Collaborative Interorganizational Relationships in a Project-Based Industry

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Abstract: The project-based construction industry finds itself in a paradoxical situation: while it weighs heavily in the world economy, it does have a history of low productivity. One important issue that plagues the industry is related to the challenges that stem from collaborative efforts (or lack thereof) between actors. The objective of this paper is to explore how actors of the construction industry organize their inter-firm relationships while examining the characteristics of such interactions and the elements affecting them (drivers, barriers, facilitators, outcomes). These interactions and elements were uncovered using a systematic literature review. A qualitative content analysis was carried out to categorize these elements and to generate dimensions describing the forms. The 139 articles retrieved depicted 12 relational forms established between construction companies (in descending order of citation): partnering, alliancing, project delivery methods, supply chain integration, joint ventures, integrated project delivery, joint risk management, collaborative design, contingent collaboration, quasi-fixed network, resource sharing, and collaborative planning. A multitude of drivers, barriers, facilitators, and outcomes were found. An analysis of the results led to the conceptualization of a multidimensional profile, which allows for a practical and flexible identification of the relationship form potential partners in the construction sector intend to establish. To provide guidelines for the implementation of this profile, a three-step framework was developed.

Keywords: inter-firm; interorganizational; relationships; collaboration; partnership; project-based

1. Introduction

The discussion on collaborative interorganizational relationships (IORs) in the construction industry started decades ago. In the 1980s, this industry saw the emergence of partnering as a management concept to tackle relational issues [1]. In the USA, the Construction Industry Institute [2] studied the adoption of partnering in the construction field. Latham [3] and Egan [4] highlighted the collaborative shortcomings of the British construction industry and presented suggestions to improve it. In Australia, the National Building and Construction Council [5] brought to light the damage caused by transactional relationships. A study that advocates more integration is the seminal work of Ireland’s [6] “T40-project”, which followed a process re-engineering approach. Although over the years, a plethora of studies on collaborative IORs explained the advantages of such relationships from a conceptual perspective or showed their benefits on a practical level, they did not enjoy a wide and consistent implementation e.g., [7]. Collaborative IORs contribute significantly to the success of project-based industries, however given the dynamic and temporary nature of projects there are still challenges ahead [8]. Crespin-Mazet et al. [9] linked the struggle to shift to collaboration with a poor comprehension of partnering requirements. Ey et al. [10] saw the definition issue as a symptom for the inadequate understanding and use while stating that implementation guidelines are not flexible enough to fit different projects. Bresnen and Marshall [11] recommended more realism and practicality when
discussing and applying partnering. They pointed out two more aspects: the customization of the concept to fit different projects, and the pluralism, i.e., the divergence of goals and views of actors within this IOR. Other forms such as alliancing and integrated project delivery also demonstrated a limited success [7]. These limitations in implementing collaborative IORs can be illustrated by the overall performance of the construction industry: as per a 2017 study [12], there is only 1% growth in annual productivity over a period of 20 years. Since collaborative IORs have been advocated by several authors as auspicious solutions for the construction industry e.g., [13], such a low rate of productivity could mean a poor application of these solutions. Another factor negatively affecting the use of collaborative IORs is the deterioration of the economy due to certain events [14], eventually this can be projected onto the period subsequent to the current COVID-19 pandemic.

All these arguments point toward a need for more research work in the field of collaborative IORs, as supported by Engebø et al. [15]. The topic has been addressed from different angles or using various approaches. One way is to map the forms of these IORs taxonomically with the intention to clarify individual concepts, contrast them with each other or deduce a new relational arrangement. However, much effort was dedicated to one single form or to discuss the most well-known forms. For instance, Yeung et al. [16] applied the Wittgenstein family-resemblance approach to define relational contracting while considering the concepts of partnering, alliancing, public-private-partnerships, and joint ventures. Lahdenperä [17] compared partnering, alliancing, and integrated project delivery to each other using seven features. Palacios et al. [18] contrasted traditional relationships with partnering and alliancing by means of four dimensions. Rahmani et al. [19] talked about procurement systems, grouping them into four categories: traditional (e.g., design-tender); integrated (e.g., design-build); management-oriented (e.g., construction management); collaborative (e.g., partnering). One prominent work on collaborative procurement practices is that of Walker and Lloyd-Walker [20]. The authors applied the Wittgenstein family-resemblance approach to suggest a better mapping of relational forms, which led to 16 characteristics.

Overall, the research questions encountered when investigating collaborative IORs that have not been fully answered reflect different aspects. There is the issue surrounding the understanding of what it actually means to work together as well as the time and efforts needed for implementing and managing this type of relationship. Another aspect is that of the versatility, i.e., pre-defined collaborative relational forms may not be adjusted to suit different types of construction projects due to the limits of these forms. Only a few authors broke down the relational archetypes and extracted underlying characteristics, dimensions, or categories. Since there is a dearth of such studies, more variety is needed. The aspect of pluralism highlights another knowledge gap. The fact that goals and views of actors within an IOR do not converge indicates a need to create a common organizational base, which not only will unify the perceptions of these actors but will also serve as a binding mechanism for a joint goal accomplishment. Furthermore, the lack of practicality is always a risk when trying to apply theoretical concepts into industrial practices. This is why solutions for collaborative work should be made easy-to-implement and eventually accompanied by practical guidelines.

