Methodology

3.1. Description of the case research

The focal collaborative research network (CRN) is a consortium composed originally by three founding entities: one public university and two private-equity companies. The first entity, is one the leading universities in the country, which adherence to the consortium was steered by the Faculty of Engineering under the coordination of the *Department of Materials and Metallurgical Engineering*. The first private-equity firm (Firm 1), is one of the top Portuguese manufacturers of electrical conductors for overhead lines and also one the largest exporters of this range of products. Firm 2, is a manufacturer of medium and high voltage underground insulated cables. The two private firms fit the category of a small or medium enterprises (SME) with an aggregate annual revenue of over 82 million Euros until before joining this CRN.

These three entities formed a consortium supported by three funding programs ("*Compete"; "FEDER"* and "*QREN"*) from the EU and a State-Member (Portugal). The primary data corresponds to the Executive Report presented by the consortium to the EU and national authorities containing among other topics: (i) a description of the project; (ii) the undertaken activities; (iii) a short-term value-creation strategy; (iv) an ex-post assessment; (v) the financial execution data; and, (vi) technical notes and appendices.

3.2. Research Design

In order to test the research questions (RQs) and determine whether the assumptions on testable propositions (P1, P2.1; and, P2.2) are observed, the empirical part of this project was fashioned as a qualitative research endeavor to delve into the scope of the (research and networking) capabilities developed in the context of the focal research consortium and subsequently comprehend the spillovers on international business growth achieved by capability-building within this collaborative network.

Fitting with the notion of a single case-study with a holistic design with one unit of analysis (UA), the qualitative data analysis (QDA) procedure followed a phronetic design, revisiting the collaborative network through an in-depth backward-looking coding procedure reconstructing the scope of the project´s activities and inherent capabilities. Our QDA coding procedure followed the seminal principles of Miles, Huberman and Saldaña (2018), as to the data *reduction*, *restructuring* and *detextualisation*, clearly noticeable in the next section, with the initial screening of data, anticipatory reduction of data, revision of signifieds and co-occurrences (within/across signifieds) and semantic diagrammatic representations, deriving from a intertwining of open and axial coding.

The use open-coding intended to reach *sense-making* out of the informant´s *signifiers*, mapping the morphological features of the focal CRN into a *Gestalt* analysis (Gioia and Chittipeddi, 1999). In addition, we followed a subsequent theoretical framework (*sense-giving*) to proceed inferring, and so gaining a wider understanding of the association between CRNs and firm´s performance. Here, the sense-making instrumentalizes *axial-coding* to identify the relations between the *signifieds* and interpret their associations. The coding implied the transformation of inputs in QDA labelled as *signifiers* (i.e. the overall executive report with all its textual and visual information) into *signifieds* (i.e. the interpretation of the meaning of such informational inputs), according to previous literature within the DCV. These units of information were matched in the first-order coding with concepts subsequently were aggregated into broader categories on the second-order of coding (axial).

4. Data Analysis and Discussion

4.1. Data mining and outputs

Our endeavors upon the QDA targeted the CRN described in section 3.1., implied an analysis of the consortium´s final report, all phases and activities (presented in Online Appendix 1), while the rationale for transforming the informant´s inputs along the codification process being explained by the code´s metadata (in Online Appendix 2). This CRN entailed a 7-phase research project, with each phase corresponding to a category of activities identified in the column "description". The signifier-signified process (Online Appendix 2) of open codification, one delivers a description of concepts paired with code´s identification (*cid*), and subsequently, Table 1 outlines the coding intensity.

Table 1 - *Coding - General figures*

Classes	Code Group	No. Codes	No. Quotations	f (codes)	f (groups)
1	Advantages	11	102	0,177419355	0,261
2	Configuration	3	36	0,048387097	0,092
3	Int. Comp. Develop.	1	2	0,016129032	0,005
4	Int. Comp. Growth	3	8	0,048387097	0,02
5	Goals	7	15	0,112903226	0,038
6	Inovation	1	13	0,016129032	0,033
7	Motivation	13	42	0,209677419	0,107
8	Networking (activities)	4	7	0,064516129	0,018
9	Networking capabilities	3	9	0,048387097	0,023
10	Research (activities)	6	56	0,096774194	0,143
11	Research capabilities	4	27	0,064516129	0,069
12	Resources	3	20	0,048387097	0,051
13	Sentiment	3	54	0,048387097	0,138
	N	62	391	-	-

Source: Own elaboration

Open coding made emerge 13 classes (or code groups), one of them (*sentiment*) being a dummy group. The codification is expressed in the total number of quotations ($N_{quotations} = 391$) shared by a total number of 62 codes ($N=62$). Those reveal an average disclosure of 6 times of appearance per each phenomenon ($\bar{x} = 6{,}31$), with three code groups aggregating over half of the coding co-occurrences (51,1%): *CRN-Advantages (.0261); CRN-Research Activities (0.143)*; and, *CRN-Motivations (.107)*. Nonetheless, the number of groups with a higher account of opened codes (cids) is *CRN-Motivations (13 codes, or n=.2097); CRN- Advantages (11 codes; or n = .1774) and CRN-Goals (7 codes; or n =.1129)*. The number of opened codes targeting the "goals" of the promoters of this CRN, as disclosed in Table 1, revealed however a low intensity in this group ($n = .038$), which lead to several interpretations as to the lower attention to this group, as discussed in findings.

In Table 4, a list of *cids* extracted from the quotations aggregate by groups, discloses the *groundeness (G)*, as the independent count of quotations per code. A general outline of the Gestalt analysis of the open coding process is attached to the manuscript in the Online Appendix 4.
Here, one may notice a signifier-signified drilling for the groundeness of the whole quotations per code. This corresponds to the core of the sense-making framework, in which, our Gestalt analysis, entailed the association of the signifiers with the respective quotations with unique identifiers (qid) and the conceptual delimitation of the phenomena covered by these qids; thus, associating them as follows: *signifier* (qid_n) → *signified* (cid_n). Based on the aggregation of these codes into broad categories (or groups), in Table 2, those are examined, not simply as to the degree of coverage of the linkages (or density) in the document, but in terms of the types of association, here denominated as co-occurrences (cooc).

