# ASSESSING STRATEGIES OF FIRMS THAT LEVERAGE INNOVATION THROUGH ALLIANCE PORTFOLIOS OR NETWORKS: Proposing the Strategic Network Analysis Innovation Framework – SNA-IF

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## ABSTRACT

*To sustain their competitiveness in the globalized marketplace, firms are increasingly following strategies that adopt alliance portfolios – APs or networks to leverage innovation, thus obliging them to take into account AP/network attributes that influence innovation. However, their strategic analyses and planning rarely consider such attributes, admittedly because of a lack of adequate tools. This paper contributes to research that seeks to fill this gap by proposing the Strategic Network Analysis Innovation Framework – SNA-IF. The latter, which is a variation of a generic SNA framework that has been successfully applied in almost 30 firms in Brazil, was designed for innovation-oriented firms that engage in APs/networks. The framework includes a methodology, constructs and a model to conduct strategic assessments from a network perspective in this type of firm. The APs/network attributes pertinent to innovation were identified in an extensive literature review regarding the relationship between APs, networks and innovation.*

**Keywords:** *Alliance Portfolios; Alliance Networks; Innovation oriented firms; Innovation Performance; Strategic Analyses; Analytical Framework; Network Theory*

## 1. INTRODUCTION

Especially in high-clockspeed industries, firms are following innovation-oriented strategies (Lahiri & Narayanan, 2013) to attend to the demands of the globalized market and sustain their competitiveness. According to an EU Innovation Survey, "...the Member States … acknowledged that increasing innovation is key to responding to the challenge offered by globalization" (Autant-Bernard et al., 2010, p. 1). Increasingly these strategies contemplate alliance portfolios or networks of linkages (henceforth referred to as APs/networks) to leverage innovation. Several authors have emphasized the importance for leveraging innovation to engage simultaneously in multiple alliances configuring networks (Ahuja, 2000) or APs (Faems et al. 2005; Duysters & Lokshin, 2011). In line with the network literature (Ahuja, 2000; Baum et al., 2000; Kudic & Guhr, 2013; Ozcan & Eisenhardt, 2011), AP is defined here as an ego-centric network, or ego-net for short, i.e. the network formed by the focal firm, its direct ties to partners and its indirect ties, i.e. between partners. Thus, AP and ego-net are used interchangeably. Although the focus is on the ego-net, second-tier ties (i.e. partner´s ties to their partners) are considered if they are strategically relevant for the focal firm. Kudic and Guhr (2013) observed that the firm´s cooperation decisions are strongly influenced by the opportunities and threats provided by the broader network environment. Indeed, the ego-net should be considered in the light of the focal firm´s value net, i.e. the network formed by all the players (partners and non-partners) and their interdependencies that are significant for capturing value that contributes to the focal firm´s competitive advantage (Brandenburger & Nalebuff, 1996). The expression "AP/network" is meant to make this point.

Innovation is defined as new products/processes developed and commercialized (OECD, 2005). We distinguish between radical and incremental innovation (Tidd, 2001). Since we research in an emerging country, we include 'Reverse Innovation': "innovation is adopted first in poor economies before 'trickling up' to rich countries" (Govindarajan & Ramamurti, 2011, p. 191).

When firms engage in APs/networks to leverage innovation, they must obviously not only know which AP/network attributes influence positively innovation, but also consider these in their strategic analyses. However, this is rarely the case, admittedly, because of a lack of adequate tools to do so.

This paper´s objective is to contribute to research that seeks to fill this gap by proposing the Strategic Network Analysis Innovation Framework – SNA-IF. The latter was designed for innovation-oriented firms engaged in AP/networks. It is a tool to assess, from a relational/network perspective, to what extent such a firm's strategy is adequate for achieving its strategic objectives, notably effective innovation performance, considering its AP/network, industry structure and organizational factors. The AP/network attributes that can influence positively innovation were captured in an extensive literature review on APs, networks and innovation.

Among the numerous studies reviewed, few propose frameworks for assessing strategic fit of innovation-oriented firms that engage in APs or networks (e.g. Yamakawa et al. 2011) and hardly any with the SNA–IF´s comprehensive approach. (For a literature review on open innovation frameworks, see Lichtenthaler, 2011). However, increasingly, investigations aim at capturing relational and network attributes that influence innovation (Ahuja, 2000; Baum et al. 2000; Capaldo, 2007; Powell et al., 1996; Wuyts et al., 2004).

The remainder of this article is divided into the following parts: research methods; literature review and theoretical basis; introducing the SNA – IF; final considerations.

## 2. RESEARCH METHODS

The SNA-IF is a variation of a generic SNA framework that was designed to help firms that engage in APs/networks to carry out their strategic analyses more effectively by considering relational/network factors, together with significant organizational and industry structural ones. This generic framework has been applied successfully to over 30 firms in different sectors in Brazil (e.g. Macedo-Soares et al., 2004; Macedo-Soares & Schubsky, 2010**;** Macedo-Soares & Mendonça, 2010), in its original form as well as in that of its different variations (e.g. Bastos & Macedo-Soares, 2014), notably the Global SNA Framework (Macedo-Soares, 2011). The SNA-IF builds on the generic framework in that it maintains its original design, but adapts its components to its new focus: innovation. It differs significantly from the latter in that it highlights AP/network characteristics that are important for leveraging innovation capability and performance. The literature made evident that when the firm is oriented towards innovation, compared with other strategic orientations, different AP/network characteristics become significant.