This study adds to the discussion on collaborative IORs by filling in gaps not covered by previous works and bringing new insights. The aim of this paper is to map relational forms implemented in the construction sector and suggest a new way to organize collaborative IORs. Components of such forms were analyzed, which allowed for the identification of some similarities and differences between them. To broaden the scope of this review, elements (drivers, barriers, facilitators, and outcomes) affecting the establishment and development of these forms were examined. The method employed to accomplish the aforementioned goal was a systematic literature review (SLR), whereby certain keyword combinations were searched in specific fields. In total, 139 papers made it to the final sample analyzed here. Forms of interorganizational relationships along with elements affecting them were then identified. From these forms, underlying dimensions were un-
covered. Together, they compose the multidimensional profile of an interorganizational relationship for the construction industry. Through the combination of this profile with the drivers, barriers, facilitators and outcomes, an IOR framework emerged. The purpose of this framework is to guide companies to a customized IOR designed to succeed in the context of their particular partnership.

The article is divided as follows: following this introduction, the research method is explained. Descriptive statistics and the answer to research questions constitute the contents of the third section. The profile and the framework are presented in the fourth section before the conclusion.

2. Research Method

To explore inter-firm relationships in the construction industry, a SLR was first conducted. It provides results that are easily traceable and can be reproduced, thus conferring more objectivity and methodology to the review process [21]. As per Tranfield et al. [22], the structured approach of the SLR has three steps: planning the review (cf. 2.1), conducting the review (cf. 2.2), and synthesizing the research (cf. Section 3). Elements retrieved from the reviewed papers (drivers, barriers, facilitators, and outcomes) were then organized in categories. To carry out this categorization, an inductive qualitative content analysis was performed. The inductive method fosters objectivity in a reasoning process [23]. In general, such a content analysis can go through different steps. First, the units to be analyzed are defined. Then, so-called labels are created based on first observations of the analysis, i.e., the meaning or notions reflected by the units. These labels, representing here the categories, are refined as more units are analyzed, and assigned to the appropriate label. Finally, this method was once again used to investigate the characteristics of the relational forms identified with the SLR and consequently generate the dimensions. Figure 1 gives an overview of the methods employed in each stage of this study.

Figure 1. Overview of the methods used in each stage.
2.1. Planning the Review

The basis for the research strategy is the research questions (RQs) which reflect the issues encountered in the topic under study. In this work, the SLR was carried out to identify relational forms used by construction companies and their characteristics. The intention here is to look for any kind of interorganizational collaboration, meaning the review is not constrained to forms of the same nature or those covering the whole construction project. Therefore, the notion of relation here refers to any interaction between companies that presents joint or individual benefits. The research questions for this SLR are:

RQ1: What relational forms exist between companies working in the construction field?
RQ2: What are the drivers, barriers, facilitators, and outcomes identified in such relationships?

2.2. Conducting the Review

The research questions to be addressed led to specific keywords that served as input for certain search fields. These were completed using inclusion and exclusion criteria to delimit the selection of publications. In the current case, the following search engines were considered: Engineering Village (Compendex and Inspec) and ProQuest (ABI/INFORM Global). At first, a set of keywords was tested. After these search trials, certain keywords proving more relevant were chosen and combinations were elaborated. These were searched in titles, abstracts, and articles’ keywords. To narrow down the results generated by the combinations, so-called controlled terms (on Engineering Village) and subjects (on ProQuest) were used. An example combination is: 

(((organisation* OR organization*) AND (form* OR type*)) OR (relation* OR strateg*)) AND (building* AND construction), with the controlled terms: construction industry AND project management AND organisational aspects.

In total, 15 different combinations were employed in this review with a multitude of sub-combinations (created with the controlled terms/subjects). Articles resulting from the combinations were filtered initially with the title, abstract, and keywords of the papers. When needed, the introduction and the conclusion were closely examined to determine whether they served the purpose of this SLR. Then, the full text of selected publications was reviewed. For RQ1, a selection criterion was to include works that inform about the functioning of the sought forms and not just mention them as examples. Moreover, these forms needed to relate to the building construction field (papers with focus on infrastructure projects were discarded). The concepts found in the selected articles were reported as they were explained by the authors. The denomination used by the authors was considered to later create the categories encompassing the results. For RQ2, the elements in Lambert et al.’s [24] model were used to analyze the articles. The “drivers” represent the reasons or motivations behind firms’ collaborative practices. The “facilitators” are factors, environmental or intrinsic to the company, that ease the development and enhancement of the interorganizational relationship. The “outcomes” reflect the output or performance resulting from these relationships. The “components” of the model were included in the answer to RQ1. As to the term “barriers” considered in RQ2, it was added to ensure the richness of this research. The “barriers” are the obstacles that impede or even stop companies from venturing into interorganizational relationships. In some articles, these four elements were not explicitly mentioned. Hence, they were deduced from the context.