Table 2 - *Matrix of Cooc (By themes – with grouped codes)*

	A	CONFIG	GOA	I	M	NA	NC	R-A	RC	RES
A	-									
CONFIG	3	-								
GOA	2	2	-							
I	8	0	5	-						
M	33	1	9	13	-					
NA	4	1	0	0	4	-				
NC	5	3	1	0	6	5	-			
R-A	6	11	0	4	5	0	4	-		
RC	6	3	0	6	6	6	2	22	-	
RES	7	8	0	1	4	1	5	29	4	-

Source: Own elaboration

This matrix considers a direct relation between co-occurring (cooc) constructs and counts the overlap of two or more quotations with different codes. The table above shows these code intersections in the text, aggregated by groups. These intersections are assumed to be a meaningfully linked and the strength of their association being determined by the existence of multiple codes (thus, a *cooc*), as follows: (i) Strong link*: Signifier* $_x \rightarrow$ *(*$_n$ *signifieds)* $\Leftrightarrow$ $_n$ *coocs; (ii)* Medium link*: Signifier* $_x \rightarrow$ *Signifieds* $_{(y,\,z)}$ $\Leftrightarrow$ *coocs = 1; (iii)* Low or null link: *Signifier* $_x \rightarrow$ *0 Signifieds* $\Leftrightarrow$ *coocs = 0.*

The matrix of cooc shows significant relations between *Motivations and Advantages (M-A)*; *Resources-Research activities (Res-R-A)*; plus, *Research Capabilities and Research activities (RC-R-A)*. The bi-directionality of these relations or the degree of reciprocation is though not visible across strong links. The same across weaker ties. Moreover, as a sense-giving data output, the cooc matrix pushes up to a group-level the original results crunched in Atlas.Ti 9 at code-level. Consequently, the dash symbol ("-") used in x and y axis crossing rows and columns is a spurious result (e.g. crossing *A-A; I-I; or NC-NC*), because the intra-group coding, allowed, in fact, to trace significant relations within groups.

Likewise, the M`s intra-group coocs showed strong (motivation) links especially between *NPD* (M009) and *value creation* (M005) (x= =5). One should underline the interdependence of A´s and the M´s as to the NPD and VC, with the dominant advantages of the project working as a compelling force, with A´s and the M´s creating a quasi-nexus of causality between a perceived NPD and value-addition. Yet, we underpin, that such magnet force is an effect to be understood in further research, as discussed in the next section.

The co-occurrences of research activities and capabilities revealed also stronger links between joint testing activities and sub-team´s testing capabilities´ formation (R-A001 ~ *RC001; x==9*), and the same with joint research planning activities and testing capability-gains (R-A005 ~ *RC001; y==6*); and, moreover, between product-market research activities and product development capabilities (R-A003 ~ *RC003; z==4*). Surprisingly, the pre-project endeavors on market research led to informational inputs of geographical distinctiveness guiding the CRN team towards a customer-centric vision, fitting into a *needs-based NPD*, in which, the three sub-project lines of the CRN evolved into the development of three dissimilar high voltage power cables typologies: (i) *Aluminum Conductors Steel Supported* (ACSS); *Thermal Resistant and Super Thermal Resistant Aluminum Conductors (ZTAL)*; and, (iii) *Aluminum or Copper Homogenous (round) conductors* (*Milliken*).

