

# Comparing Classifications of Inter-organizational Relationships and Inter-organizational Networks



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**Abstract** The formation and diffusion of networks between institutions, organizations, and firms is a clear trait of modern societies and economies. This fact is challenging both economic and management sciences and political sciences to develop a good theory to explain why and how this phenomenon is taking place. During the last four decades, a plethora of theories has been advanced and has produced a huge number of contributions, thus making this research field very complicated and characterized by basic concepts like coordination, cooperation, and collaboration which are not univocally or clearly defined. In this paper, six general classification schemas are discussed, and their theoretical references and major points of strength and weaknesses are underlined. This work can shed light on the state of the art, evidence the main contradictions and unsolved problems, and thus hopefully contribute to further developments.

## 1 Introduction

As a matter of evidence, organizations do not regulate their relationships only through prices, nor only through formal contracts. This fact is anything but surprising when concerning social institutions such as political parties, and local or central government, because they are not supposed to “sell” anything *strictu sensu*, and in those cases where they do provide a service, they are supposed to do it in a non-purely market logic. So, no wonder that social institutions build stable (or relatively stable) agreements and look at the costs and revenues of their commitment only as a secondary assessment. Less obvious is the fact that other not-for-profit organizations, but different from institutions or public administration, do the same, because they actually offer goods or services like public transport, health, assistance to elder people, etc. Therefore, business is their core activity, though not aimed at seeking profit as their primary goal. This vast range of organizations also includes most cooperatives and the many different forms of social enterprise. All these types of

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organizations establish (relatively) stable agreements with other organizations, be they for- or not-for-profit. It might be definitely surprising that the same applies to companies (for-profit organizations) which, conversely, according to Standard Economics (SE), are supposed to have only price-driven arm's length transactions. That (wrong) expectation is, in fact, typical of SE or theories close to it like Transaction Cost Economics (Theurl, 2005; Williamson, 1975) and Agency Cost Theory (Fama, 1980; Jensen & Meckling, 1976) that have the model of atomistic markets made by independent agents as the ideal reference. For such theories, the "natural" state had to be that of competitive and efficient markets, in which organizations interact only through simultaneous and spot adjustments to prices and quantities. Hence, the existence of various types of (relatively stable) interaction other than prices and quantities becomes the problem to be explained.

Conversely, theories of the firm/organization far from SE such as, for instance, Social Exchange Theory or Neo-Institutionalism, according to which the existence and behavior of firms/organizations are not exclusively (or so much) determined by economic reasons, the fact that firms interact through various types of (relatively stable) non-price or non-quantity ways is all but surprising. In the middle between the two opposites there are many other theories, including Organizational Economics (Grandori, 2013), Capability Theory (Teece, 2012), Resource Dependence Theory (Pfeffer & Salancik, 1978), Organizational Ecology (Hannan & Freeman, 1977), to mention just some of the most important ones. Actually, this is the research field labeled as Inter-Organizational Relationships (IORs) and Inter-Organizational Networks (IONs), the latter concerning the structures created by a significant set of organizations connected through one or more IOR. Indeed, this definition of IONs is already a theoretical position and advancement, because—as we will see below—past approaches to this issue did define IONs in a different way. Research into IORs and IONs has grown a lot and was rich in different approaches, due to its novelty and complexity. Two short remarks can address the complexity of these topics, and the interest that they have stimulated during the last four decades. Preceded by Mark Eber's book of 1997, Nohria and Eccles (1992), Oliver and Ebers (1998), and Anna Grandori's (1999) readings, in their 2001 meta-analysis, Anne Parmigiani & Miguel Rivera-Santos examined more than 20 contributions (papers or books) reviewing IOR theories and almost 30 contributions (papers or books) reviewing IOR forms. Just a few years after (2008), their review has been outranked by the monumental volume of more than 1300 pages edited by Steve Cropper, Chris Huxham, Mark Ebers, and Peter Smith-Ring. The high number of theories that deal with IORs is actually a cause of great difficulty. For instance, the volume edited by Cropper and colleagues explicitly includes specific treatments of IORs or IONs developed within five "theories"<sup>1</sup> that are supposed to constitute the field of Organization Science—Social Network Perspective, Evolutionary Theory, Transaction Cost Theory (TCT), Critical Perspectives, and Management Perspective—plus those developed within four further theories that are supposed to be outside Organization Science—Social Psychology, Political Theory, Economic Geography, and Legal Studies. Moreover, in

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<sup>1</sup> The quotation marks indicate that the label "theory" is rather inappropriate in most cases.

their introduction to Part III of the volume, the editors remind that in the bibliometric analysis conducted in 1998 by Oliver and Ebers—that surveyed research published in four leading journals between 1980 and 1996—17 theoretical perspectives were identified within Organization Science alone.

Now, the aim of this paper is not to discuss the different theories advanced to justify the existence of inter-firm (or, more broadly, inter-organizational) relationships and networks, an endeavor that would require a whole book, but rather to present the main different classifications advanced so far. indeed, besides the obstinate (but still influential) supporters of the totally unrealistic theoretical framework of pure (neo-Walrasian) SE, nowadays nobody denies the existence and diffusion of IORs and IONs, but we are still very far from getting a consensus or general sound theory about grouping them into categories. The first section of this paper will define IORs, listing the most important ones, and also introducing some other important concepts like coordination and cooperation. Then, in the following sections, the main classifications proposed so far will be discussed. Note that the Oxford Handbook mentioned before offers various classifications, but they are not full-spectrum, because the design of that handbook is intentionally focused on specific forms of IORs.<sup>2</sup> I will also address, for each classification, the theoretical framework that inspired them explicitly or in the background. Further, each categorization will be commented by addressing its points of strengths and weaknesses. The categorizations discussed here are the following: Pfeffer & Salancik (1978); Alter and Hage (1993); Grandori and Soda (1995); Parmigiani and Rivera-Santos (2001); Nooteboom (2004); Jones (2013).