The search includes publications up to February 2021. Theses and trade journals were excluded from the SLR. Figure 2 summarizes the selection process including the numbers of retained publications after each step.
3. Research Synthesis

The findings of the SLR are organized in three parts: a summary of the descriptive statistics; the answer to RQ1; and the answer to RQ2.

3.1. Descriptive Statistics

From the 139 reviewed articles, 118 were related to RQ1 and 73 to RQ2. Due to space limitation, only a fraction of the 139 papers is included in the references section. Figure 3 illustrates the number of reviewed articles per publication year.

Figure 3. Distribution of reviewed articles based on the publication year.
Accordingly, interorganizational relationships in the construction industry began gaining more attention in the late 1990s. This could be explained by the fact that prominent studies in the field were published around that time e.g., [4]. Most of the studies surveyed for this review originate from the UK (23), followed by the USA (13), Hong Kong, and Sweden (12 each).

Regarding the research methods used in these papers, most publications developed conceptual models (50) while others focused on conducting investigations about industrial practices or selected projects (40). Quantitative methodologies (23) and literature reviews (21) were not largely employed. Mathematical and simulation modeling (5) was the last in the list.

3.2. Relational Forms Existing between Construction Companies (RQ1)

From the 118 articles relevant to RQ1, 12 relational forms were extracted (in descending order of citation): partnering, alliancing, project delivery methods, supply chain integration, joint ventures, integrated project delivery, joint risk management, collaborative design, contingent collaboration, quasi-fixed network, resource sharing, and collaborative planning. The terminology is a challenge when searching the contours of the field as there is no standardized vocabulary that encompasses the different forms retrieved in this review. A certain perspective suggests that some forms represent a part or a type of another form, e.g., joint ventures are a type of alliancing. Partnering was mentioned the most due to its widespread usage in the construction industry, across many levels of the supply chain or even transcending geographical borders. Consequently, less known or experimented forms showed lesser citation frequency. However, concepts as the integrated project delivery seem to be given more attention lately and to attract more practitioners. The framework agreements and build-own-operate-transfer forms such as private financing initiatives or public-private-partnerships were not included in this mapping of forms as they focus more on contractual or financing aspects.

3.2.1. Partnering

Ngowi [25] deemed that in partnering, as an informal relation, the equity is not shared and there is no control hierarchy. These two aspects, i.e., equity and control, differentiate partnering from joint ventures. Partnering could also be seen as a management practice to boost teamwork [26] or -in the form of concurrent engineering- “as a viable method of defining customer value” [27]. Anvuur and Kumaraswamy [28] perceived partnering as a “transformative mechanism”, which fosters cooperation in no-trust situations, resulting in a change from a “workgroup into a high-performance team”. Fisher [29] considered partnering as a process to avoid conflicts between future partners. Partnering can be classified into project partnering and strategic partnering [30].

3.2.2. Alliancing

Several authors e.g., [27] agreed that alliancing is a contractual relationship, i.e., a legal agreement that makes participants commit to each other in positive as well as negative scenarios. Here, a high degree of integration is noticed when participants behave as a virtual corporation. Interestingly, this aspect of alliancing differentiates it from the partnering concept, which refers to non-contractual agreements. Some authors used the terms alliancing and partnering interchangeably, but still considered these forms as contractual agreements e.g., [31]. Gottlieb and Storgaard [32] saw alliances and consortia as a hybrid form between arm’s length transactions (low integration) and in-house performing (high integration).

There are two types of alliancing: project alliancing, involving cooperation for a period of one project, and strategic alliancing, serving a certain goal that brings continuous shared benefits over a long term [26]. Cheng et al. [33] opined that the concept of strategic alliancing in construction is not frequent and that it constitutes an informal relationship characterized by equity in power and sharing as well as cooperation in decision-making.
3.2.3. Project Delivery Methods (PDMs)

An overview of the PDMs is given in Ahmed and El-Sayegh [34]. These are contractual arrangements that define the role of the client, the contractor and/or other parties. They serve the partitioning of the design and the construction phases between project participants [35]. In a design–build method, the contractor executes both the design and the construction. Traditionally, companies follow a design–tender approach. Here, the customer takes responsibility for the design part. In the construction management method, design and construction are also separated. The main actor here is the construction manager, which oversees the effectiveness of the designers (previously recruited by the client) and the efficiency of the contractor. In the “general construction in collaboration” delivery method, there is a high degree of integration due to the operational responsibilities being shared between the client and the general contractor [36]. The early contractor involvement method includes contractors in the design stage to share their knowledge with designers and clients. Henceforth, the client can choose to continue with the same contractor or not [37]. Sparkling et al. [38] assumed that the performance of project delivery methods can be enhanced when implementing interorganizational concepts such as project partnering.