Our literature review included a two-stage bibliometric study. In the first the sample was composed of 376 articles from the Web of Science data base from 2001-2014, and 5 key words (Turano, Macedo-Soares & Esteves, 2014). In the second stage, the sample consisted of 812 articles, same time frame, 4 data bases (Web of Science, Scopus, Ebsco Host and Science Direct), and 9 key words. Bibexcel software helped organize the data, and multivariate data analysis with SPSS software was used to generate maps of co-citations. We thus selected the 129 most relevant articles that were analysed qualitatively to identify AP/network attributes with significant implications for innovation.

## 3. LITERATURE REVIEW AND THEORETICAL BASIS

Note that alliances were defined as voluntary arrangements among two or more independent firms, involving exchange, sharing or joint development of technologies, products or services (Gulati 1998). We considered a typology of linkages according to their intensity that has been associated with performance impact (Contractor & Lorange, 1988). Linkages are thus classified running the following gamut: mergers & acquisitions – M & A (most intense), and joint ventures, to agreements and contracts (less intense). Apart from M&A, the others are alliances when they meet Gulati´s (1998) definition. They are strategic when they contribute to the firm's competitive advantage (Macedo-Soares, 2011).

In the literature we found two bibliographic studies related to our investigation. In their study of the literature on alliance networks and technological innovation, Stolwijk et al. (2013) verified that the more complex network structural variables and their relationship to technological development had hardly been looked into. They concluded that empirical literature on this relationship is growing, but not in a systematic fashion.

In Wassmer´s (2010) literature review three research areas on APs were identified: i) emergence; ii) configuration; iii) AP management. He found 14 theoretical lenses used in AP research. The SNA-IF proposal seeks to contribute to research both in the AP configuration and management areas. In line with with Wassmer´s (2010) findings, it draws on a combination of social network theory, RBV, organizational learning and dynamic capability theory (Ahuja, 2000a; 200b; Baum et al. 2000; George et al., 2001; Lavie & Rosenkopf, 2006).

The theoretical basis for the generic SNA Framework, upon which the SNA-IF was built, came from the social network literature. Ahuja (2000), Baum et al. (2000), Galaskiewicz and Zaheer (1999), Gulati et al. (2000), Kale et al. (2000) and Knoke (2001) made significant contributions for the analysis of alliances´ strategic

implications from a network perspective. Galaskiewicz and Zaheer (1999) proposed three key dimensions – network structure, network composition and network linkage modalities – and associated constructs for a firm-level analysis. Drawing on other empirical studies, Gulati et al. (2000) added constructs for network characteristics in these dimensions. They showed how they have strategic implications, creating opportunities and threats at industry level, and strengths and weaknesses at corporate level. They argued that network management could be another key dimension at corporate level. Because of networks' dynamic nature they emphasized "dynamic" strategic fit (Zajac et al., 2000). In the SNA-IF these four network dimensions are used to classify AP/network characteristics pertinent to innovation.

3.1. *Network structure*

The constructs focussed in this dimension are ego-net size, density, scope, position/centrality, structural holes and configuration of partners/resources

Ego-net size, i.e. number of firm´s direct ties to partners, influences innovation performance positively (Ahuja, 2000; Hoffmann, 2007), especially when its configuration is heterogeneous. As Kudic and Guhr (2013) observed, multiple collaboration innovation endeavours with diverse heterogeneous partners increase access to different types of knowledge or learning opportunities and accelerate the development of new ideas and products.

Density - degree of connectedness among focal firm´s partners, i.e. number of indirect ties relative to the maximum possible) is also positive for innovation, since indirect ties are mechanisms for knowledge spillovers with hardly any costs, although the contribution of direct ties is probably greater than indirect ties (Kudic & Guhr, 2013). While direct ties are sources of both information and resource sharing, indirect ties are sources of only the former (Ahuja, 2000); moreover, indirect ties can create competition for the focal firm from partners that use the same information. In addition, when the ego-net´s size increases, indirect ties´ positive influence on innovation diminishes because of the problem of absorbing extra information. Large APs, as well as significant levels of heterogeneity and diversity contribute to stepping up the complexity of the network structure, which is usually positive up to a certain limit, after which it can be negative for innovation (Beers & Zand, 2014; Duysters & Lokshin, 2011; Goerzen & Beamish, 2005; Lahiri & Narayanan, 2013; Leeuw et al., 2014; Oerlemans et al. 2013). Ahuja (2000) concluded that the ego-net structure´s potential for influencing innovation depended on other factors, notably tie nature and content and the broader network in which the ego-net is embedded, as well as the firm´s strategic objectives. Wide geographic scope is positive for innovation because of the increased diverse external knowledge it potentially provides. However, as Cui and O´ Connor (2012) noted, APs with high partner dispersion can influence innovation negatively because of the higher transaction and coordination costs involved. In their research on Brazilian multinationals, Costa and Porto (2014) found that a high degree of dispersion of technological development activities affected negatively the success of the innovation cooperation efforts.