## 2 Some Introductory Remarks

Before starting with the categorizations, it is necessary to say something more about what an IOR is, and list the most important ones. The first specification is that not all IORs are transactions, at least in the sense defined by Williamson, that is as a good that is transferable through a technological separation. Indeed, most of them are not, for example, the link connecting two or more organizations can be a shared director (board member) or manager (department head or member). Biggiero and Magnuszewski (2023) have recently shown how fundamental these two types of IORs are in the EU Aerospace Industry and for its competitiveness in the global Aerospace Industry. Further, links could be shared values, ideas, symbols, patents, etc. Therefore, there are non-transactional IORs, as for example all associative agreements.<sup>3</sup> Further, as a rough approximation, what distinguishes an IOR from an arm's

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<sup>2</sup> Cropper et al. (2008) decided to avoid general IOR or ION classifications and the relations between them, while leaving both the possibilities to some contributions that, however, advanced classifications only focused on some restricted categories of IONs like supply chains and others. Consistently, Cropper and colleagues decided to introduce the concept of IOEs, defined as “manifestations of relationships among organizations as Inter-organizational Entities” (2008: 24).

<sup>3</sup> This point has a lot of fundamental implications for a critical assessment of the whole TCT.

length transaction are two crucial aspects: time and relevance of non-transaction features. Let us now briefly look at these three issues.

As for the role of time span, it should be underlined that in SE models<sup>4</sup> economic agents are supposed to be selfish tireless maximizers, who choose the best price for their purchases and sales at any one moment without any constraint of (but perfectly able to know and calculate demand and supply of) the past and the future. Let us say it is a world of spot transactions occurring between rivals: agents that have opposing interests. Conversely, what characterizes IOR transactions is the time duration, which extends over months or years, depending on the specific case. In other words, what distinguishes IORs from arm's length transactions is a relative stability: relative because, sooner or later, any IOR will decay. Therefore, to argue that we are in the presence of an IOR instead of a spot (an arm's length) transaction, we have to agree with the time span that makes the difference. And this is a matter of (mostly empirical) discussion.

The other distinctive aspect refers to the relevance of non-transaction features. Typically, in SE models, only prices and quantities are taken into account. All other aspects of transactions are neglected or, in some theories derived from SE, like TCT, other aspects such as power or strategy are simply reduced—and thus included in—to prices and quantities. They simply enter as components of the agents' risk evaluations. With two masterpieces, after long debates held with organization scholars, Williamson (1991, 1993) precisely expressed that view: trust is part of risk calculation, and “strategizing is the best [form of] economizing.” Conversely, out of SE and TCT, these and many other aspects, like the agent's collective identity, reputation, propensity to collaborate, etc., cannot be reduced to price–quantity–risk calculations, thus they constitute the matter out of which IORs are made. Part of these juxtaposed perspectives between SE and TCT on one side, and other approaches—especially those at the opposite extreme, as the Social Exchange Theory or the Neo-Institutionalism mentioned before—on the other side is made by the role of rationality, which is perfect or quasi-perfect for SE,<sup>5</sup> and for the approaches on the opposite side it is weak and biased.<sup>6</sup>

The third distinctive trait of IORs that I wish to underline is that many of them do not refer to transactions at all: they refer to forms of association between organizations among which no transaction is held. They cooperate or somehow coordinate their behavior because they share the same resource or have common interests or purposes or a sense of collective identity. Hence, to a further extent, SE and TCT have, if anything, little to say for all such cases. However, in the real world of IORs, many

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<sup>4</sup> Economic theory is a galaxy of different approaches, sometimes very different, but nevertheless that galaxy collapses in a very narrow perspective in teaching basic courses, as it is shown by handbooks. For the sake of simplicity, let us group under the label of SE the models based on general (or partial) economic equilibrium and those strictly derived from them. Some more clues on this point are discussed in Biggiero (2016, 2022).

<sup>5</sup> Despite his frequent claims of being far from SE due to the consideration of transaction costs, Williamson shares with SE most fundamental theoretical assumptions, among which that of extremely high, though not perfect, agents' rationality.

<sup>6</sup> More on all these issues can be found in Biggiero (2016) and (2022).

(most?) of them are made by only such cases or by a mix of transactional and associative IORs. As we will see, this distinction is often classified as symbiotic (transactional) and competitive (associative). The former is also meant as occurring in vertical supplier–buyer relationships within a given sector or laterally between different sectors. The latter, instead, is meant as occurring between rivals insisting on the same niche or segment. I do not want to dig deeper into this issue here, but it is worth noting that both these conceptual combinations, transactional-symbiotic and competitive-associative, are not so effective, especially the latter. For example, consortia are associative forms of IORs that can be issued between actors holding both types of connections.