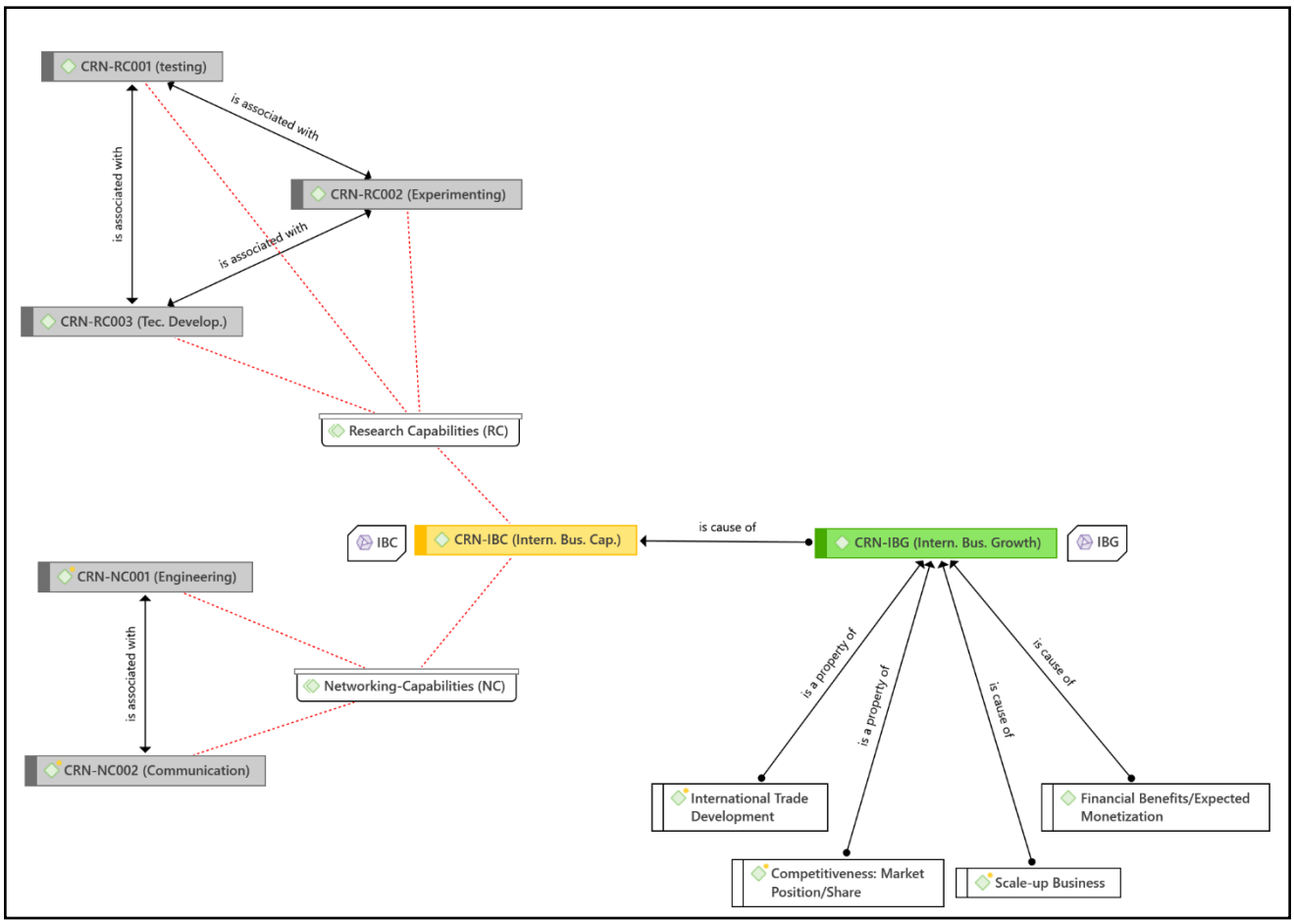
4.2. Findings

One of the most essential data outputs for comprehending the breadth and depth of this CRN is the information summarized on the "signifier/signified drilling" (Table 1). The richness of the data allowed us to grasp the major features of a CRN, ranging from its morphology and navigate throughout the motivations and advantages, until their performance implications.

The focal CRN garnered 3 types of *technical tangible resources* (i.e. laboratory facilities and equipment; production facilities and equipment; and other supporting tools and materials) accompanied by one major *technical intangible resource* (i.e. prior knowledge - on electrical and mechanical engineering; electrochemistry; and materials/components). The latter subtype of resources was complemented by five *managerial intangible resources*, regarding the experiential knowledge (i.e. project design and supervision; quality assurance; strategic and operational communication; product homologation; and patenting).

In addition, this collaborative network counted with six different types of *managerial tangible resources*: a formal protocol of cooperation; a consortium organic structure; intra-partnership supervision; direct and indirect staff; clear definition of duties and responsabilities; activities´ planning; and, clear communication and reporting rules. These managerial resources here amalgamated were key to the gathering of multiple others, tangibles/intangibles. The effective resource utilization, as real CRN´s assets, was prominently grounded on two most seminal intangible-types "gluing" the whole collaborative network together (i.e. *prior technical knowledge-base*; and the *prior management knowledge-base*). Together, they functioned, as underpinned by George, Zahra and Wood (2002), as a favorable condition for further learning and above-average performance outputs, i.e. as a *preparatory absorptive capacity* (PACAP). Herein, the PACAP of these organizations revealed a combination of networking capabilities and research capabilities (exposed in Table 2) which were the pillars for the success of that CRN, as represented in semantic diagram below:

Figure 2 - *Hierarchical Left-to-Right View (RQ2: IBC-IBG)*



Source: Own elaboration

Looking at this hierarchical left-to-right view of the semantic diagram, is clear that the CRN capabilities of this consortium deriving from these two streams (networking and research capabilities), formed upon the PACAP condition aforementioned, contributed to the uplifting of the international business competences (IBC) of these organizations and subsequently to their international business growth (IBG), as further explained in the conclusion section.

The networking capabilities revealed two major sub-sets, engineering and communication capabilities. A multiparty collaboration was noticed across levels, from holistic activities, as planning (e.g. Kaizen meetings), to the specificities surrounding the construction of prototypes and pre-series, the preparation of pilot tests or the experimental installing in the electrical network (e.g. shared updating of product engineering data backups). On the research capabilities´ side a triad of skills were unveiled within this category (i.e. the joint ability to *test*; *experiment*; and *develop new technologies)*. Indeed, these organizations shown the possession of collaborative research skills, as follows: (i) joint-analysis of resource options (as to the materials to be tested upon electric resistance); (ii) joint-operation (as to the testing of materials´ reactions); and, (iii) joint-assessing (of resource and activity´s options and outcomes). The interaction of these networking and research capabilities, unraveled a collaborative meta-capability capable with engineering and managerial skills being key to effective planning of strategic and operational actions, to deploy resource effectively, to solve integrated

problems and furthermore, to take rational decisions upon emergent problems. With regard to research capabilities, is noteworthy also the hybridization of the rational for the implementation of the project´s strategy. Seemingly blending a Resource-Based View with an Industrial Organization view, this CRN developed pre-project market research endeavors to understand the geographical distinctive requirements. Such vision (*market-based view*) influenced the consortium to pursue three different product lines and so to undertake a clear needs-based NPD mode.

On the other hand, the sense-making framework exhibited in Figure 2), revealed a limited significance power with regard to *reciprocity*. The exploring reciprocity, namely as to the *directionality* and the *depth* of reciprocation among codes, was limited, not due to the coding frame but as the typology of data under observation. This qualifies, though, in our point of view, to a potential spin-off research project, for understanding, in separate, of the rationale of intercode relations; event nexus of causality between constructs; or their roots of intention and behavioral consequences. These type of normative studies exemplified above diverge substantively from ours. Notwithstanding the sharing a phronetic design, the *locus* of attention of these studies is the interaction of constructs in the sense-making framework, while our study is the assessment of firm´s performance with regard to transactional and investment growth. Thus, as reciprocity was not comprised in the purpose of this research, we recognize, however, the importance of continuing such avenue due to early-stage of maturity of previous literature on CRNs, including the incipient studies on CRN capabilities.