3.2.4. Supply Chain Integration (SCI)

SCI is project based and concerns the technical aspects of supply chain management (integration of operations, information, planning) [39]. Kesidou and Sovacool [40] advocated the idea that a better SCI is guaranteed by the interaction of three components: governance mechanisms based on trust (organizational dimension); synergic-oriented integrated systems that provide feedback (system dimension); and personal-related integration enabling better interpersonal collaboration (personal dimension).

3.2.5. Joint Ventures (JVs)

JVs are new organizations funded by the joint investment of parent companies to accomplish common objectives. Partners must agree upon the contribution of each participant and how they depend on each other. A specific appellation was introduced: construction joint ventures (CJVs). In CJVs, initially independent partners join their resources and skills to achieve a larger scope of construction services (e.g., procurement, construction). Partners have responsibilities towards each other (JV contract) and towards the client (construction contract). This double contract regulation distinguishes CJVs from other JV types [41,42]. CJVs are frequent in large-scale projects, which induces a managerial challenge. To deal with this, two governance structures were observed: integrated joint-ventures characterized by shared decision-making and high coordination; and non-integrated joint-ventures where each partner makes their own decisions and there is no need for higher levels of coordination [42,43].

3.2.6. Integrated Project Delivery (IPD)

IPD is a project structure based on one contract. In this form, the client tries to create a team-oriented culture with more direct communication. When contrasting different delivery methods, IPD seems more relationship-oriented [44]. The main characteristics of the IPD method can be summarized as follows: different organizations/disciplines with different attributes acting in a fashion similar to one unit; aligned processes and cultures; integrated resources, structures and practices; focus on mutuality [45].

3.2.7. Joint Risk Management (JRM)

Interorganizational interactions can take the form of JRM where partners evaluate and handle project risks together. JRM integrates the focus of the partners on project risks rather than being isolated in managing risks related to each one of them. The contract conditions of this relationship should stay flexible since risks change throughout the project [46,47].
3.2.8. Collaborative Design

Collaborative design is a relationship based on a contract that leads to the creation of multidisciplinary groups aiming at generating more creativity. Depending on the design stage, this collaboration can be identified as: participatory design during concept definition where the focus is put on the user involvement; integrative design during the technical specification phase where building information modeling tools are employed for the sake of integration and coordination; or concurrent engineering during the implementation phase where a collaboration occurs between designers and contractors/builders to optimize the construction costs. While participatory design and concurrent engineering constitute an external integration of users or contractors, integrative design deals with the internal integration of the design unit see e.g., [48,49].

3.2.9. Contingent Collaboration

Interorganizational collaborations can grow to such an extent that some partners benefit other parties by a non-contractual action. Such partners incur the possible risk of a non-reciprocal profit or even negatively affecting their own interests. This concept is referred to as the organizational citizenship behavior and is commonly found in large-scale construction projects. An example is the so-called “contingent collaboration”, which implies flexibility in helping other partners, information and knowledge sharing, assistance in dispute resolution, and averting issues [50]. This kind of collaboration was also noted in case studies conducted by Toppinen et al. [51].

3.2.10. Quasi-Fixed Network

In the quasi-fixed network, project participants are integrated by the client on two separate levels. Participants of the first level are characterized by a strong formal commitment where so-called “liminal zones” or joint workspaces are implemented. On the second level, participants depend less on each other [52].

3.2.11. Resource Sharing

Contractors working on the same project may rent equipment from each other. The lease of equipment can cause a schedule delay; therefore, it is important to arrange a balance between the collaborating contractors. The project owner may stimulate this interaction through a reward–penalty system [53].

3.2.12. Collaborative Planning

Construction project participants can choose to share the decision-making. For example, Daniel et al. [54] investigated the relationship between the last planner system and collaborative planning practices. One component of this system is the collaborative programming, which brings all project participants together to elaborate the construction program via regular meetings, joint planning, and joint project progress assessment.

3.3. Drivers, Barriers, Facilitators, and Outcomes (RQ2)

As mentioned above, 73 of the selected articles addressed drivers, barriers, facilitators, and outcomes to IORs and the results were grouped into categories. These categories were first based on those found in the literature and, for the elements that were not included into a predefined category, new categories were created applying the qualitative analysis method see e.g., [55]: once the first elements were analyzed, it was possible to create labels, which correspond in this case to the categories. The subsequent addition of new elements refined the denomination of the categories.

3.3.1. Drivers

Drivers are what motivates companies to establish IORs. The categories used for the drivers are the same as those for the outcomes [28] as they seem to have a direct link. Economic drivers were ranked first in terms of citations. This category includes: sharing risks
and rewards [31]; responding to a competitive market [42]; exploring opportunities [56]; and exporting services abroad [42]. Knowledge-related drivers came in second place. These encompass: gaining access to innovation and technology [43]; and creating knowledge [56]. Finally, the social category relates to companies who are motivated to work together to solve conflicts and decrease the risk of opportunist behavior [57].