When density is high, the firm is embedded in the network (Uzzi, 1997), which is positive because embeddedness contributes to trust, knowledge transfer, joint problem solving and reduced opportunism (Ahuja, 2000). For Lahiri and Narayanan (2013), density´s impact on innovation depends also on the firm´s strategic vertical scope. When the latter is integrated (versus specialized), high density is less favourable for innovation. When density is excessive, it generates overembeddedness (Uzzi, *ibidem*), and network closure (Coleman, 1990) which can be negative for innovation, because the network becomes closed to outside and thus potentially new information (Ahuja, 2000). Simard and West (2008) noted that regional clusters, although known for their innovative capacity, incur the risk of becoming overembedded.

Figueiredo's (2011) research into subsidiaries of MNEs in Brazil found that 'dual embeddedness', i.e. firm simultaneously embedded in two networks - of internal and external knowledge-intensive linkages - contributed to superior innovation performance.

Gilsing et al.'s (2014) study revealed that, mainly, in conditions of technological turbulence, "clique-embeddedness" could be negative because of the relative homogeneity of knowledge within the clique. For leveraging technological innovation, firms should establish alliances with organizations outside their cliques.

As Ahuja (2000) pointed out, an open network, where the firm´s partners are not linked, or with many structural holes in the ego net, increases the firm´s access to diverse information and thus enhances innovation output. On the other hand, an ego-net "with fewer structural holes might promote trust generation and reduce opportunism, leading to more productive collaboration from the perspective of resource sharing" (p. 433).

Burt (1992) had already argued that what counted was not the number of ties but a firm´s position in the network, notably, in terms of creating bridges over structural holes, i.e. by brokers connecting with network members that were not connected. His theory revealed that brokerage was positive for innovation, by enabling access to new knowledge by the broker firm (Kudic & Guhr 2011; McEvily & Zaheer, 1999). Position, in terms of centrality in the network would also have a positive influence on firm outcomes (Shan et al. 1994;, Walker et al. 1997), including that of innovation oriented firms (Powell et al., 1996, Pandza, 2011). However, over time, it could be negative as it leads to inertia (Tidd, 2001) and redundancy.

3.2 *Network composition*
According to Lin (2001) it is the network´s resources, and not the network itself, that are important, arguing that it is not sufficient to create a bridge over a structural hole, its content has to be different. Otherwise, information would be redundant, hardly favouring innovation. The constructs focussed here are focal firm and partners´ identities, types, status - and their resources (type, volume, access).

Network´s composition is obviously positive when the firm and its partners in the AP/network are rich in valuable resources for innovation (Gulati et al., 2000), notably, new information and knowledge, but also social capital and distinctive innovation capabilities, including managerial ones. Network partner diversity has been viewed as a vehicle to access external-party valuable resources. As Lavie and Miller (2008) noted, foreign partners' resources can dislodge a firm from its own competency traps and stimulate innovations. However as we saw, a high degree of diversity can be negative for innovation (Cui & Connor, 2012; Duysters & Lokshin, 2011; Sivakumar, 2011).

Note that the focal firm´s easy access to valuable innovation related resources is critical, as this increases its bargaining power with its partners (Lavie, 2007). Difficult access to the focal firm or its partners´ resources, from outside the network is positive in that it creates a barrier to new entrants (Westney, 1993).

3.3. *Network Linkages´ Modalities*
The constructs focussed here were strength and nature of linkages. Strength depends on relationship intensity, frequency of interaction, duration and reciprocity. Various linkage modalities were considered: i) collaborative versus opportunistic/competitive (coopetition); ii) exploration versus exploitation; iii) international versus local. The literature also mentions formal/informal and deep/wide, generally associated with strong/weak linkages.

Generally, strong linkages are positive for firm performance (Gulati et al., 2000). However, according to the theory of the strength of weak ties (Granovetter, 1973) this may not be so for innovation. As Borgatti and Halgin (2011) observed, the stronger the tie, the greater the superposition of the social worlds of those involved. Consequently, strong ties are not a source of new information. Bridging ties are such a source, and only weak ties are bridging ties.

Capaldo (2007) found that dual network architectures formed by a nucleus of strong ties, within a wide periphery of weak heterogeneous ones would be positive for firm innovation performance.

Simard and West (2008) noted that portfolios of deep ties could generate only incremental innovation, while wide ones had a greater potential for radical innovation, albeit without the trust inherent to deep and formal ties, and, thus, faced greater management challenges.

Among the different types of alliances, exploitative and explorative ones have significant implications for innovation. Similarly to March (1991), Koza and Lewin (1998) considered that exploitation referred to leveraging existing capabilities, while exploration constituted the discovery of new opportunities, with partners as well as other players.

Garcia-Canal et al. (2002) applied these concepts to analyse alliance-based internationalization processes. They conducted 11 case studies of Spanish MNEs, considering alliances´ scope – global/local - and orientation - exploitation/ exploration. Firms with exploitation alliances intended to exploit current competencies, using the local or global partner merely to have access to the foreign market. Firms with exploration alliances sought to develop new products/solutions by combining their competencies with those of their partners. International exploration alliances contributed more to radical innovation (Lavie & Rosenkopf, 2006). However, in certain cases, e.g. in a relationship between a small and big firm, exploitation alliances were preferred, so as to mitigate the larger firm's potential opportunism, while contributing to incremental innovations of interest to both parties (Yang et al., 2013).