Nonetheless, we argue that the dominant relations (with strong linkages across code groups) are transversally influential of the formation of other constructs. If one recalls the *A´*s code group example in the previous section, one may assert the existence of hidden "interdependent advantages", as the text reveals multiple co-signifieds, which, might be a mediating, moderating or even a confounding effect, with the dominating social factors (as seen in, e.g. the A010 – Technical Aptitude) functioning as a magnet for the envisioning of other factors. Naturally, we consider such effect to repeat itself in other code groups. Thus, understanding the "magnet force" of those effects may be a critical line of further research for the development of knowledge upon the CRNs, namely, instrumental theories depicting the CRN association to firm performance. In addition, we assert the benefits here encountered in this CRN did not reach the full scope of possibilities opened by other CRNs.

5. Conclusions

Opposing to the majority of the studies on collaborative networks (CNs), based on comparative designs across CNs and/or utilizing large samples of network affiliates (within the CN), this study took a diametrically different approach to understand the same phenomenon. Firstly, we focused on the subset of collaborative research networks (CRNs), then we instrumentalized one single CRN, with a small dimension (with three members – one public and two private organizations). Such research decision, allowed us to develop a study with a phronetic design with a true immersion into an exploratory observation of a collaborative endeavor, arguably richer in data mining, to study in-depth, the morphology and the performance implications. Our results vary from previous literature on CN categorization (but are consistent with others on CN performance). Firstly, it varied, significantly, as we have concluded that this collaborative network did not fit into none of the major CN categories previously established. The universe under analysis, revealed itself as a *hybrid collaborative network (HCN)*, something not acknowledged in previous literature. The focal CRN is neither a pure *piloted CN* nor an *atomized CN*, as it captured features from both typologies (Wegner et al., 2022). This new *hybrid form* relied, simultaneously, on a highly-specialized strategic apex and operational teams. This

is typical of piloted CNs. At the same time, the focal CRN was supported on a highly formalized structural configuration and subsidized by two National/European programs ("*Compete*"; "*FEDER*" and "*QREN*"), holding moreover a strict accountability and procedures. Conversely, this is typical of atomized CN. Moreover, the consortium here studied is the living proof that the CRN has embedded a meta-capability (or a combinative set of multiple DCs) that is capable of leveraging significantly the firm´s performance on small firms. Performance-wise, our results are consistent with previous literature underpinning the higher performance of collaborative networks composed of small firms (Wegner, Sarturi and Klein, 2022).

Hence, as to the CN-categorization, we broke up with the dogma of incommensurability between the two pure forms above and proved that having them once blended, may yield, noteworthy, valuable outputs to a large number of product-market stakeholders. The three entities involved in the project proved to be capable of designing and manufacturing together three new types of electric cables for the overhead lines with unique features (resisting to extremely high temperatures and with the capacity to transport higher bulks of energy). These accomplishments were only possible by the entrepreneurial mindset of these entities to jointly explore their bundles of resources and capabilities and engage in value-addition, assuming that the societal benefits of the cross-pollination of ideas, resource-sharing and social exchange in general, would outweigh the challenges and risks they were undertaking. This is consistent with the assertion that multiple complex problems (or *integrated problems*) inevitably require cooperation – especially value driven ones – leading to collaborative advantages in the heuristic form of (continuous) knowledge-sharing (or *overlearning* advantages) or product/service innovation advantages (Furr and Furr, 2022; Parrish, Timothy and Holloway, 2020). With regard to international business competences (IBC), the (over)learning process was a dyadic one, as the firms have accomplished both technical and social upskilling. Herein, the dynamic capabilities type 2 (NC), as to the RQ2/P2, were also observed through the engagement of the promoting entities of the project into conversations with (and ultimately hiring) international experts as external consultants; and, moreover, through the social exchange process with other stakeholders in a large networking spectrum. These organizations had the virtue to broaden their international relations with multiple actors from the energy cluster, encompassing, firstly, the direct providers within the Engineering, Procurement and Construction (EPC) areas, such as, High Voltage Direct Current (HVDC) manufacturers and cable-technology/engineering firms, but also (secondly), Electric Power (EP) companies, and other agents from the wider Utilities´ sector and also National and EU authorities and regulators of the Energy sub-sector.

In addition, to the deepening of core networking capabilities, these firms managed furthermore also to expand their marketing and innovation capabilities (Proposition 1). Following a customer-centric view, they have developed market-responsiveness capabilities, as they embarked on a needs-based NPD approach in order to disseminate these products in one way that fulfills dissimilar geographical needs, and so, diversifying their market coverage and the ability to place products in previously inaccessible or distant markets using cutting-edge technology to break down competitive barriers. Marketing capabilities were vital to equip the consortium with the initial information about the industry environment and so streamline the direction the R&D on the type of materials to test. Moreover, the networking skills gained through intra-collaborative efforts and involving external agents with furthermore essential for the technical upskilling of the parties, for the design and for the manufacturing of new products. Altogether, these skills constituting the CRN meta-capability, as a combinative set of multiple dynamic capabilities, that individually each of the participating firms was equipped with, constituting the extent of their IBC-gains, subsequently, reinforcing their international competitive position (IBC-leveraging).

Hence, the technical and social upskilling were both crucial to the effective creation of new products (as a new technical solution for attenuating EU´s energy) but also paving the way for a myriad of business opportunities as to the dissemination of these products in the international markets (Aim 2). We argue that, opened the horizon of the incumbents for further capability reconfiguration or renewal. Moreover, product-innovation resulted in spill-overs in terms of international business growth (IBG) with the two private firms having reinforced their exports in the following years. Both firms with an overall annual revenue of 82 Million Euros before entering the consortium, achieved a curve of transactional growth (Proposition 2.1.) accentuating the export ratio in 72% with revenue abroad (RA), growing over 37.4 million Euros (O2). Firm 1, captured 25,1% of this growth with an increase in exports of 9.4M€ while firm 2 captured the remaining 28M€. They also increased steeply their exporting quota, respectively, from 42% and 46%, to 80% and 64%. These staggering figures uncover two types of CRN successful outcomes: successful product-development and successful dissemination. The aluminum products developed by the teams in sub-projects 1 and 2 reached a 98% of exports over sales (jointly taken *ACSS* and *TAL/ZTAL* cables). The sub-project 3, in charge of cable design/manufacturing for medium, high and very-high voltage, ("*Milliken*" type) reached an 88% export ratio over sales.

