THE DARK SIDE OF COLLABORATION: THE RISKS OF STRONG TIES IN COLLABORATIVE PROJECT NETWORKS

Anna af Hällström¹ and Petra Bosch-Sijtsema

Technology Management and Economics, Chalmers University of Technology, Vera Sandbergs Allé 8, Göteborg, 41296, Sweden

Collaborative project delivery models (CPDMs) have been introduced as a way of managing infrastructure projects to improve the adversarial mindset characteristic for the field and improve project outcomes. A plethora of valuable research exists pertaining to the relevance and benefits of increased collaboration; but is all collaboration positive? A recent rise in the interest in social networks and their impact on project implementation has highlighted the need for further research into the structure of project networks. We apply a project network lens to study the strength of collaboration in infrastructure projects in which CPDM is applied to increase collaboration. We have conducted a pre-study using a collaborative way of working and two case study projects utilising a CPDM during 2019-2020. The data consists of interviews, observations and document analysis. We found that strong ties between individuals enable rapid information exchange and build trust within the network; but if the initialising phase is incomplete; it can be hard to include all participants later on in the process. Strong ties can also become over-embedded, resulting in a restricted project network and a constrained information flow. This is an interesting aspect to consider especially in long-term; major projects, where a certain relocation or reassignment of people is to be expected during the project’s life cycle. Another aspect to consider is the need for the project manager to rely on interpersonal relationships (i.e., strong ties) for efficient leadership as they lack traditional tools to manage project participants originating from other organisations, such as contractual ties. While strong ties are reported to bring several benefits, such as rapid information exchange and trust; they also carry risks restricting network development which become relevant for the application of CPDMs in large scale projects.

Keywords: collaboration; large-scale infrastructure; project network; ties

INTRODUCTION

The infrastructure construction industry has recently introduced collaborative project delivery models, or CPDMs, (Lahdenperä 2012) in order to combat industry-characteristic adversity (Hansen-Addy and Nunoo 2014), project overruns (Rahman and Kumaraswamy 2004, Flyvbjerg 2014) and to manage more complex projects, a result of growing project sizes (Flyvbjerg 2014, Volker et al., 2018). A plethora of valuable research exists pertaining to the relevance and benefits of increased collaboration as well as the procurement of such models.

¹ anna.af.hallstrom@chalmers.se

The benefits of collaboration are much discussed in this literature. It leads to improved project outcomes, lowers the risk of cost overrun and delays and facilitates efficient problem solving (Hansen-Addy and Nunoo 2014, Adami and Verschoore 2018). These are all core concepts in CPDMs, who are characterised by early involvement of all key actors, joint decision-making and sharing resources, risks and responsibilities (Lahdenperä 2012). However, little is known about the possible downsides of collaborative relationships, the basis of CPDMs. Only few studies mention risks of collaboration of CPDMs and relate to e.g., groupthink (c.f. Hietajärvi 2016).

Furthermore, many of the traditional theoretical frameworks, such as transaction cost theory and agency theory give valuable insights into the mechanics of interactions but leave the social structures and networks unattended (Uzzi 1997). While network theory discusses positive and to some extent negative consequences of strong networks, this has not been discussed in project management or construction management literature.

A recent rise in the interest in social networks and their impact on project implementation in the construction industry has highlighted the need for further research into the structure of project networks. We apply a project network lens to study the consequences of the strength of collaboration in infrastructure projects in which CPDM is applied to increase collaboration.

THEORY
Project networks and CPDMs
Recently, network approaches have increased in popularity in the construction sector (Zheng et al., 2016) as a network view allows for in-depth understanding of behaviour and ties between network actors (Pryke et al., 2017). Actors can be either individuals or organisations and the ties can be divided into formal and informal (af Hällström 2021). Formal ties can be observed or measured (Papadonikolaki et al., 2017, Wang et al., 2018) while informal ties are less visible and often are a social relationship between two actors (Papadonikolaki et al., 2017).

One of the most common networks to study are social networks, which is especially concerned with the network structure (Loosemore et al., 2020). Loosemore et al., (2020, p.1062) defines social networks as "self-organising, emergent and complex and form repeatable patterns of relationships which can be used to understand organisational phenomena (such as construction project organisational outcomes)".

In this study, we focus on the informal social ties between actors in a project network. A project network is here defined as the network that forms around the project organisation by the project participants and the ties connecting them (Hellgren and Stjernberg 1995, Adami and Verschoore 2018), as this enables us to study the ties in a specific context and possibly uncover before unseen connections.