The adoption of exploitation and exploration alliances could vary according to the innovation process´s stage. Dittrich and Duysters´s (2007) study of Nokia found that the company managed to remain a global leader in its segment for three decades by using both types at different stages of its history.

Regarding international firms, Vapola et al. (2010) recommended that exploitation alliances be managed through a global strategy and exploration alliances through a transnational one. The choice of alliance orientation for innovation would depend on its fit with the other strategically significant factors for innovation. Similarly, Yamakawa et al. (2011) suggested that the AP's exploitation versus exploration orientation depended on its fit with the firm, strategy and industry.

Gilsing et al. (2014) also highlighted exploitation/exploration orientations for innovation. They noted that a certain superposition of technological knowledge between clique members could be attractive for taking advantage of existing knowledge (exploitation). However, as we saw this could lead to "clique-embeddedness" which would be negative for innovation.

Yamakawa et al. (2011) proposed a framework to identify which AP type – exploitative or explorative – would be most positive for firm performance, including innovation. Their study found that exploration APs, which often go beyond their existing frontiers to obtain new resources, had a superior innovation performance, compared to exploitation portfolios, mainly in more mature firms. In firms with differentiation strategies, exploration portfolios would be more adequate in high growth industries, while exploitation would be preferable in low growth sectors.

The contribution to innovation of international versus local network linkages has already been touched upon in connection with the network´s geographic scope and the implications of ensuing diversity. There is a consensus in most of the literature (Beers & Zand, 2014; Belderbos et al., 2011; Duysters & Lokshin, 2007; 2011; Lavie & Miller, 2008; Leeuw et al., 2014; Sivakumar et al., 2011) that up to a certain point, AP or network diversity (i.e. degree of variance in alliance and partner types, functions, geographic scope, industry, institutions, governance) is positive. (See Juang et al., 2010, for multidimensional diversity construct). Lião and Yu (2013) noted that international alliance diversity influences positively innovation as it involves not only greater heterogeneity but informal ties. Such ties, that would have the positive attributes of social networks without significant costs, would be more adequate in emerging countries where institutional contextual factors are sources of uncertainty. However, both local and international linkages would be positive for innovation, depending on the institutional context. Similarly to Panzda (2011), they stress the importance of institutional diversity.

Focusing on Finnish firms, Ritala (2012) found that a few well selected coopetition alliances in the firm´s AP was positive for innovation, especially in knowledge intensive sectors characterized by uncertain markets, low levels of competition and high network externalities. In manufacturing, however, coopetition alliances´ would be negative for innovation.

3.4 *Network Management*

The constructs focussed here were relational governance, AP/Network management capabilities, dynamic fit between firm and partners, and innovation AP/network performance assessment.

A critical factor for AP/network management is relational governance (e.g. Gulati & Nickerson, 2008; Puranam & Vanneste, 2009). Arranz and Arroyabe (2012) argued that network transactional and relational governance mechanisms mitigate opportunistic partner behaviour and influence positively innovation performance. Also, Felin and Zenger (2014) observed that several studies found that innovation performance improves when open (through alliances/networks) governance forms are adopted. They distinguished between closed and open innovation forms of governance.

Kale and Singh (2009) argued that firms in alliances should develop AP management capabilities. We saw that AP/network diversity was a highly relevant attribute for innovation in all network dimensions. In fact, one of our bibliometric study's most important results was that diversity was the most cited significant AP/network characteristic in the recent literature. There indeed appears to be a trend to expand prior research that associated diversity of APs or networks with innovativeness (Duysters & Lokshin, 2007; Lavie & Miller, 2008). In this trend the benefits of AP/network geographic diversity are generally viewed as outweighing the costs of geographic/'psychic' distance that was emphasized in the traditional IB literature (Johanson & Vahle, 1990). However, recent studies found that diversity influenced positively innovation up to a certain point, after which it had a negative impact because of the management challenges it posed. The great majority thus stressed the importance for firms of having the capabilities to manage the heterogeneity, dynamic shifts, dispersion and complexity associated with high AP/network diversity.

Several studies of diversity observed that what influences positively innovation is the right mix and balance between the different types of linkages/partners within the ego-net (Gilsing et al. 2014; Lahiri & Narayanan, 2013; Lavie & Kang, 2011; Patel et el. 2014; Ritala, 2012; Vrande, 2013), and beyond it considering the wider network formed by indirect or weak, informal ties, or eventually even dual network architectures (Capaldo, 2007). To ensure the necessary delicate balance, certain management capabilities gain special significance. Cases in point are dynamic capability – DC, integrative capability – IC, absorptive capability - AC, and resource sharing capability – RSC. DC is the capability to "integrate, build, and reconfigure internal and external competencies to address rapidly changing environments" (Teece et al. 1997, *in* Eisenhardt & Martin, 2000, p. 1106). IC refers to "exploiting synergies and complementarities (Leeuw et al. 2014; Wassmer & Dussauge, 2011). AC refers to being able to acquire, assimilate and exploit external knowledge (Cohen & Levinthal, 1990). RSC refers to sharing and combining information and what is learned from different partners (Cui & O´Connor, 2012).

In connection with their finding that high dispersion of innovation activities influences negatively innovation performance, Costa and Porto´s (2014) research in Brazilian multinationals found that DC to manage dispersion interactions in developing countries was critical for innovation.