These results provide a couple of hints for such success. Despite CRNs are primarily driven by organizational or corporate citizenship endeavors (and naturally excluding the stream of research focused on unethical practices), they are also a type of social arrangement capable of yielding, potentially, significant societal contributions (value-addition). However, they might hold, likewise, intrinsic value to those organizations with incumbents actively involved in societal development, whom may also, in turn, appropriate part of the jointly created value (as demonstrated above). Thus, we argue that, to the motivational factor of utilitarianism (or ethic-driven action), benefiting the companies per se (and their internal stakeholders) have an added motivational factor of benefiting directly from the CRN successful outcomes, as the might also reap the benefits of value-appropriation. Hence, for the firm´s point of view, positive direct effects may be taken in *lato sensu* (i.e. value creation to society in general) and in *stricto sensu* (i.e. to the organization as a single beneficiary) and positive indirect effects are closely tied to the spillovers of meta-capabilisation, constituting a stimulus for continuous action through capability deployment.

As to the extent of investment growth (Proposition 2.2.), neither the open-coding nor the axial-coding procedures managed to determine, with regard to the remaining variables of the transnationality index, i.e. *assets abroad (AA)* or *employees broad (EA)*, whether the international positioning of these firms has been leveraged or not, as a consequence of the project, with an minimum increase of AA´s or EA´s over 10% with this project. To determine a positive evolution of these indicators, one would need to collect additional data from alternative sources.
In sum, this research added to previous literature new insights on: (i) CRN-structures, with the identification of a new hybrid form of collaborative networks; (ii) Structure-strategy fitness, as the consortium revealed a "Commensurable Strategic Vision" blending an Entrepreneurial, Innovational, Market and Product Orientation stance (and the development of capabilities in those four domains); and, (iii) Performance lessons from the collaborative strategic behaviour. The firms in the focal consortium garnered a meta-capability with a unique set of dynamic capabilities. Thus, three take-aways were withdrawn from the formation of this meta-capability, certainly relevant for broadening this research avenue or for iterations of this study. The focal consortium revealed a customer-centric approach (market vision); an eclectic technical/social prior resource-base (preparatory absorptive capacity); and action driven by dominantly by values (ethical behaviour).

5.1. Limitations

The specificity of this research project, focused on the observation of a CRN, as an small hybrid collaborative network, with an unique morphology, objectives and resources (involving academic and industry actors), this implied the gathering of a wide knowledge-based from scholars, on one side, from Strategic Management with a thorough understanding of Collaborative Networks (CNs) and Resource Based View (RBV) and on the other side from Engineering sciences. Moreover, another set of skills was required in QDA coding, with the ability to handle a sophisticated CADQA system.
Certainly, the richness of the data we have encountered, but at the same time, the combination of academic and industrial expertise required to handle it in a project with such a research angle, to be concluded within the pre-established timeframe constituted an initial obstacle. But, above, all, the technicity of the language within the domains of Chemical, Electrical and Material Engineering was, assumedly, among this research team, the most challenging part. In essence, as a QDA study, it required, undoubtedly, the ability of the outside-researcher/s to interpret the signals from the informants, in order to make sense (into quotations) out of the confusing amount of signifiers. However, worse than fuzzy, the language was at the beginning simply imperceptible. The process of coding was time-consuming, sluggish I shall say, and it required the implementing of a specific procedure to be able to achieve any degree of sense-making. This procedure was *joint-coding*.

Yet, considering the specificity of data, coding in pairs, simply, would not be enough, as this type of qual data required particular engineering skills and experience to decode it. Hence, our adoption of Miles, Huberman and Saldaña´s (2018) model, as to the QDA procedure, as to the phase of *reduction*, implied a type of data manipulation, accounting the procedures of the selection of focus, simplifying and abstracting, in which, we needed the material engineer (skills) to move forward with the open-coding. Fortunately, the team integrated a trained QDA coder with formal education at under/postgraduate level (and also professional experience) in Material Engineering and with managerial experience in the energy sector. His inputs were key, truly demystifying the language, cracking the technical codes and understanding the reality of this consortium. Thus, joint-coding was for us, a double sense-making procedure: (i) uncoding (the language to non-engineering terms); and, coding to Strategic management theoretical terms with focus on dynamic capabilities, as we followed the three steps above mentioned of Miles, Huberman and Saldaña´s (2018) model. Thus, QDA in this particular research project, implied going an extra mile in QDA beyond the traditional sense-making (*Gestalt Analysis*) of typical sense-making directly from the informant´s inputs.

Subsequently, another great challenge were the decisions surrounding the amount of, what we call "technical terminology" (as the engineering-related vocabulary). A major concern was, the balancing of the amount of terms needed to explain this CRN project, plus the data outputs, the data mining and the results (in text and detextualized formats) without overusing them and eventually suffocating both the reviewers and future readers. Hence, we can assert that the amount of information extracted from the source of data in use (i.e. from the official report: "*Relatório Executivo do Project CED*" - or, Executive Report of the Project "*Condutores de Elevado Desempenho*" – *High* Performance Conductors), that ultimately was considered in the manuscript was filtered to the most essential one, avoiding the use of non-essential/superfluous terminology.