It is now useful to provide a (partial) list of main IORs:

- Ownership shares of equity capital, which in fact links two or more companies until the share is sold;
- Long-term trade agreements, which can be typically (but not exclusively) expressed by a situation in which the buyer can gain a lower price by guaranteeing to buy a minimum amount of a product during a certain time and the seller acquires the certainty of future sales, though with a lower margin;
- Consortia, when a set of companies decides to supply a good or service as a single (usually also legally distinguished) entity;
- Associations such as trade associations gathering the producers of some goods or services;
- Board interlock or department interlock, when a director or manager is a member of more than one board or department, respectively;
- R&D collaboration projects, when two or more companies participate in one or more R&D projects;
- Co-patents, when two or more companies participate in one or more patents;
- Analogously, there is co-marketing, co-design, co-makship, etc., when two or more companies agree to manage and make efforts jointly in a given field of activity;
- Licensing, when a company gives the license to sell or use a product to another company;
- Franchising, in a similar way to licensing;
- Joint ventures, when two or three companies invest equity capital to build a new company;
- Etc.

This list is far from being exhaustive, and certainly new types of IOR will be added in the future, because many more forms can be elaborated according to the trade, company, or governance law of each country. Moreover, the dozen examples mentioned above concern only formal IORs, while there might be many more informal ones enhanced by the absence of legal limitations.<sup>7</sup>

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<sup>7</sup> Once more, the reader can refer to Cropper et al. (2008) to find a plethora of other IORs, some of which are discussed in depth.

The object of this work is to compare classifications of IORs and, as ways to instantiate them, of IONs. However, despite the wish of many authors and seemingly against the evidence, there is never a true bi-univocal correspondence between an IOR and an ION, because most IONs are likely made up of mixtures of different IORs. It could be reasonably argued that, in some IONs, a single or a few IORs is/are so prevalent that, in those cases, a given ION can be taken as an instantiation of a single (or few) IORs. This is the reason why I will not list IORs and IONs separately, an operation that would have also made this paper very complicated and much longer. I chose, instead, to keep IORs as the causes and driving phenomena, with few references to the IONs characterizing them, mostly left to the classification schemas.

It is very important to underline that IORs are all forms of coordination employed by organizations to interact through forms of relational governance, be it intentional or not. Noteworthy, coordination means are not mutually exclusive, because two or more companies can, for example, have an ownership relationship and, at the same time, be interlocked through directors or managers or participate in the same R&D project. Consequently, IONs are likely multi-layer networks, where each layer is constituted by a type of coordination form. This is a source of high complexity of organizations' behavior and makes the analysis of their networks very complicated. Together with the paucity of data and lack of theoretical clarity and delay about relational governance between organizations, the difficulty to run this type of analysis made the knowledge of combinations and mutual influence of different coordination forms an almost completely unexplored field of research.

### **3 Pfeffer and Salancik's Categorization**

In their seminal book on Resource Dependence Theory, Pfeffer and Salancik (1978) make only a raw classification between IORs that aims at reducing uncertainty by intervening directly or indirectly in an organization's dependence. Basically, the former case is that represented by equity capital investments: ownership, merger, acquisition, and joint venture. Ownership is meant as majority control or green-field investment. Conversely, the indirect forms include "many informal mechanisms and semiformal inter-organizational linkages that can be employed to coordinate the respective interests of various social actors" (1978: 143). They treat explicitly and diffusely interlocking directorates, co-optation, long-term trade agreements, and some others. It is worth noting that they consider only these indirect (informal and semiformal) mechanisms as forms of coordination, setting aside those implying equity capital investments.

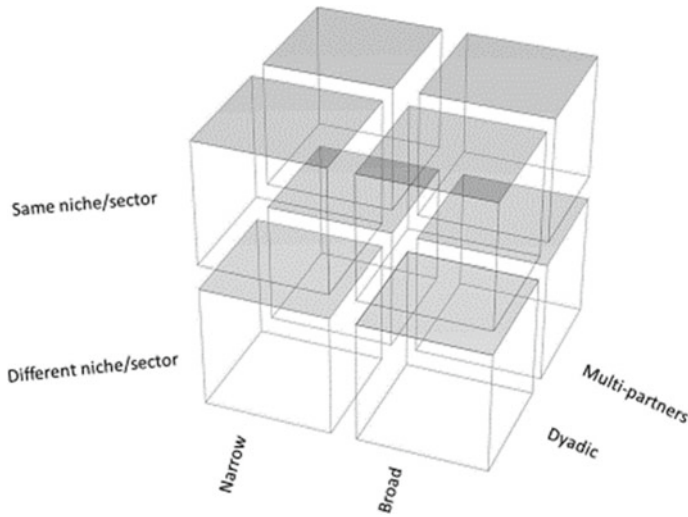
## 4 Alter and Hage's Categorization

The book by Alter and Hage (1993) was perhaps the first one providing a whole and very detailed classification of IORs and IONs, and it inspired many other following works. Alter and Hage's schema is made in three dimensions (Fig. 1): same niche versus different niches; dyadic versus multi-party relationships; narrow vs. broad extent of cooperation. They consider the former as the most important of the three, and draw it from a previous attempt at categorization done by Astley and Fombrun (1983), who, in turn, borrowed it from the Human Ecology theoretical approach. The basic idea—extensively adopted by others, too, as we will see below—is that when organizations work in the same niche, then they have a fundamental competitive relationship that allows some forms of competitive cooperation, an expression that, to a large extent, sounds like an oxymoron. Conversely, when they work in different niches,<sup>8</sup> they have a symbiotic relationship, which allows them to enter into a symbiotic cooperation. The second dimension reminds us relevance of the number of actors, with an explicit reference to TCT (Williamson, 1975), according to which that number strongly influences the possibility and effectiveness of opportunistic behavior. The third dimension, which is the only original contribution that Alter & Hage acknowledge for themselves, refers to the width of cooperation. They draw from Aldrich (1979) and the Swedish School (Hakansson & Johanson, 1988; Johanson & Mattson, 1987) the idea of identifying and distinguishing “a variety of bonds including technical, planning, knowledge, social, economic, and legal” (1993: 48). However, Alter & Hage hang that variety on an equivalent variety and number of partners, while it is rather evident (at least today) that the three aspects are not necessarily entangled: organizations A and B can establish only one or many forms of cooperation between them.