3.3.2. Barriers

Barriers are the factors that hinder or prevent companies from pursuing IORs. Categories used to group barriers were found in Eriksson et al. [58] and Sparkling et al. [38]. Cultural barriers were the most cited among authors. Such barriers are: uncertainty seen as a risk not as an opportunity [48]; focusing on tasks while ignoring interactions between people [48]; lack of social bonding [31]; relationship prioritization not as expected [59]; and non-resilience to change [60]. The organizational category is next in the list and comprises: non-aligned objectives [51]; lack of customer participation [48]; multiple and contradictory interpretations of the problem [48]; and imbalance between contribution and dependency [56]. Industry-related barriers came in third place. These comprise the following elements extracted from the literature: increased technical complexity [61]; bureaucratic public client organization [38]; standardized contracts [58]; and interdependencies [62]. The last category of barriers refers to the use of resources and consists of: financial security [38]; risky nature/risk liability (of the partnering process) [63]; availability of resources [38]; and partnering process as time consuming and resource intensive [51].

3.3.3. Facilitators

Facilitators indicate concrete measures to overcome the difficulties generated by the barriers. The large number of instances recorded for the facilitators implies a growing effort to deal with relational problems in the construction industry. Various categories were created for this matter, however, the “collaborative tools” category was defined by Löfgren and Eriksson [57]. Behavioral facilitators were the most cited. In this category, trust was the most important [48]. Other behavioral facilitators are power sharing [33]; and appropriate control [48]. Secondly, the literature puts forth that interorganizational relationships are positively affected by the use of technology [63]. Such technologies consist in building information modeling [36], information and communication technology [62], cloud computing [64] and virtual reality [65]. Collaborative tools came in third place. These tools comprise: alignment of interest and objectives [44]; trained facilitator/consultant [66]; and team building activities [46]. Contractual elements were next in the ranking. Facilitators included in this category are: collaboration agreements [38]; clear contract statement [38]; project goals clearly set [33]; clear definition of responsibilities [67]; and relational norms [58]. The organizational facilitators are: value proposition management [68]; organizational structure [33]; coordination of the site project manager with the client [67]; and tailored project procurement [58]. Some facilitators are related to the partners. In this regard literature suggested: being familiar with organizational norms and behaviors [31]; previous experience in partnering projects [63]; adequate understanding (of the relationship and expectations) [60]; and quality in equipment and material [69]. In addition, an open-minded, free, timely, and effective communication can contribute to the development of IORs [44]. The communication category also covers elements such as information sharing [62]; mutual coordination [53]; technology transfer [70]; and knowledge sharing [71]. The category of resources-related facilitators includes: strong focus on staff [33]; shared resources (material, non-material and human resources) [69]; skilled workers [70]; relational skills and attributes [38]; and adequate resources [33]. Some elements concern the processes of the partners and how these are implemented. The literature refers to: continuous improvement [44]; regular monitoring of the partnership process [67]; early implementation of the partnering process [67]; innovation approach [71]; and standardization [62]. A social category was also created for some facilitators. Elements in this group are: conflict resolution [67]; team integration [38]; teamwork [44]; and good relationships (with clients/authorities) [70].
Other facilitators are associated with the culture of the partners like: no-blame culture [72]; similarities/integration of culture [70]; partnering culture [63]; cultural compatibility [73]. It was also observed that jointly performed activities help in the establishment of IORs. Such activities can be: joint problem solving [72]; joint risk assessment [48]; and joint procurement of subcontractors [46]. Finally, a limited bid invitation [46] was the sole element of the business environment category.

3.3.4. Outcomes

Outcomes represent the results of—or the performance obtained from—the partnership. A link between the drivers and the outcomes exists in the literature. This can be explained by the fact that what usually motivates companies to work together is the expected positive output from the relationship. The categories employed for the outcomes were adopted from Anvuur and Kumaraswamy [28] and are the same as those used for drivers. Similar to drivers, the economic category received the greatest number of citations. Reduced cost [43] seems to be the most important outcome. It was found that improvements in project performance [60] came before outcomes related to project schedules [43]. Other economic outcomes are: enhanced value creation activities [63]; and reduced risk [70]. Social outcomes cover the following: enhanced communication [31,74]; and generate trust between people and organizations [71]. The last category in this list concerns the knowledge-related outcomes. Authors mentioned: joint organizational learning [59]; holistic creativity [48]; and improved knowledge and capabilities [59].

Figure 4 illustrates a summary of the categories for each element with the distribution of the elements based on the previously defined categories.