5.2. Managerial implications and further research avenues

The body of literature in collaborative network capabilities is an underexplored domain within the Resource-Based Theory, Entrepreneurship or Innovation Management and especially in SMEs. The study of a small collaborative research network allowed us to grasp a new (hybrid) form of collaboration with commensurable features between atomized and piloted CNs. Moreover, the performance implications here shown in this manuscript, for the two private-firms participating in the consortium, demonstrated that, regardless of the ethical commitment to value-addition to a society, the contribution of a single organization to the solution of a societal problem can be a tremendous business opportunity to significantly enhance the strategic position of the firm, to disseminate its products, to reinforce networks and to leverage current results in the international markets. The initial problem that led the three entities to collaborate more formally constituting a consortium, i.e. in this case, the EU dependence of utilities´ imports mostly from OPEP countries, demonstrated to be a crucial project for the electric power companies, and ultimately, to these two SMEs, as they managed to enhance their exports over 72%, increasing their revenue over 37 million euros a year, and. The results here shown are unequivocal of the utilitarian importance of this product-innovation´s diffusion; and so, there is a underpinned here a tacit responsibility of industry practitioners to embrace, in general, such responsibility, with the risks and opportunities they might carry, and involve the firms one represents in this type of social arrangements, regardless of the regulatory and legal frameworks set in place.

In addition, Balland, Boschma and Ravet (2019) pinpointed the lack of attention of scholars to the study of the performance implications of networking capabilities in collaborative research projects. They claim, the link of those phenomena to performance is still broadly unexplored as at firm-level, and summoned scholars to pursue on this area a research line focused on the self-centered benefits of CNs. We corroborate with their assertion, but, we argue that instrumental research on performance focused on those two aspects is short. The sparse research in the areas aforementioned, for instance, the incipient focus on structures, goals, resources and capabilities of a CRN, constitutes still a broad avenue for future research in the realm of strategic management. The results here exhibited demonstrate the great potential of these typology of collaborations whose application is transversal to geographies and economic sectors.

Appendices/Supplementary materials are available on request by emailing the corresponding author or can be obtained under https://www.xxx.xxx

References

Abrantes, B. F., & Ostergaard, K. G. (2022) Digital footprint wrangling: Are analytics used for better or worse? A concurrent mixed methods research on the commercial (ab) use of dataveillance. *Journal of Marketing Analytics*, 10(1), 187-206. https://doi.org/10.1057/s41270-021-00144-5

Abrantes, B. F., Preto, M. T., & Antonio, N. (2022) Unraveling collaborative learning stimuli and effective dynamic capability integration on MNCs: the global capabilities administration model (GCAM), *Review of International Business and Strategy*, 33(2), 272-300. https://doi.org/10.1108/RIBS-06-2021-0085

Abrantes, B. F., Preto, M. T., & António, N. (2021) Toward a dynamic capabilities' diffusion model for international business headway of SMEs: evidence from the metallurgic and metal-mechanic

(MMI) sectors. *Review of International Business and Strategy*, 32(2), 204-227. https://doi.org/10.1108/RIBS-10-2020-0125

Abrantes, B.F. (2020) Tech-innovation and spillovers on corporate-defensiveness: Evidence from the Lisbon startup ecosystem. *International Journal of Business Competition and Growth*, 7 (1), 68–100. https://doi.org/10.1504/IJBCG.2020.108439

Abrantes, B. F., Preto, M. T., & António, N. (2020) SMEs foreign establishment decision-making: a multiple-case research of internationalisation strategies in the metallurgy and metal-mechanic industry. *International Journal of Management and Decision Making*, 19(3), 364-390. https://doi.org/10.1504/IJMDM.2020.108647

Abrantes, B. F. (2020). Are Neoclassic Internationalization Models Enduring? A Case-Review of the Uppsala Paradigm. *Sage Open*, 10(2), 1-16. https://doi.org/10.1177/2158244020932535

Adams, J. (2012) The rise of research networks. *Nature*, 490 (7420), 335-336. https://doi.org/10.1038/490335a

Adner, R., & Helfat, C. E. (2003) Corporate effects and dynamic managerial capabilities. *Strategic Management Journal*, 24(10), 1011-1025. https://doi.org/10.1002/smj.331

Al-Aali, A and Teece, D. J. (2014) International entrepreneurship and the theory of the (Long–Lived) international firm: a capabilities perspective. *Entrepreneurship Theory and Practice*, 38(1), 95-116. https://doi.org/10.1111/etap.12077

Ambrosini, V., Bowman, C., & Collier, N. (2009). Dynamic capabilities: An exploration of how firms renew their resource base. *British Journal of Management*, 20, 9-24. https://doi.org/10.1111/j.1467-8551.2008.00610.x

Anser, M. K., Khan, M. A., Awan, U., Batool, R., Zaman, K., Imran, M., ... & Bakar, Z. A. (2020). The role of technological innovation in a dynamic model of the environmental supply chain curve: evidence from a panel of 102 countries. *Processes*, 8(9), 1033.

Arasti, M., Mokhtarzadeh, N. G., & Jafarpanah, I. (2021) Networking capability: a systematic review of literature and future research agenda. *Journal of Business & Industrial Marketing*, 37(1), 160-179. https://doi.org/10.1108/JBIM-06-2020-0273

Bachmann, R., & Inkpen, A. C. (2011) Understanding institutional-based trust building processes in inter-organizational relationships. *Organization Studies*, 32(2), 281-301. https://doi.org/10.1177/0170840610397477

Balland, P. A., Boschma, R., & Ravet, J. (2019) Network dynamics in collaborative research in the EU, 2003–2017. *European Planning Studies*, 27(9) 1811-1837. https://doi.org/10.1080/09654313.2019.1641187

Barreto, I. (2010) Dynamic capabilities: A review of past research and an agenda for the future, *Journal of Management*, 36(1), 256-280. https://doi.org/10.1177/0149206309350776

Boekel, (2015) Do Cooperative Research and Development (R&D) Subsidies Stimulate Regional Innovation Efficiency? Evidence from Germany. *Regional studies*. 49(7), 1087-1110. https://doi.org/10.1080/00343404.2013.812781

Bogers, M., Chesbrough, H., Heaton, S., & Teece, D. J. (2019) Strategic Management of Open Innovation: A Dynamic Capabilities Perspective", California Management Review, 62(1), 77–94. https://doi.org/10.1177/0008125619885150

Bygdas, A. L. (2006, July). Enacting dynamic capabilities in distributed organisational environments. In Proceedings of the EGOS Conference, Bergen, Norway (Vol. 22, No. 1).