Dynamic network management at each stage of the innovation process is indeed fundamental for its outcome (Doz & Williamson, 2002), and implies, not only dynamic, but also integrative capabilities - i.e. including capabilities to avoid the trap of path dependency (Figueiredo, 2010; Park, 2011; Perello-Marin et al., 2013).

Lião et al. (2009) emphasized the role of DC for innovation and argued that IC was at the centre of DC in fast changing environments. Their research found that the relationship between a firm´s set of resources and innovation was mediated by IC. However, competitive advantage implied aligning these resources dynamically with changing environmental opportunities. It is relevant that integrative capabilities are directly related to absorptive capacity. Several recent studies on innovation APs and networks highlight the critical mediating role of absorptive capacity for managing effectively high AP/network diversity (e.g. Chen et al. 2009; Lião & Yu, 2013).

For Cui and O´Connor´s (2012) RSC is particularly critical. Indeed, they argue that AP´s resource diversity positively influences innovation only if resources and information are shared. However, they show that the latter is hardly an easy task and may be inhibited or facilitated by a number of factors, such as AP composition, the market environment, and the firm's ability to manage the AP. Governance, a dedicated alliance management function and high control over the alliances in diverse APs were found to be significant facilitating AP management factors.

Dynamic fit between partners in the AP/network at strategic cultural and organizational levels has been stressed as significant for the AP/network performance (Hoffmann, 2007). As Kale et al. (2000) noted there is a positive correlation between partner compatibility and complementarity (indicators for partner fit) and alliance success. Lião et al (2009) were concerned with the dynamic strategic fit of innovation-oriented firms and developed the Dynamic Capability Model of Innovation for Internet-Based Entrepreneurship. Yamakawa et al. (2011) found that the orientation of innovation alliances in terms of exploitation or exploration influences positively innovation depending on its fit to strategy, firm and industry.

The periodic performance assessment of a firm´s AP/network with a view to its improvement or redesign is also a critical success factor for AP/network (Koka & Prescott, 2008) management. In firms that seek to leverage innovation performance through AP/Networks, it is fundamental that they have relational/network innovation performance assessment processes and metrics (Boly et al. 2014; Chesbrough, 2003).

## 4. INTRODUCING THE SNA INNOVATION FRAMEWORK

First, we present the proposal´s main assumption: strategic management of innovation-oriented firms in APs/networks should adopt a network perspective. We thus argue that, in this type of firm, a dynamic strategic fit only exists if its strategy capitalizes on the strengths constituted, not merely by the firm´s internal innovation resources/conditions, but also by those provided by the AP/network, reducing pertinent organizational and relational weaknesses. The aim is to exploit both environmental structural opportunities for innovation and those offered by the AP/network, while minimizing threats from both environmental structural and relational factors. We adapt Barney´s (1997) concept of 'good' strategy to the relational view and to the case of innovation-oriented firms. In keeping with RBV, resources include capabilities/competencies. Since we consider dynamic fit, both real and potential strengths/weaknesses and opportunities/threats must be assessed.

The SNA-IF has three components: SNA-IF Methodology; SNA-IF Reference Lists; SNA-IF Model.

4.1. *The SNA –IF Methodology*

Ten steps were devised for carrying out the strategic analysis.

1. Characterize the focal firm´s competitive strategy (use for example, Mintzberg, 1988, typology), and its AP innovation strategy (e.g. Hoffmann, 2007, typology).
2. Identify the opportunities and threats for innovation from environmental structural factors: i) political, economic, socio-cultural and demographic (Austin 1990), ii) strategic actors/roles (Porter, 1980).
3. Identify the strengths and weaknesses of the firm´s resources pertinent to innovation (Boly et al., 2014) and organizational conditions to administer these, in the light of its strategy.
4. Characterize (strength, nature) the innovation related alliances in the AP/network, using appropriate typologies (e.g. Contractor & Lorange, 1988; Garcia-Canal et al., 2002; Dittrich & Duysters, 2007; Lavie et al., 2011; Ritala, 2012) and relational reference list (see Table 1).
5. Map the firm´s innovation-oriented AP/network with the help of the SNA-IF Model.
6. Assess the opportunities/threats and strengths/weaknesses for innovation of the focal firm's AP/network attributes, respectively, at industry and corporate levels, using relational reference list.
7. Capture data on the firm´s performance, with a focus on innovation dimension (Boly et al. 2014) using relational/network metrics (Chesbrough, 2003), and other significant performance metrics for firm competitiveness.
8. Assess firm's dynamic strategic fit, posing the question: "Does the firm's innovation-oriented strategy capitalize on the strengths constituted, not merely by the firm's internal innovation resources/conditions (real/ potential), but also by those provided by the AP/network, reducing weaknesses (real/potential) pertinent to both the firm and AP/network, so as to exploit not only environmental structural opportunities (real/potential) for innovation, but also those offered by the AP/network, minimizing threats (real/ potential) posed by both the structural factors and the AP/network?"
9. Identify sources of inconsistencies. Verify whether they are due to a lack of essential resources/conditions for leveraging innovation performance or if they stem from factors that may appear to be discrepant, at the time of the assessment, but that are critical for the future development of the necessary innovation-related resources for sustaining the firm's competitive advantage. Instead of being viewed as a weakness, an inconsistency related to the latter type of factors should be considered a potential strength, in that it accounts for *positive imperfect fit* that enables dynamic fit, and is called a 'positive' inconsistency. One more step is suggested when the assessments reveal inadequate fit.
10. On the basis of the assessment's results regarding weaknesses, prescribe changes in the latter to improve firm's dynamic strategic fit. Make strategic decisions — adjustments or adoption of a new strategy — considering the importance of sustaining competitive advantage through AP/network leveraged innovation in the increasingly competitive markets.