Interestingly, Alter & Hage claim to be not limited to the transactional dimension of cooperation, identified with the perspective of the Social Exchange Theory, in which those other authors have a stake. In other words, Alter & Hage are indeed only partially limited to the transactional dimension of cooperation, because they argue that “in our typology, exchanges are only the beginning, not the end of cooperative inter-organizational behavior” (1993: 48). Moreover, they argue that coordination is the subset of cooperation characterized by intentionality, deliberate actions, and explicit common goals. Now, because they identify IORs as forms of coordination, basically they do not consider all the other forms: that is, unintentional, informal, and emergent cooperation settings. As various authors underline (see Cropper et al., 2008), this set of coordination outcomes is quantitatively and qualitatively relevant.

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<sup>8</sup> They use the concept of niche and sector as equivalent, that is indeed simplification quite disputable.



**Fig. 1** Alter and Hage's categorization

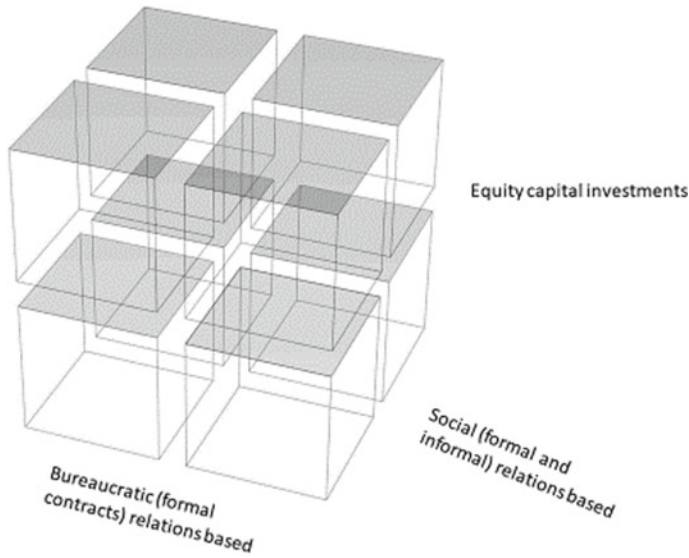
## 5 Grandori and Soda's Categorization

Anna Grandori and Giuseppe Soda proposed their classification in some works during the second half of the nineties (Grandori, 1995, 1997; Grandori & Soda, 1995); it was then recalled and extended by Soda in 1998. Their view is fully placed into Organizational Economics (Grandori, 2013), which is strictly related to TCT, according to which there are three possible forms of transaction governance:

- Market governance, meant as arm's length transactions mostly coordinated by prices, thus characterizing efficient markets, where the three dimensions in which a transaction is supposed to be defined—assets specificity, frequency, and uncertainty—should score zero or very low values;
- Hierarchical governance, meant as central-unitary coordination of transactions under a single legal entity, be it a simple or functional or multi-divisional or multi-national company. This is considered the most efficient form of governance when asset specificity and frequency are high, and thus, transaction costs also high;
- Relational governance, when asset specificity and uncertainty are medium–high, but frequency is low: this is the area in which, according to TCT, it is supposed that IORs become efficient governance mechanisms.

In market governance, coordination is guaranteed by prices (or the combination of prices and quantities) between legally independent agents: the theoretical reference is the efficient market of neo-Walrasian General Equilibrium Model, mentioned before in this paper. In hierarchical governance, coordination is designed and managed by top management through a set of rules and procedures, guaranteed by fiat (authority)





**Fig. 2** Grandori and Soda's categorization

and job contracts. Managers are the agents of owners (their principals) but, at the same time, principals with respect to their subordinates. Workers are still independent agents, but their working time is bought by the company owners through the managers. In relational governance, independent legal entities—be they organizations or single agents—coordinate their behavior by establishing relatively stable agreements, usually accompanied by rules and procedures. Of course, their legal independence does not prevent the agreement being balanced.

In the beginning, the focus of conceptual and empirical work mostly emphasized the bimodal alternative between market (outsourcing, if a company was already producing the good) and hierarchy (internalization, if a company was buying the product in the market). However, over time and with the theoretical and empirical enrichments arrived from the fields of evolutionary, cognitive, and institutional economics, what was initially the make-or-buy dilemma became the make-or-buy-or-ally “trilemma,” with the third option extending in importance, diffusion, and variety. Management and Organization Science (MOS) has substantially contributed to this shift and enrichment toward the relational forms of governance, especially with the Resource Dependence Theory and the knowledge-based view of the firm, with its many ramifications.