Camarinha-Matos, L. M. (2009). Collaborative networked organizations: Status and trends in manufacturing. *Annual Reviews in Control*, 33(2), 199-208. https://doi.org/10.1016/j.arcontrol.2009.05.006

Cardeal, N. C., Abecassis-Moedas, C., & António, N. S. (2014) Shared cluster resources as a source of core capabilities. *International Journal of Entrepreneurship and Small Business*, 21(1), 55-78. https://doi.org/10.1504/IJESB.2014.057915

Chesborough, H. (2003) *Open Innovation: The new imperative for creating and profiting from Technology"*. Harvard Business School Press, Boston, Mass.

Cislaghi, T. P., Wegner, D., & Vieira, L. M. (2022). How do governance and relational rents evolve during the maturity stages of supply chains?. *Supply Chain Management: An International Journal*, 27(3), 369-382. https://doi.org/10.1108/SCM-07-2020-0296

Contractor, F. J., Kundu, S. K., & Chin-Chun, H. (2003) A three-stage theory of international expansion: The link between multinationality and performance in the service sector. *Journal of International Business Studies*, 34(1), 5-18. https://doi.org/10.1057/palgrave.jibs.8400003

Dhanaraj, C., & Parkhe, A. (2006) Orchestrating innovation networks. *Academy of Management Review*. 31(3), 659-669. http://www.jstor.org/stable/20159234

Douglas, S. P., & Craig, C. S. (1983) Examining performance of US multinationals in foreign markets. *Journal of International Business Studies*, 14(3), 51-62. http://www.jstor.org/stable/154689 (accessed 04 September 2024).

Dyer, J. H., & Singh, H. (1998). The relational view: Cooperative strategy and sources of interorganizational competitive advantage. *Academy of Management Review*, 23(4), 660-679. https://doi.org/10.5465/amr.1998.1255632
Dyer, J. H., Singh, H., & Hesterly, W. S. (2018). The relational view revisited: A dynamic perspective on value creation and value capture. *Strategic Management Journal*, 39(12), 3140-3162. https://doi.org/10.1002/smj.2785

Eisenhardt, K. M., & Martin, J. A. (2000) Dynamic capabilities: what are they?. *Strategic Management Journal*, 21(10-11), 1105-1121. http://www.jstor.org/stable/3094429 (accessed 04 September 2024)

Faccin, K., Wegner, D., & Balestrin, A. (2020) How to orchestrate R&D networks? The role of orchestration subprocesses and collaborative practices over time. *Creativity and Innovation Management*, 29(1), 161-177. https://doi.org/10.1111/caim.12355

Fredrich, V., Gudergan, S., & Bouncken, R. B. (2022) Dynamic capabilities, internationalization and growth of small-and medium-sized enterprises: The roles of research and development intensity and collaborative intensity. *Management International Review*, 62(4), 611-642. https://doi.org/10.1007/s11575-022-00480-3

Frieden, D., Tuerk, A., Antunes, A. R., Athanasios, V., Chronis, A. G., d'Herbemont, S., Gubina, A. F. (2021) Are we on the right track? Collective self-consumption and energy communities in the European Union. *Sustainability*, 13(2), 1-26. https://doi.org/10.3390/su132212494

Furr, N, & Furr, S.H (2022) *The Upside of Uncertainty*. Boston, Massachusetts: Harvard Business School Publishing.

Geldes, C., Felzensztein, C., & Palacios-Fenech, J. (2017) Technological and non-technological innovations, performance and propensity to innovate across industries: The case of an emerging economy. *Industrial Marketing Management*, 61(1), 55-66. https://doi.org/10.1016/j.indmarman.2016.10.010

George, G., Zahra, S. A., & Wood Jr, D. R. (2002) The effects of business–university alliances on innovative output and financial performance: a study of publicly traded biotechnology companies. *Journal of Business Venturing*, 17(6), 577-609. https://doi.org/10.1016/S0883-9026(01)00069-6

Gioia, D. A., & Chittipeddi, K. (1991) Sensemaking and sensegiving in strategic change initiation, *Strategic Management Journal*, 12(6), 433-448. http://www.jstor.org/stable/2486479

Gioia, D. A., Corley, K. G., & Hamilton, A. L. (2013) Seeking qualitative rigor in inductive research: Notes on the Gioia methodology. *Organizational Research Methods*, 16(1), 15-31. https://doi.org/10.1177/1094428112452151

Gulati, R., Nohria, N., & Zaheer, A. (2000). Strategic networks. Strategic management journal, 21(3), 203-215. https://doi.org/10.1002/(SICI)1097-0266(200003)21:3<203::AID-SMJ102>3.0.CO;2-K

Gulati, R. (1998). Alliances and networks. *Strategic Management Journal*, 19(4), 293-317. https://doi.org/10.1002/(SICI)1097-0266(199804)19:4<293::AID-SMJ982>3.0.CO;2-M

Hagen, B., Zucchella, Chechiello, P., De Giovanni, N. (2012) International strategy and performance - Clustering strategic types of SMEs. *International Business Review*, 21(3), 369–382. https://doi.org/10.1016/j.ibusrev.2011.04.002

Helfat, C., Finkelstein, S., Mitchell, W., Peteraf, M., Singh, H., Teece, D. & Winter, S. (2007) *Dynamic Capabilities: Understanding Strategic Change in Organizations*. Malden, MA: Blackwell.