4.2. SNA-IF *Reference Lists*

To conduct the assessment in accordance with the steps outlined above, we propose reference lists of the factors to be analysed at each step. They form the basis for developing the instruments (e.g. questionnaires.) to capture and interpret the necessary data/information. Table 1 presents a summarized version of the relational reference lists for Steps 5 and 6. The values regarding AP/network attributes' positive implications (strengths and opportunities) for innovation are in bold type.

**Table 1 –** *Reference List of Relational/Network Constructs Pertinent To Innovation*

4.3. *SNA-IF Model* (Figure 1)

As the SNA-IF Model's objective is to map the ego-net of an innovation-oriented firm it highlights the innovation alliances/linkages that constitute this ego-net. Actors outside the ego-net in the wider value net are called 'Other Strategic Actors'. Organizational factors pertinent to Step 3 and to the network management dimension are not shown in the model, to avoid cramming in too much information.

Using different sizes, shapes and colours (if applicable), the model features essential constructs pertinent to innovation for the other network dimensions.

The network structure constructs shown in Figure 1 are ego-net size, density and structural hole (dotted line circle between supplier B and Client A). The constructs for network composition shown are: i) network member status – high profile, represented by the relatively larger size of the partner compared to the others (e.g. supplier

B is much more important, in that it is richer in innovation related resources than supplier A); ii) identity – partner's role (e.g. supplier – Suppl.; client – Cli., etc.). The constructs shown for the Linkage Modalities dimension are: i) strength – the fuller the line the stronger the linkage, ii) nature, indicated by the colour of the lines that represent the linkages, and the arrows' directions. When linkages are collaborative, arrows appear at both ends, and when opportunistic only a single arrow is directed at the partner that is being taken advantage of. When colours can be used, we recommend the rainbow spectrum to characterize the linkages in terms of their intensity, with red lines corresponding to the high end – M & A or joint venture, and violet to the low end – agreement. In the case of a black and white version, the spectrum goes from black line to very light grey. In between, various shades of grey can be adopted (e.g. in Figure 1, very dark grey for cross equity ownership alliance, less dark for minority equity investment alliance). To distinguish linkages, in terms of scope – local/international, exploitation/exploration, etc. different patterns and arrows can be used. In Figure 1, a white and grey scotch pattern was used to depict an exploration alliance. Also, an exploration alliance with complementor C outside the ego-net is shown, to illustrate the importance for this type of alliance of accessing new knowledge and information through connections to actors outside the focal firm's ego-net. As it is a collaborative alliance, arrows are depicted at both ends. On the other hand, the joint R & D agreement with a rival (Riv.) is exploitative and represented by a black dotted line to indicate that it is stronger than an exploration alliance. As it is opportunistic, the arrow points in only one direction.

**Figure 1 –** *SNA-IF Model*

## 5. FINAL CONSIDERATIONS

The SNA-IF will be validated using similar procedures to those used in the case of the other SNA frameworks. The necessary data for carrying out the strategic analysis according to the SNA-IF methodology will be captured using the case study method (Yin, 1986) that is appropriate for theory building. The framework will prove to be valid when it makes evident that it provides relational/network insights pertinent to innovation that could not be captured when only environmental structural factors (Step 2) and resources that are relevant for innovation are considered (Step 3). By comparing results of a strategic analysis that limits itself to the latter, i.e. what we call a traditional analysis, with results pertinent to AP/network factors (Steps 4, 5 and 6) – relational analysis, two different pictures will emerge. The complete analysis (10 steps), that takes into account the conjunction of all these factors, confronting and complementing results of steps 4, 5, and 6 with those of steps 2 and 3 contributes to a more accurate picture for strategic decision-making. Note that in most firms where the generic SNA Framework was applied, the majority of network opportunities identified contributed to mitigating environmental structural threats.

Although the SNA-IF has yet to be validated, there are indications that it has the potential to capture relevant relational insights for the strategic planning of firms that engage in APs/networks to leverage innovation. Even in its current form, it reveals several significant differences in the case of this type of firm, as compared to firms that are not innovation-oriented through AP/networks. For example, one of the results of the application of the Global SNA Framework in firms in the telecom industry was that the high density of alliances and their centrality within the network of global telecom infrastructure firms contributed to higher entry barriers in the industry, thus, mitigating the threat of global new entrants (Macedo-Soares & Mendonça, 2010). As the literature review revealed, high portfolio density can have negative implications for innovation because of the risk of overembeddedness. Weak ties, bridging ties, and a balance of different types of alliances in the AP/network, or in the scope of dual network type architectures, become particularly significant for innovation. Moreover, as several empirical investigations made evident, the institutional context, the type of industry – characterized by the degree of market uncertainty and competition, as well as the stage of the firm´s innovation process, are all critical contingencies to be considered when assessing the dynamic strategic fit of a firm that seeks to leverage innovation through AP/networks.