A CPDM consists of multiple levels of actors (individuals, project, organisations, industry) which interact with each other and the project (Sydow and Braun 2018). In this perspective, the project network is shaped both by the individual actors partaking in the project and their role in the project organisation, as determined by their home organisation and their employment contract, but also by the organisations who are contracted to deliver the finished product. These organisations are furthermore connected by social ties to each other, born from the interaction and action of their employees as they meet in different projects and form social ties.
Collaboration in networks
CPDMs are based on the collaboration between key actors in early stages of the process and equal partaking and sharing in the project process. The practicalities of the model rely on the interplay between the project organisation and process, as laid down in the governing contract, but particularly on the social relationships created between actors (Lahdenperä 2012, Walker and Lloyd-Walker 2015). Collaboration, or the shared, interactively developed understanding of the rules and norms governing the context (Wood and Gray 1991) is based on close relationship between project actors. Although literature has discussed the models themselves, this relationship has received less attention.

Close social relationships, or ties between individual actors (af Hällström 2021) in a project network can assist in coordinating adaptation and adjustment within the network, which helps in shifting the perspective to cultivating long-term relationships rather than chasing short-term gains (Uzzi 1996). According to Uzzi (1997), such close social ties build on the three principal components of trust, close information transfer and joint problem-solving processes. These components are also part of the CPDMs (Lahdenperä 2012), indicating the relevance of social ties for the model.

Although benefits of collaboration make CPDMs attractive to use, there are two aspects of collaboration-related challenges that are little discussed in current literature. First, the homogeneity of social networks and second, the creation of in- and out-groups and the related groupthink.

First, a weakness in strong social ties is related to the classic statement "similarity breeds connection" (McPherson et al., 2001, p. 415): dense social networks are often homogeneous, leading to implications regarding the interactions within the network as well as the project process itself (ibid.).

Second, project networks are formed by several clusters, often based on the individual's home organisation. This, coupled with differing roles in the project and amount of time spent there, can create in- and outgroups which have implications for both intergroup and interpersonal behaviour (Tajfel and Turner 1979). For example, according to Hietajärvi (2017), studying alliances, "although a collaborative project identity mostly supports and enhances performance" (p.44), there is a risk of groupthink as the "strong impetus for unanimity can in some instances hinder continuous improvement" (p.44). This risk can be mitigated by involving outside experts and discussing matters with people outside the network (Hietajärvi 2017).

Embedded relationships
How the quality and relationships of a network influence the activities within is related to the concept of structural embeddedness (Uzzi 1997). Although literature on structural embeddedness (see e.g., Granovetter 1985, Uzzi 1997, Nell and Andersson 2012) focuses on economic activity and exchange, this concept can be applied to network theory in general as it is concerned with the interaction of the network ties.

Embedded relationships relate to the way relationships between project actors shape the project network (Uzzi 1996, Nell and Andersson 2012). A high level of embeddedness enables trust and collaboration, while a low level of embeddedness results in an arms-length relationship between the actors (Nell and Andersson 2012). A high level of embeddedness of relationships "shifts actors' motivations away from the narrow pursuit of immediate economic gains toward the enrichment of relationships through trust and reciprocity" (Uzzi 1996, p. 677). It can also help shape goals and behaviours through close ties between actors, as well as coordinate
actor adaptation and adjustment. This shifts the focus away from short-term gains to cultivating long-term relationships: the project network moves from low to high levels of embedded relationships (Uzzi 1996). A high level of embedded relationships supports the formation of collaborative relationships (Uzzi 1997).

Uzzi (1997) furthermore identifies several risks connected to over-embeddedness in networks, leaving actors vulnerable to sudden changes, making adaptation difficult and reducing the flow of novel ideas and innovations within the network.

Over-embedded ties in a classical organisational network constrain information flow and hinder innovations from arising (Uzzi 1997, Nell and Andersson 2012). Close social ties are furthermore easiest to create with people similar to oneself (McPherson et al., 2001). However, when people in a group are too similar, innovation and new ideas are stifled (Granovetter 1985, Uzzi 1997, McPherson et al., 2001). Close social ties can therefore hinder information sharing and the rise of innovations, if not managed properly.

The difference in levels of embeddedness, combined with the changing project models, has raised interest in the new demands placed on actors, globally but also in the Nordic countries where CPDMs have become more common in recent years.