Holtbrügge, D. (2004) Management of international strategic business cooperation: Situational conditions, performance criteria, and success factors. *Thunderbird International Business Review*, 46(3), 255-274. https://doi.org/10.1002/tie.20008

Hörsch, J., Hofmann, F., Schlachtberger, D., & Brown, T. (2018) PyPSA-Eur: An open optimisation model of the European transmission system. *Energy Strategy Reviews*, 22(1), 207-215. https://doi.org/10.48550/arXiv.1806.01613

Knight, G.A. & Kim, D. (2009) International business competence and the contemporary firm. *Journal of International Business Studies*. 40(1), 255-273. https://link.springer.com/article/10.1057/palgrave.jibs.8400397

Kurtmollaiev, S. (2020) Dynamic capabilities and where to find them. *Journal of Management Inquiry*, 29(1), 3-16. https://doi.org/10.1177/1056492617730126

Kandampully, J. (2002) Innovation as the core competency of a service organisation: the role of technology, knowledge and networks. *European Journal of Innovation Management*, 5(1), 18-26. https://doi.org/10.1108/14601060210415144

Jap, S. D., & Anderson, E. (2003). Safeguarding interorganizational performance and continuity under ex post opportunism. *Management science*, 49(12), 1684-1701. https://doi.org/10.1287/mnsc.49.12.1684.25112

Lane, P. J., & Lubatkin, M. (1998). Relative absorptive capacity and interorganizational learning. *Strategic management journal*, 19(5), 461-477. https://doi.org/10.1002/(SICI)1097-0266(199805)19:5<461::AID-SMJ953>3.0.CO;2-L

Li, D. Y., & Liu, J. (2014) Dynamic capabilities, environmental dynamism, and competitive advantage: Evidence from China. *Journal of Business Research*, 67(1), 2793-2799. https://doi.org/10.1016/j.jbusres.2012.08.007

Lu, J. W., & Beamish, P. W. (2004) International diversification and firm performance: The S-curve hypothesis. *Academy of Management Journal*, 47(4), 598-609. https://doi.org/10.5465/20159604

Massaro, M., Moro, A., Aschauer, E., & Fink, M. (2019). Trust, control and knowledge transfer in small business networks. *Review of Managerial Science*, 13, 267-301. https://doi.org/10.1007/s11846-017-0247-y

McKelvie, A., Davidsson, P. (2009) From resource base to dynamic capabilities: An investigation of new firms. *British Journal of Management*, 2(1), 63-80, http://dx.doi.org/10.1111/j.1467-8551.2008.00613.x

Miles, M. B., Huberman, A. M., & Saldaña, J. (2018) *Qualitative data analysis: A methods sourcebook*. Thousand Oaks, CA: Sage publications.

Miles, R. E., & Snow, C. C. (1978) *Organizational strategy, structure, and process"*. New York: McGraw-Hill Book Company.

Mo, S., Booth, S. A., & Wang, Z. (2012). How do Chinese firms deal with inter-organizational conflict?. *Journal of Business Ethics*, 108, 121-129. https://doi.org/10.1007/s10551-011-1066-8

Oliveira, N., & Lumineau, F. (2019). The dark side of interorganizational relationships: An integrative review and research agenda. *Journal of Management*, 45(1), 231-261. https://doi.org/10.1177/014920631880402

Parrish C.S.C., D., Clark, T.S. & Holloway, S.S. (2020) The collapse of sensemaking at Yarnell Hill: the effects of endogenous ecological chaos on enactment. *European Journal of Management Studies*, 25(2), 77-95. Available at: https://doi.org/10.1108/EJMS-10-2020-005

Provan, K. G., & Kenis, P. (2008) Modes of network governance: Structure, management, and effectiveness. *Journal of Public Administration Research and Theory*, 18(2), 229-252. https://doi.org/10.1093/jopart/mum015

Rajapathirana, R. J., & Hui, Y. (2018) Relationship between innovation capability, innovation type, and firm performance. *Journal of Innovation & Knowledge*, 3(1), 44-55. https://doi.org/10.1016/j.jik.2017.06.002

Rosellón, J. (2003) Different approaches towards electricity transmission expansion. *Review of Network Economics*, 2(3), 238-269. https://doi.org/10.2202/1446-9022.1028

Teece, D. J. (2009). *Dynamic capabilities and strategic management: Organizing for innovation and growth*. Oxford University Press.

Teece, D. J. (2007). Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. *Strategic management journal*, 28(13), 1319-1350. https://doi.org/10.1002/smj.640

Teece, D. J., Pisano, G., & Shuen, A. (1997) Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7), 509-533. https://www.jstor.org/stable/3088148

Todeva, E. (2006). *Business networks: strategy and structure*. Routledge. https://doi.org/10.4324/9780203028261

Todeva, E., & Knoke, D. (2005). Strategic alliances and models of collaboration. Management decision, 43(1), 123-148. https://doi.org/10.1108/00251740510572533

Vernon, R. (1971) *Sovereignty at Bay: The multinational spread of US enterprises*. New York: Basic Books.

Williamson, O. E. (1991). Strategizing, economizing, and economic organization. Strategic management journal, 12(S2), 75-94. https://doi.org/10.1002/smj.4250121007

Wegner, D., Dias, M. F. P., Azevedo, A. C., & Marconatto, D. A. B. (2022) Configuring the governance and management of strategic networks for higher performance. *Journal of Business & Industrial Marketing*. 37(12), 2501-2514. https://doi.org/10.1108/JBIM-07-2021-0336

Wegner, D., & Verschoore, J. (2022). Network governance in action: Functions and practices to foster collaborative environments. *Administration & Society*, 54(3), 479-499. https://doi.org/10.1177/00953997211024580

Wiersema, M. F., & Bowen, H. P. (2011) The relationship between international diversification and firm performance: Why it remains a puzzle. *Global Strategy Journal*, 1(1-2), 152-170. https://doi.org/10.1002/gsj.5

Zhang, S., Li, N., & Li, J. (2017). Redefining relational rent. Technological Forecasting and Social Change, 117, 315-326. https://doi.org/10.1016/j.techfore.2016.10.072

Zollo, M., & Winter, S. G. (2002). Deliberate learning and the evolution of dynamic capabilities. *Organization science*, 13(3), 339-351. https://doi.org/10.1287/orsc.13.3.339.2780

Notes

1. Evidence of acquisition of new research and development (> DC-type 1) or networking capabilities (> DC-type 2).
2. Evidence of development, or growing in attributes of an existing capability (DC-type 1 or 2), whether through the learning of new components, or the reconfiguration of possessed attributes (partial modification); or renewal (total modification) of it knowledge-bundle.