Validating the SNA-IF also implies refining and consolidating it by way of multiple applications, and thus contributing further to theory building through multiple case studies (Eisenhardt, 1989).

Considering the shift from global production networks to global innovation networks (Herstad et al., 2014), future research is recommended to design variations of the SNA-IF for the specific case of international and global firms that seek to leverage innovation performance through international alliance portfolios and networks.

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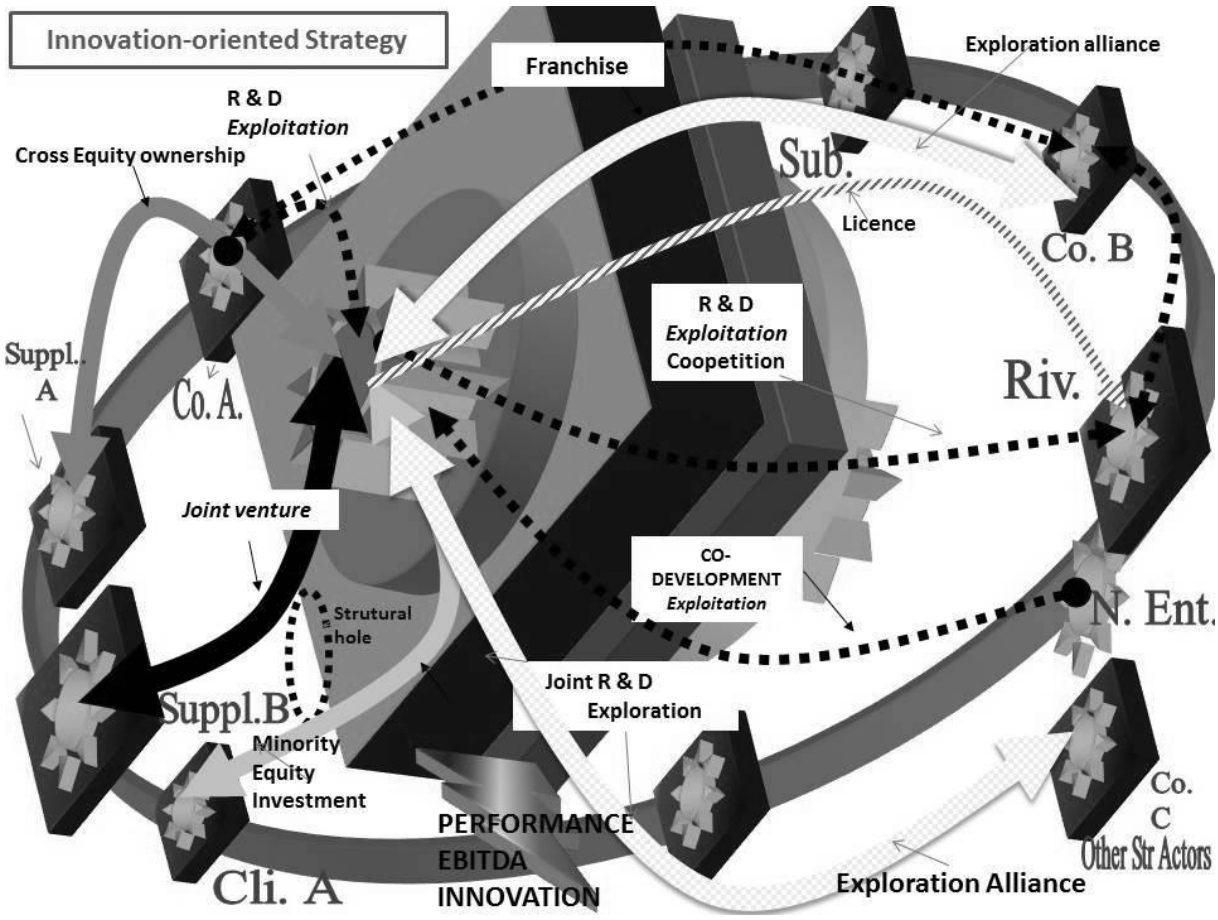
**Figure 1 – SNA- IF Model**




**Suppl. = Supplier; Cli.= Client; Co.= Complementor; Sub.= Substitute; Riv.= Rival; Other Str Actors.= Other Strategic Actors**