**Figure 4.** Frequency of citations of drivers, barriers, facilitators, and outcomes per category.

4. Organizing Relationships in the Construction Industry

Based on the findings of the SLR, an alternative way of organizing the construction IORs is presented. It suggests that IORs can be depicted using dimensions, which constitute the multidimensional profile. To help with its implementation, a framework was devised. The concept proposed can therefore be viewed as an alternative to pre-defined relational archetypes (e.g., partnering, alliances) and to the ideas brought forward by previous mapping studies as well.

4.1. Multidimensional Profile

The variety of relational forms identified in the review describes different general aspects of IORs in the construction sector. Hitherto, the description of an IOR was constrained to pre-established relational concepts. This remains useful if the company knows exactly which form it needs, or if the inter-firm situation matches one of the forms. Otherwise, it is complex and inconvenient for potential partners to define the type of relationship they intend to establish, especially in the context of a project-based industry. Instead of consid-
ering already defined relational archetypes, one may conceptualize the interorganizational relationship based on specific building blocks.

A multitude of researchers depicted such relationships using a similar idea, where the building blocks were referred to as dimensions. Some authors considered only one dimension, e.g., decision level (operational, tactical, strategic) [75]. Others elaborated a bi-dimensional model [76] that accounted for degree of control and degree of ownership. Crujisse [77] adopted four dimensions: decision level, competition, combined assets, and objectives. As previously observed, the relational concepts identified from the review do not provide a customized depiction of IORs. To overcome this gap, the idea of using building blocks was combined with the dimensions-based perspective. This reasoning allows for a conceptualization around a multidimensional profile to define IORs adapted to the construction industry.

First, to outline what really distinguishes the 12 relational forms found in the literature, their characterizing dimensions were derived from their general description. To determine these dimensions, the qualitative content analysis method was used. The process can be described as follows: first, the units of analysis were determined as being the characteristics of the relational forms. A coding was next performed to create labels. This was based on the meaning or notion reflected by the first units analyzed. In fact, these labels constitute a grouping of statements with similar meanings. When assigning further units to labels, a set of rules was used as recommended by [23]. The rules applied in this case were: labels should ease the comparison of the 12 relational forms; units should be observable in all forms; elements such as drivers, barriers, facilitators, and outcomes should be excluded from these groups. This iterative process led to refining the content of each label. The final labels represented the dimensions. Applying this process to every relational form led to the identification of eight dimensions:

- **Engagement**: This refers to how partners will commit to each other and make sure that the duties and rights of each one is fulfilled. They may sign a contract (contractual), define a set of rules (formal), or just rely on social conventions with no declared rules (informal);
- **Horizon**: this relates to how long the collaborative IOR will last. Partners may choose to work together for one project (short-term), or engage in a series of projects (long-term);
- **Range of activities**: The range indicates whether the collaboration will be during one activity or phase of the project or encompasses the whole construction endeavor. Therefore, the collaborative work may be limited to one activity, or stretch over multiple ones (e.g., planification, design, and construction);
- **Control i.e., decision-making**: This dimension pertains to who will be in charge in terms of decisions, and hence assume liability. Partners can agree to pursue a joint decision-making (shared). It may be that each partner makes their own decisions separately (individual). Another possibility is that of a partner (dyadic relationship) or partners (multi-party relationship) assuming all the responsibility (exclusive);
- **Ownership**: This dimension mainly describes how financial assets will be organized between partners. These assets may refer to material possessions (e.g., construction equipment) or equities (e.g., in the case of a joint venture). This ownership can be distributed between partners according to agreed upon portions (shared), or each partner can use their own assets (individual). The ownership can be eventually restricted to one or some partners (exclusive);
- **Structure**: This indicates how the relationship will be organized in terms of positions in the supply chain. Hence, partners can have a client-supplier relationship (vertical) or be at the same supply chain level (horizontal). In some cases, a relationship may have features of both types, resulting in a hybrid structure;
- **Integration**: This dimension mainly refers to the “tangible activities or technologies” [78] and to what degree information systems are integrated, i.e., compatibility and effectiveness of communication [79]. The level of integration needed for the prospective IOR can be low due to previous collaborative efforts between partners.
or increased compatibility, or high due to the lack of compatibility of systems and communication procedures;

- Financial investment: This dimension portrays a direct consequence of all other dimensions, e.g., if a high degree of integration is requested, partners have to invest in some activities or technologies. This investment can be performed jointly or separately, for instance a partner may need to upgrade their information system for compatibility purposes.

The dimensions “engagement”, “horizon”, and “range of activities” act as delimiters, i.e., set up the limits of the relationship. Table 1 summarizes how the 12 relational forms relate to the dimensions.