The categorization proposed by Grandori & Soda is tripartite: bureaucratic, proprietary, and social. The former is characterized by formal rules established through contracts and extensive coordination mechanisms such as long-term trade agreements, franchising, licensing, etc. The second category is characterized by investments of equity capital such as ownership shares and joint ventures. Indeed, this

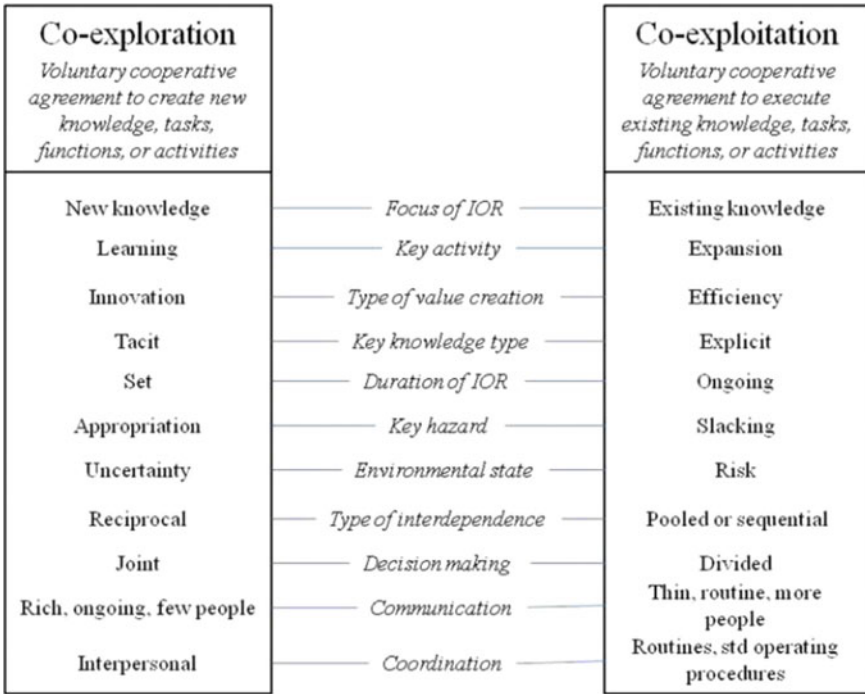
category had to be considered a subset of the previous, because of course all its items imply a formal contract, but Grandori & Soda overlook this aspect.

The third category is that of social inter-organizational networks, meant as those in which the role played by social norms and institutions prevails or is at least very important. Typical examples of IORs of this type are board interlocks or co-optation forms. As is clear, this category does not mark a precise demarcation from the other two, because, for example board interlocks, to the extent that they should be formalized, are also bureaucratic IORs. All in all, the main weakness of this classification is that the three dimensions are not mutually exclusive.

## 6 Parmigiani and Rivera-Santos' Categorization

In a paper published in 2001, Anne Parmigiani & Miguel Rivera-Santos run a meta-review of the literature on IORs and, being inspired by March's (1991) idea of distinguishing firms' orientation toward resources exploration vs. exploitation, they identify two pure forms of IORs—those based on co-exploration vs. co-exploitation—and argue that, analogously to what happens to single companies, real IORs combine traits of both. Hence, the key issue that should characterize a given IOR becomes whether exploration prevails overexploitation or vice versa, or if the two tendencies are well balanced. Unlikely all the other forms of classification advanced so far, Parmigiani & Rivera-Santos shift the focus from the intrinsic features of each IOR, namely concerning equity capital or trade or other aspects, to the purposes of the parties involved. In other words: from the nature of IORs to the intentions of the actors issuing them.

The variables distinguishing the two pure forms of co-exploration and co-exploitation IORs are synthesized in Fig. 3. Then, Parmigiani & Rivera-Santos proceed to identify the constructs that address each of the two pure forms according to the following theoretical perspectives: TCT, Resource-Based View, Agency Cost Theory, Resource Dependence Theory, Stakeholder Theory, Institutional Theory, Social Exchange Network Theory. Finally, they analyze some main IORs—namely, strategic alliance, joint venture, supplier–buyer, franchising, cross-sector partnership, and network—and show that, in terms of purpose, their key attributes can fall either in one or the other ideal type of co-exploration and co-exploitation, depending on single attributes. “Thus [they argue], form alone does not connote IOR intent. It is this intent, this emphasis on co-exploration or co-exploitation, that provides useful insights that are missed in the traditional classification of broad discrete categories such as “joint venture” or “buyer–supplier relationship.” In this way, our framework brings the firm to the center of the analysis by emphasizing the why rather than the how. Partners must agree on the intent of the IOR, as it needs to fit into the overall exploration–exploitation strategy for each partner. By considering this intent, we can better understand each IOR, identify how an IOR fits with a partner's overall strategy, and recognize similarities and differences across given IORs, independent of their form” (Parmigiani & Rivera-Santos, 2001: 22).



**Fig. 3** The two pure forms of co-exploration and co-exploitation IORs. Source: Parmigiani and Rivera-Santos (2001: 1122)

This categorization is different to all others, because it introduces a meta-criterion that is related neither to the intrinsic traits of IOR forms, like all other categorizations, nor to the features of the linkages (see Nooteboom’s categorization in next section), nor to the types of the firm or ION instantiated through them (see again Nooteboom’s categorization in the next section). That meta-criterion, in fact, concerns the purpose for which a given IOR is created, and such a purpose is further categorized in a threefold classification: (i) a mix of co-exploration prevailing over co-exploitation, (ii) the opposite case, (iii) a good balance between the two opposite extremes. It is a micro—substantially dyadic—approach to IORs.

Now, besides a significant degree of approximation of the analysis discussed in their paper and some incongruence, such as considering the network form in a substantial dyadic approach, the main weakness concerns precisely the network level of the analysis, that is, what happens in terms of IONs. In fact, by definition, an ION is made up of many dyadic IORs where one or more firms have multiple IORs with others. This is what above I called the multi-layer nature of IONs, using a jargon derived from network analysis, and concretely employed so far in the empirical analysis of inter-firm interlock coordination forms (Biggiero & Magnuszewski, 2023). Now, if a single dyad—that is, a single IOR—can be assessed on the previous criterion as being in one of the three cases, what will be the assessment of the whole ION

generated by multiple firms connected through multiple IORs? The authors leave us without an answer to this issue, and perhaps this is justified by their focus on single dyads, but the problem remains in any case. One possible solution is applying at network level the same criterion applied at dyad level: thus, for example, if, at network level, co-explorative purposes IORs will prevail, then that network will be predominantly co-explorative as well. It is a possibility, though it is unclear how effective and practicable.