**Table 1 –– Reference List of Relational/Network Constructs Pertinent to Innovation (selectively summarized)**

| Dimen-sions | Constructs | Subconstructs/ Values | Firm Level Strength/Weakness for Innovation | Industry Level Opportunity/Threat for Innovation |
|---|---|---|---|---|
| **1. Network Structure** | **1.1. Size**<br>**1.2. Density of linkages**<br>**1.3.Scope**<br>**1.4. Position & Centrality in network**<br>**1.5 *Structural holes*, Brokerage**<br>**1.6. Configuration of partners/ Resources.** | **1.1. Many**/Few<br>**1.2. High /*Low***<br>**1.3.Wide** /narrow;<br>**1.4. Central** /Peripheric<br><br>**High**/Low<br>**1.5.*Presence*/** Absence of ***Structural holes***<br>**1.6. High/** Low **Heterogeneity, diversity, complexity** | **1.1. Many ties constitute strength**<br>**1.2. High network density can be both strength** and weakness**. Dual embeddedness can be a strength.**<br>**1.4. A central network position is strength;** over time it can be negative**.**<br><br>**1.5. Some structural holes can be a strength when the firms can bridge them, connecting not connected members**<br><br>**1.6. Heterogeneity/diversity is a strength up to a certain degree. When it is very high it becomes a weakness** | **1.1. Many ties create opportunities, especially with different partners.**<br>**1.2.** High density can be a threat because of overembeddedness.<br>**1.1., 1.3 & 1.4.. Plentiful ties, high centrality, wide geographical scope creates opportunities**<br><br>**1.5. Structural holes are opportunities for brokerage, giving access to new information and knowledge, valuable for innovation.** |
| **2 Network Compo-sition** | **2.1. Focal firm Identity (partner role)&**<br>**2.2. Status**<br>**2.3. Partner Identity &**<br>**2.4. Status**<br>**2.5. Access to firm's innova-tion resources**<br>**2.6. Access to partner´s innovation resources.** | **2.1. & 2.2. & 2.3. & 2.4. High profile/** low profile; **Success** /failure; **Rich/** /poor **in innovation resources**<br>**2.5. Difficult /Easy Access**<br>**2.6.** Difficult **/Easy Access** | **2.1., 2.2., 2.3. & 2.4. Potential Strength when linkages are established with high profile successful firms, rich in non redundant information and knowledge.**<br><br>**2.5.** Difficult Access to focal firm's innovation resources or those of its partners, on the part of firms outside the network, can be a strength | **2.6.** Difficult Access by focal firm to partners' innovation resources is a threat and easy access is an opportunity. |
| **3 Network Linkage Modalities** | **3.1. Strength of linkages**<br><br>**3.2. Nature of linkages** | **3.1. & 3.2. Degree of inter-dependence Strong (more binding, greater commitment), formal, deep/ weak, informal, wide.**<br>**3.2.1. Collaborative** /Opportunistic /Coopetition<br>**3.2.2 *Explorative/ Exploitative***<br><br>**3.2.3. International/** Local | **3.1. & 3.2.Weak ties can be potential strengths; ideally there should be a balance between strong and weak ties**<br>**3.1. & 3.2.1 Trust inherent to strong and collaborative ties is a strength, reducing transaction costs and opportunism**<br>**3.2.1. A few coopetition alliances in AP are positive for innovation.**<br>**3.2.2 Explorative alliances are strengths for radical innovation and exploitative ones for incremental innovation.**<br>**3.2.2. & 3.2.3 International exploration alliances are strengths. Balance between explorative and exploitative is positive; its benefit for innovation is greater when the 2 types are with different partner types in different functions.**<br>**3.2.3. A balance between local and international linkages is a strength by accelerating new product's commer-cialisation in the international market** | **3.1. & 3.2** Strong ties are threats when they lock firms in unproductive relationships<br><br>**3.2.2.& 3.2.3. International exploration alliances offer more opportunities for radical innovation. Exploitation alliances between small and big firms constitute opportunities for small firms in terms of incremental innovation.** |
| **4. Network Mana-gement <u>(only at firm level)</u>** | **4.1 Relational governance.**<br><br>**4.2. AP/ Network management capabilities: -Dynamic; Integrative; Absorptive; Resource-Sharing**<br>**4.3. Dynamic Strategic Fit of AP/Network, i.e. almost perfect fit.** | **4.1. Presence/** Absence. **Open/** closed,<br>**4.2. Development and use of capabilities Yes**/No **High**/Low degree<br><br>**4.3 High degree of consistency with some inconsistencies** /Low, **between strategy, organization,** | **4.1. Relational and open governance forms are strengths.**<br><br>**4.2., 4.2.1., 4.2.2., 4.2.3. & 4.2.4. Effective dynamic network management throughout the innovation process is a strength. It implies a high degree of development and use of dynamic and integrative capabilities, especially for dealing with various linkages and networks, as well as changes in these, and for ensuring balance between these and radical and incremental innovation. High absorptive capacity and high degree of resource-sharing capability are also critical mediating factors in the management of highly diverse AP/networks and associated complexity with a view to leveraging innovation performance .**<br><br>**4.3. Dynamic fit between innovation-oriented strategy, the AP/network, organizational factors and environmental contingencies is a strength for innovation performance, Dynamic strategic fit implies almost perfect but not perfect fit, i.e. some inconsistencies. Thus, both real and potential implications - strengths/weaknesses, threats and opportunities - for innovation of these factors, respectively at firm and industry level must be considered to assess dynamic fit. Orientation of AP/networks in terms of exploitation or exploration has positive implications depending on its fit to strategy, firm, and industry.** | |

| | | | |
|---|---|---|---|
| | | **AP/network,and environmental structural factors.** | |
| | **4.3.1. Strategic fit between firm and innovation partners.** | **4.3.1.High/**Low **Compatibility & Complemen-tarity with partners** | **4.3.1. High degree of compatibility and complementarity between focal firm and AP/network partners' at strategic, cultural, and organizational levels contributes to strategic fit and is a strength for innovation.** |
| | **4.4. AP/Network Performance Assessment** | **4.4. Presence/** Absence **High/**Low **degree of use of processes/metrics for performance assessment** | **4.4. The periodic performance assessment of the innovation AP/network with a view to its improvement and eventual redesign is a critical success factor for innovation.**<br>**The use of performance assessment processes with relational/network metrics pertinent to innovation represents a strength.** |