These dimensions are to be considered as the types of efforts that potential partners need to invest in to establish and develop a successful relationship. However, this success is endangered by the existence of barriers. Therefore, the level for each dimension should be determined based on contextual barriers inherent to the partners’ situation. These barriers should be analyzed to uncover the challenges inside of the relationship. Since the categorization already employed for the barriers indicates the business area where efforts are needed, an alternative classification is suggested using the content analysis method. This was performed precisely to organize the barriers in terms of how they affect the relationship. It led to four alternative categories: the link, the balance, the relational skills, and legal factors. The link refers to the tie that exists between partners and how they interact with each other. The balance concerns the distribution of power, liability, and resources between partners. Relational skills relate to the qualification of the partners in terms of relationship management and perception about interorganizational interactions. Barriers of the fourth alternative category portray unswayable factors that can be associated with legal matters. The idea that the actual interaction and the balance between partners are main components of a relationship can be supported by works such as [80–83]. It was also observed that barriers of the category “relational skills” can be attributed to the “link”-category and the “balance”-category as well.

Barriers are then arranged into barriers that hinder the link between partners (Type L) or affect the balance (Type B), or both. Based on the premise that dimensions are regarded as efforts to counter barriers, a correlation between them was examined. As it was already defined that three dimensions are considered as delimiters and financial investment is a cumulative outgrowth, the focus in finding a correlation was put on the remaining dimensions. “Ownership” and “decision-making” concern the distribution of power, liability, and assets among partners, hence they directly affect the balance aspect. The “integration” reinforces the interaction between partners in terms of communication and compatibility. Therefore, it contributes to the link. The “structure” dimension is of a particular interest since it is divided between balance and link. At one end, in a vertical structure, partners acting as suppliers will always strive to meet client’s needs, which would contribute to a better interaction. Moreover, such a structure will not necessarily impact the balance due to already defined roles (positions in the supply chain). At the other end, a horizontal structure would help in the distribution of power, liability, and assets among partners. However, this structure may have a negative impact on the link because of the risk of competition between potential partners. In summary, the partition of dimensions into Type L and Type B was defined based on whether these dimensions can have a direct positive impact on either the link or the balance, and thus can help overcome the barriers of that type. Furthermore, when examining the correlation between barriers and dimensions, it was noticed that barriers of the category “relational skills”, which affect both the link and the balance, could not be assigned to any of the dimensions previously mentioned. This prompted the addition of another dimension called “relational skills” in the multidimensional profile (i.e., Type L and B) to counter the barriers of the same type. Thereupon, the multidimensional profile has the following template (cf. Figure 5).
Table 1. The twelve forms depicted by the eight dimensions.

| Form                | Engagement     | Horizon            | Range of Activities                  | Decision Making  | Ownership          | Structure     | Integration | Investment  | Number of Articles (% of 118) |
|---------------------|----------------|--------------------|--------------------------------------|-------------------|--------------------|---------------|-------------|-------------|-----------------------------|
| Partnering          | Non-contractual| Short- and long-term| From unique to multiple activities   | Could be shared   | Not shared         | Any or none   | High        | Optimization-oriented      | 52 (44%)                    |
| Alliancing          | Contractual    | Short- and long-term| From unique to multiple activities   | Shared            | Shared             | Hybrid        | High        | Joint        | 22 (19%)                    |
| Project delivery methods | Contractual | Short-term         | Cover the whole project              | Depends on the method | Not shared | Vertical and horizontal | Depends on the method | Individual | 19 (16%)                    |
| Supply chain integration | Rather contractual | Short- and long-term | Multiple                            | Could be shared   | Not shared         | Vertical and horizontal | High        | Individual | 16 (14%)                    |
| Joint ventures      | Contractual    | Short- and long-term| Multiple                            | Depends on the governance | Not shared | Vertical and horizontal | Depends on the governance | Joint        | 13 (11%)                    |
| Integrated project delivery | Contractual | Short-term         | Covers the whole project            | Shared            | Shared             | Horizontal   | High        | Joint        | 12 (10%)                    |
| Join risk management| Contractual    | Short-term         | Only planning                       | Shared            | Not shared         | Any          | High        | Individual | 4 (3%)                      |
| Collaborative design| Contractual    | Short-term         | Only design                         | Shared            | Not shared         | Vertical and horizontal | High        | Individual | 3 (3%)                      |
| Contingent collaboration | Non-contractual | Short-term         | Multiple                            | Not shared        | Not shared         | Any          | High as a target | Individual | 2 (2%)                      |
| Quasi-fixed network | Rather formal  | Short-term         | From unique to multiple activities  | Not shared        | Not shared         | Vertical and horizontal | Two levels  | Individual | 1 (1%)                      |
| Resource sharing    | Contractual    | Short-term         | Only construction                   | Not shared        | Shared             | Horizontal   | Low         | Individual | 1 (1%)                      |
| Collaborative planning | Formal        | Short-term         | Only planning                       | Shared            | Not shared         | Vertical and horizontal | High        | Individual | 1 (1%)                      |
4.2. IOR Framework

As mentioned previously, the construction industry operates based on projects. Hence, the challenges vary from one project to another and so do the barriers. To ensure that a company enters an appropriate relational form and builds a solid base for this partnership, the interorganizational relational framework was devised to be used according to the needs of each relationship (cf. Figure 6).