The second main weakness, indeed common to all classifications, especially to those rich in terms of multiple variables/criteria, is of a methodological and empirical nature. Let us start from the latter: Fig. 3 lists 11 variables/criteria to distinguish co-exploration from co-exploitation. There is no mention of the thresholds over which the instantiation of a given variable should be assigned to one or the other group. As for the methodological problem, it is very subtle, but also fundamental: how can we deal with conflicting purposes? In other words, if 3 variables lie on one side and 4 on the other and 4 others are balanced, then what would be the final assessment? Just counting them? So, can they be considered substitutes? Or are some more important than others? And eventually, are they always comparable? Again, Parmigiani & Rivera-Santos leave this issue unanswered. As can be seen, this problem occurs for any multi-variable/multi-criteria assessment. I will come back to this point in the final section.

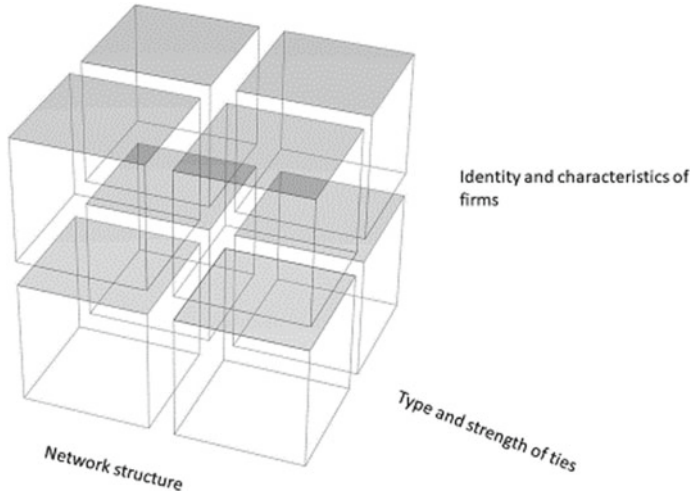
## 7 Nootboom's Categorization

At the end of nineties and the beginning of 2000, Bart Nootboom published various works on IONs and IORs, particularly focused on strategic alliances, learning, and collaboration for innovation (Nootboom, 1999, 2004). In his second book, he advanced a classification in four dimensions. However, because the third and fourth can be collapsed into a single dimension without seriously compromising the whole theoretical framework, I have represented it in Fig. 4, thus gaining the simplified and more intuitive view provided by the three following fundamental dimensions:

- The identity and characteristics of firms in the network;
- The network structure;
- The type and strength of ties engaged, which could be split into the two aspects of type and strength, thus forming a four—instead of three-dimensional classification.

Nootboom (2000) refers to the whole framework as a way to classify IORs, though indeed the identification occurs only in the third dimension—type and scope, where all those IORs listed in the introductory section can be included. The fourth dimension is a further specification of such linkages, namely:

- (a) The features of the investments employed in the tie: size, specificity, and economic life;
- (b) Its strength *strictu sensu*, measured in terms of frequency and duration;



**Fig. 4** Nootboom’s categorization

- (c) Its openness of (internal) communication; and.
- (d) The role of cognitive and spatial proximity.

In points (a) and (b) there are clear references to TCT, and thus, it seems that Nootboom has in mind mostly transactional rather than associative IORs. Actually, the nineties and right after were the time of the strongest seduction of MOS for TCT, and many authors embraced it perhaps too enthusiastically. Here it is not the right place to do a systematic revision of TCT, but what I wish to argue that, while the idea of transaction cost as a factor influencing the boundaries of organizations is very good and realistic, the idea that it is also the explanation of the *raison d’être* of organizations and the only single and sufficient factor explaining the boundaries and the variety of organizational forms is definitely not reasonable, conflicting with other theories, and not supported by empirical studies.

The second dimension addresses the following nine main topological and economic features that characterize the structure of IONs: size (number of participants); density; connectedness; degree centralization; betweenness centralization<sup>9</sup>; structural holes; isolation (lack of ties to other networks); stability (frequency of exit and entry); structural equivalence; concentration of ownership and control.<sup>10</sup> As is evident, these are not traits of IORs, but rather of their concrete instantiations in IONs. Thus, this list can be enriched by many other aspects, and it should be not meant as a dimension that contributes to classifying IORs.

<sup>9</sup> Here Nootboom writes degree and betweenness centrality, but because those measures are applied at network and not node level, centralization should be used.

<sup>10</sup> All these measures and methods can be found in most handbooks of Social Network Analysis, but if the reader wishes to see them directly applied and interpreted to IONs of interlock coordination, in Biggiero & Magnuszewski (2023) all of them (and many others) can be found.

The first dimension—the identity and characteristics of firms in the network—is articulated in the following four aspects:

- i. Ownership of the firm, meant as the fragmentation or concentration of property;
- ii. Control of the firm, meant as the governance types;
- iii. Legal form, let's say joint stock company, limited liability, etc.; and.
- iv. Industries in which it is active, meant as the type of technology and knowledge mostly implied, and the type of competition.