**RESEARCH DESIGN**

In order to study collaboration in major infrastructure projects, we focused on three projects in a Nordic context: one pre-study and two main studies (see Table 1). The pre-study was governed by a traditional bid-build contract based on collaboration while the main studies used a CPDM, divided into a tendering phase, phase 1 (design and project planning) and phase 2 (detailed design and construction). The studies focused on the three main roles of client, design engineer and contractor.

44 interviews were conducted with respondents from all levels of the project hierarchy and from all participating main organisations. The respondents were selected by snowball sampling, the chain starting from the project manager. All interviews were taped and transcribed. Notes were also taken during all interviews to ensure data safety in case something happened to the tapes and/or transcriptions. The shared office space was also observed in the two main cases (58 hours in total, see table 1). Moreover, documents obtained from the projects and from publicly available sources were analysed. The data was inductively coded in NVivo, and main themes related to collaboration were coded according to an inductive approach.

**FINDINGS**

The nature of collaboration was seen as a key to the project's success and that it enabled several benefits, most notably related to time savings. The main themes related to collaboration visible in the data related firstly to the impact of the initial phase on collaboration later on in the project and secondly, to the role of strong social ties for collaboration and information exchange.

*On the impact of the initial phase*

The initial phase here refers to the start of the project, after the tendering process is done and when the project is starting with the establishment of collaborative spaces, the allocation of roles and tasks and the introduction of the individual project participants to the project.
In case A, the winning team, consisting of the contractor and their team, had already created a strong network during the tendering phase according to respondents from both contractor and design engineer. According to a design engineer, "because we had worked together during the project planning document stage, then we worked really intensely together with [the contractor] during the tendering stage. So, when we got there, we were a really tight team. And there we- now that I look at it afterwards, we should have understood how strong a team we were, …we didn't get [the client] on board. Or it was a challenge for [the client], I think, to be a part of it". In case B, the client had decided to choose the design engineer and the contractor at different occasions to be able to "choose the best ones" as a client representative said. The client and design engineer started to work on the project organisation and plan the project before the contractor was chosen, approximately two months after the design engineer. Thus, during the initial project phase a strong tie either formed (case B) or had formed previously (case A) between two of the actor organisations, leaving one organisation outside the resulting dyadic relationship. Respondents commented on this during phase 2, indicating long-term impact of these early ties on the project network.

Moreover, respondents commented on the role change for all parties in this initial phase in both main cases. The client and the design engineer lacked experience in working almost full-time in a project office, as opposed to the contractor. The contractor, however, was not used to the early input they were required to give, and many respondents commented on the lack of "real work" during phase 1 in general, but in the initial phase in particular. The contractor was also seen to lack experience in giving input to the design process, but they still saw the early involvement as a positive concept overall. In the pre-study, the process followed a more traditional construction route, where the client first contracted the design engineer, after which the contractor was chosen.

The role of strong social ties for collaboration and information sharing
All three cases showed strong social ties between actors, which was seen to facilitate collaboration and its beneficiary information sharing by the respondents. In general, however, collaboration was seen to demand more resources than traditional ways of working during the whole project process, both in terms of time and personnel. "It takes time to get to know each other", several respondents mentioned. Respondents from both cases discussed the time required to create a shared understanding of both project goals and of the need for a common concept of collaboration in the project network. As a respondent from the contractor stated in case A, "let's agree together what collaboration is in this project. If I walk around and think we should collaborate
in one way and you think another way is better; well, that's a bit silly. Isn't it better that we discuss and together decide that 'this is how we're going to collaborate in this project'. The sentiment was echoed by other respondents from both cases.

Collaboration moreover "demands active participation" as a client representative stated, echoed by several respondents from all organisations as exemplified by a contractor statement: "collaboration requires all parties to be seated around the same table". A traditional project focuses heavily on the contract, which was seen to enable a more confrontational approach to the project in comparison to a collaborative model. This traditional way was visible in case A, where the design engineer mentioned that they couldn't approach the client directly, as the main contractual relationship was between the contractor and the client. Another key aspect of collaboration was a willingness to be open, to share and understand each other in order to build mutual trust and relations between the participants. Furthermore, collaboration was seen to be working towards the same goal and finding the best solution for the project.