![Figure 6. The Inter-firm Relational Framework.](image)

The framework starts with Step 1, where the company tries to determine whether to establish an interorganizational relationship and the reasons behind it to make sure that it really needs such a relationship. The idea here is to contrast the drivers with the barriers using a generic list (extendable if needed) of such elements. Once the company
decides to establish a relationship with a potential partner (or partners), the second step begins. Context specific barriers (project or partner related) are added to the list of barriers. Facilitators are then identified to overcome some of the barriers. The remaining barriers will be overcome by carefully structuring the interorganizational relationship as follows. These remaining barriers are grouped into Type B and/or Type L. Then, the corresponding dimensions are selected, which give the multidimensional profile. The profile illustrates the type of efforts to invest in to overcome the relational challenges that lie ahead of the partners. This means that for each relational challenge (barrier), a corresponding effort (expressed by the dimension) can assist partners to suppress the encountered difficulties. Afterwards, appropriate facilitators are identified to help implement the selected dimensions. In the last step of the framework, partners assess how well they worked together based on the outcomes. To do so, they can rely on jointly defined KPIs. Depending on this post-mortem evaluation, participating companies can choose to work together in future endeavors while possibly adjusting dimensions or cut off the partnership.

5. Conclusions

This article aimed to identify relational forms adopted by construction companies to organize their relationships and to uncover elements that incite, affect or result from such relationships via a SLR. A thorough screening allowed for a selection of 139 papers to be analyzed for their relevance to the research goals. From 118 papers addressing the relational forms in construction, the 12 following forms were identified and analyzed (in descending order of citation): partnering, alliancing, project delivery methods, supply chain integration, joint ventures, integrated project delivery, joint risk management, collaborative design, contingent collaboration, quasi-fixed network, resource sharing, and collaborative planning. Furthermore, 73 articles addressed at least one of the four elements that affect these relationships (drivers, barriers, facilitators and outcomes) and the results were grouped into categories.

This work adds to the research on construction collaborative IORs by addressing several discussion points. First, it constitutes an enrichment to the body of knowledge since there is a lack of publications providing a map of the existing construction interorganizational relationships. Such mapping can help both researchers and practitioners to navigate the different forms, and thus fostering a better understanding and use of these forms. Second, this work contributes to the clarification of the relational forms by shaping the contours of such concepts and thus bringing forward their understanding (addressing the understanding issue). Furthermore, the multidimensional profile developed in this research represents a common ground to potential partners, which addresses the aspect of pluralism mentioned earlier. The aspect of practicality is also present since the profile is easy to implement and guidelines in the form of the framework accompany the users in its application. In that regard, the chain of barriers–dimensions–facilitators constitute a roadmap for practitioners about how to navigate from the relational issues, through the needed efforts to tackle these problems, to implementing concrete measures. The most attractive feature of this profile addresses the issue of versatility and consists in the ability to customize the relationship according to the needs of the situation, which is most relevant for a project-based industry. The idea of using dimensions instead of pre-defined archetypes allows for a better description of the relationship and adds more flexibility when choosing the appropriate form. Moreover, the resulting dimensions differ from the ones suggested in previous research, which brings a new insight on how to perceive and organize collaborative IORs.

Following the results of the SLR, some research gaps were uncovered:

- There is a coherent trend in construction publications, i.e., topics such as the building information modeling technology are gaining more attention [48]. Albeit such topics are important and reflect an increasing industrial need, other areas of interorganizational relationships should also be appropriately studied, such as supply chain-related
issues, the perspective of organizational behavior (e.g., to study the element of trust), or building performance [40]:

- A methodological gap that was often observed is the scarcity of longitudinal studies, which can examine the dynamic aspect of the construction industry and its actors;
- There is clearly a lack of quantitative models and especially mathematical and simulation modeling. Such techniques could be used e.g., to assess the risk coming from cases where companies work together;
- It was noticed that emerging branches of the construction industry, such as prefabricated wood construction, did not receive much recognition. According to Toppinen et al. [51], assessing the role of the socio-political environment in promoting the use of wood in construction projects is needed. In that regard, collaborative IORs can help implement new concepts, i.e., novel wood structures in a sector as conservative as the construction industry [13];
- There is a lack of studies on performance measurement of construction joint ventures, especially the aspects of sustainability and evolutionary contexts. Measurement factors are also an issue in governance structures. The question of how to better transfer knowledge between partners of CJVs should be addressed along with investigations on conflict contingencies and resolution. Because CJVs can be an international relational form, more attention should be given to developing countries [41];
- Publications addressing the topic of SCI in the construction industry are quite limited. Indeed, research works tend to discuss the supply chain management in general [70];
- The mechanism and impact of incentives is another research direction for future works.

It is noteworthy that the keyword combinations and the search engines used when conducting the SLR limit the obtained results. It is, therefore, possible that publications potentially relevant to this work were not included. Alternative keywords and search engines could generate different results. Future work should involve applying the framework and the profile for different construction projects and companies.

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