As can be seen, even these four characteristics do not refer to IORs, nor to IONs, but rather to the firms involved in a given ION and its industrial environment—or ecology, as would be said today, because Nooteboom underlines the role of institutions. Moreover, rather than IONs, Nooteboom focuses on inter-firm networks (and especially innovation or R&D collaboration networks), because not-for-profit organizations are not extensively considered in his works.

Now, the major strengths of this “classification” are that: 1) networks are explicitly considered, not just as metaphors or specific structures among others; 2) the framework is full of interesting and meaningful aspects. The two major weaknesses are that the whole framework is rather incongruent, because it combines IORs’ aspects, IONs’ aspects, single firm’s aspects, and industries’ aspects. Hence, it is neither an IOR nor an ION true classification framework, being a mix of different classifications for different (albeit related) phenomena. The second point concerns the “side effect” of considering analytical dimensions including various aspects, that is, being multi-criteria, because this conceptual richness then requires clear indications—and possibly formal algorithms—about how such criteria can be combined, especially in the cases in which they vary in opposite directions. Nooteboom does not provide any clear indication about this problem, if not for the case of a “spider diagram” used to show co-webs of IOR profiles (p. 77). As commented on for the previous classification, this is the hard problem of multi-criteria evaluations, at which I will go back in the concluding section.

## 8 Jones’ Categorization

Gareth Jones introduced his IORs classification in a textbook on organizational theory, design, and change (2013). His schema is split into two dimensions (Fig. 5): (i) formal versus informal; (ii) symbiotic versus competitive. This view substantially borrows from that of Alter and Hage discussed before but is simplified in that the number of variables (dimensions) is reduced to two. Therefore, almost the same comments hold here, but accompanied by the following ones:

- The bi-directional arrow informal–formal indicates that Jones supposes a continuum and not a precise demarcation between the two opposites;

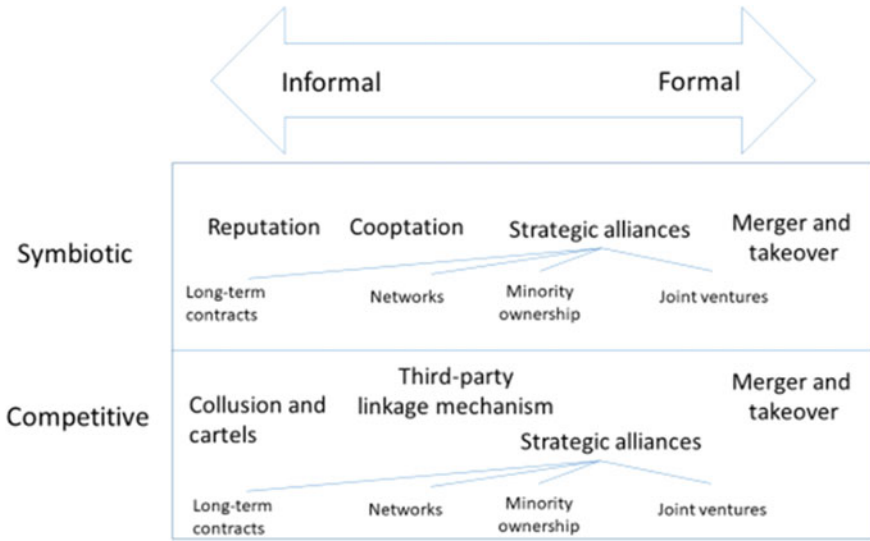


Fig. 5 Jones' categorization

- The symbiotic and the competitive IORs have two categories in common: strategic alliances, and mergers and takeovers. These two commonalities are very important because those categories, especially that of strategic alliances, are usually considered the most important in many respects, at least for firms. Therefore, it means that the distinction expressed by this symbiotic vs. competitive dimension is not so demarcating after all;
- Strategic alliances are constituted, in both cases, by long-term contracts, networks, minority ownership, and joint ventures. This way, proprietary and non-proprietary IORs are gathered in the same category;
- Though it is rather common to find them considered in this way in specialized literature, mergers & acquisitions are not forms of inter-firm coordination, because the link is suppressed just by the act of merging and acquiring. In other words, after a merger there is no longer any inter-organizational link;
- The category “network” is totally unclear, because a network is not a form of IOR in itself, but rather it can be formed by a set of organizations connected by any form of IOR. Actually, for decades (and for some authors still now), in MOS people thought that a network indicated any non-hierarchical structure, and not just any structure, be it hierarchical or not. Therefore, most authors were juxtaposing hierarchies to networks, while—on the contrary—hierarchies are networks, just a family of them. This important misunderstanding has previously been reported briefly by Biggiero (2016) and Biggiero and Mastrogiorgio (2016). Indeed, among all classifications discussed here, only that of Nooteboom is correct in this regard; and

- The final comment concerns reputation. While Jones considers it as an IOR, reputation is instead one of those “extra-economic” variables that significantly affect IOR formation and duration, but they are not IORs by themselves. In other words, reputation is an evaluation that some organization can have with respect to someone else. Such knowledge affects the selection of a given IOR—or even the choice of whether issuing it or not—but it is not a kind of IOR per se.

## 9 Conclusions

A first remark that can be drawn from the previous discussion and from the few references to the scientific literature on IORs and IONs is that, in contrast with the many theoretical approaches and single contributions, relatively few attempts have been made to elaborate unitary classifications. Even more surprisingly, the present work is the first one, at least to my knowledge, that tries to compare them. Likely, the explanation of this discrepancy lies in the complexity of the issue, which discourages scholars and practitioners from engaging in building a general framework, but at the same time, due to the growing theoretical and empirical relevance and diffusion of IORs and IONs, encourages the investigation of some specific instantiations. Actually, this is the era of network capitalism (Castells, 1996; Johansson & Karlsson, 1994), and, at the same time, of theoretical fragmentation in economics (Roncaglia, 2019) and social sciences (Segre, 2018). Both of them—network capitalism and theoretical fragmentation—are outcomes directly caused by the growing complexity of evolutionary dynamics in society and economy (Biggiero, 2022; Leydesdorff, 2021).

A clue of this difficulty in formulating unitary schemas is the multiple meanings assigned to some fundamental concepts such as coordination, cooperation, collaboration, transactions, knowledge, and network. Such a multiplicity strictly depends on the multiplicity of theoretical perspectives within which those concepts are formulated and employed. For example, some authors distinguish cooperation and collaboration while some others do not; some authors, for example, Alter & Hage and, to some extent, also Grandori & Soda and Jones, argue that coordination is a special kind of cooperation, namely goal-seeking cooperation. Nooteboom and Parmigiani & Santos are unclear, too, on the definitions and distinctions between coordination, cooperation, and collaboration.

As for the equivocation or multiplicity of the concept of network, to some extent, this was understandable until the end of last century, when Social Network Analysis was still at a pioneering stage in MOS. However, we have seen that, in Jones’ classification of 2013, that of Network is still a category separated from others within that of strategic alliance. Conversely, networks are precisely those objects that are formed when a significant number of organizations do connect one another through one or more IORs, regardless of the type of IOR. Networks do represent not an IOR on its own, but rather the outcome of one or more IORs viewed at aggregated level—just the network level—instead of at the micro-level of single dyads. Further,



from an ontological point of view, networks are, for IORs and, more generally, for socio-economic phenomena, not (only) simple metaphors, but objects, at least as single organizations or social systems are objects as well. For a deeper discussion on this point, applied to interlock coordination forms, see Biggiero and Magnuszewski (2023), while for a more conceptual discussion of the network concept and role in economic and management sciences see Biggiero (2016).

Another interesting remark is that, despite the number of theoretical approaches discussed in the introduction, at the end all the six classifications fall within Management and Organization Science, and two of them are very close to Organizational Economics—that of Grandori & Soda and that of Jones. Even those proposed by Alter & Hage and by Nooteboom assign high relevance to the concept of transaction costs, though the latter, jointly with that of Grandori & Soda, starts giving relevance even to the network perspective by assigning to networks not only a metaphorical or vague meaning, but rather considering them as objects whose analysis should be operationalized. Indeed, recent works explicitly deal with or emphasize IONs made up of forms of strategic alliance such as franchising. Moreover, more recently, the analysis has been extended also to cooperatives instead of capitalist firms as the actors forming networks: Cliquet (2007), Ehrmann (2013), Tuunanen (2011), Windsperger (2015), just to name some books and papers.

If we now try to compare the six classifications discussed above, we have difficulty because they are all very different, though the single IORs and IONs recalled by each author are all the same to a great extent. The IORs listed in the introduction are, in fact, those systematically discussed by all authors of the reviewed classifications. However, they are classified in very different ways. Maybe two pairs of variables have been employed almost in the same way by at least two classifications. One pair is that of formal vs. informal IORs, which is literally used by Jones and, in an indirect way, by Grandori and Soda, included in the bureaucratic and equity capital forms as formal IORs, contrasted to the social-based IORs, which indeed can be both formal and informal. The other pair of variables is that of competitive versus symbiotic forms of IORs, a distinction employed by Alter & Hage and by Jones substantially in the same way.

Besides these similarities, the reviewed classifications share common problems instead of proposals. In fact, as we have seen, all classifications require assessments of multiple variables, meaning multiple criteria. Here we face two hard methodological problems, common to all sciences, and almost ubiquitous in social sciences: (1) how to measure each variable; (2) how to combine them in a single synthetic evaluation, possibly quantitatively. Concerning the former, which is widely treated in many handbooks and papers on social science research methodology, let me note only that, when it comes to the topic of this paper, some variables are conceptualized as dichotomous while others as being in the continuum. Further, sometimes this different treatment concerns the same variable, for example, formal vs. informal, treated as dichotomous by most authors and continuous by Jones. These differences, of course, then create problems of comparison between different classifications.

Anyway, the hardest—and much less investigated—problem is that of combining different variables, especially when they move in opposite directions. This is the

multi-criteria evaluation problem. None of the authors of the classifications reviewed here says anything about it or seems aware of it. As Biggiero and Laise (1998, 2003; Biggiero et al., 2005) have discussed theoretically and empirically with real-world applications to various fields of MOS, Finance, and Technology Policy, the methodological problems raised by multi-criteria evaluations are all but trivial, and are usually dealt with using wrong (reductionist) approaches that overlook the true complexity of socio-economic phenomena. Biggiero and Laise showed that the right methodological approach, which is also the only one truly consistent with the impossibility of maximizing solutions due to actors' bounded rationality and subjectivity, is that of outranking methods developed by the French School of Operations Research.

In conclusion, we can say that, despite its growing diffusion and relevance between profit and not-for-profit organizations, today we still lack a good classification of IORs. Further, there is a plethora of theories claiming to be able to explain one or many forms of IOR. Most of these theories belong to the field of MOS, and most of them have been significantly influenced by TCT, especially those advanced during the nineties. Further, the most important concepts necessary to build a theory of IORs are still treated with different meanings and often suffer from ambiguity or a lack of precise definitions and measurements. The concept of ION has never been in better health, though during the last 20 years it seems that, thanks to the diffusion of Social Network Analysis, it is better focused, and has been empirically investigated with much success.

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