Social ties were seen as the result of time and active engagement, building trust and a shared understanding. The individual attitude towards collaboration and 'personal chemistry' was also seen as a major factor in the creation of collaborative social ties. As one respondent from the designer put it, "in many projects you can sidestep the question about 'personal chemistry' but in this [collaborative] process, I think it has a surprisingly large role if 'we get along'." The respondents were, however, most comfortable with actors they knew from before. In case A, the contractor and the design engineer had a history of working together and regarding the individual level, a design engineer from case B remarked that "where you seek that… those collaborations, those are also sought from your familiar circle instead of… a designer seeking a discussion partner in a contractor, or a contractor from a designer."

Furthermore, the shared project office, or co-located space, was highlighted as a major contributor to creating social ties, information sharing and collaboration in both the pre-study and case B, as it enabled people to spend time together and get to know each other as well as provided a quick way to access key actors in the project. There were, however, also some negative aspects highlighted with the co-located space, as not all who partook in the project were there constantly. This left these actors outside the created social network and made their collaborative efforts harder. We did not map the whole project network, this is outside the scope of our research, but is an interesting aspect to focus on in later studies.

All studied projects exhibited a close relationship between two key actors, leaving the third outside, as visualised in Fig 1. In the pre-study, the contractor and client were actively using the co-located space and talked in positive terms about the collaboration in the project, while the design engineer was seated at their home office and spoke of the project in more traditional terms. In case A, the contractor and design engineer consortium had previous experience of working together and had already created a strong network in the tender phase before the project properly started. In case B, the client and design engineer started planning the project and setting up the project organisation before the contractor was chosen and created a strong network in the early months of the project, although all actors were active in the co-located space. This initial over-embeddedness between client and designer was perceived as a reason for difficulties between designer and contractor later on in the project, as they lacked understanding of the other. The over-embeddedness between two of the three actors was seen as a problem in all studied projects, as this exclusion was seen to restrict
collaboration and diminish information flow and relational aspects of the project. This was furthermore commented on during phase 2, indicating a long-term impact on social tie formation. Several respondents remarked on the challenge of introducing new project participants to the project.

Another topic brought up in case B was the lack of formal management tools regarding project participants from other organisations. If a person was unsuitable for a certain role, the project organisation and management had to rely on interpersonal relationships (i.e., strong ties) to organise project activities and actors, while employment-related issues were dealt with at the home organisation. This was seen as a problem in inter organisational projects in general, not only in CPDMs.

**DISCUSSION**

**On collaboration and the impact of the initial phase**

The initial phase seemed to have a major impact on collaboration later in the project. The early relationships between selected actors made later inclusion of additional actors difficult, which was seen even during phase 2.

The uncertainty inherent in the initial phase combined with the role changes and new demands placed on the actors, both individual and organisational, originating from the CPDM, made this phase especially challenging from a collaborative point of view: when faced with uncertainty and change, it is easy to fall back in traditional roles and routines.

Since the language about collaboration was similar across all respondents and organisations, there seems to be a relative consensus regarding the definition. It is however important to ensure a shared understanding of the concept in the project network in question, as remarked by respondents. This requires all parties to be seated around the same table - both physically and contractually. First, as was evidenced by the findings related to co-location, a shared understanding is easier to achieve through time spent together and learning to know each other. Second, a common contract enables parties to discuss directly facilitating information flow and decision-making. Although case A had a shared view, their actions were not in line with this, leading to differing practices.

**The risk of over-embedded ties**

The greatest challenge of collaboration came from the strong social ties between individuals created in the initial phase of the project, whose effect was still visible in phase 2. These ties could be classed as over-embedded, (Uzzi 1997, Nell and Andersson 2012), creating in- and out-groups (Tajfel and Turner 1979) in the project network, restricting the participation of one of the actors by limiting their access to the network structure.
This restricted network, which can be expected from over-embedded ties, was seen in case A where intra-organisational ties were much stronger than inter-organisational ties, making information exchange difficult and reliant on meetings and processual/contractual aspects. In case B the ties were more in balance, although there were difficulties between contractor and designer. These were, however, related to the actor's changing roles and not to over-embeddedness. Moreover, there was a risk of being shut out from the project network in case B, depending on the time an individual spent at the co-located space. This led to people not knowing who to approach when they had questions, knowledge people gained tacitly when they spent a considerable amount time at the project office. This could be seen to lead to a formation of in-group and out-group identities, or under- and over-embedded actors in the network.

Strong ties can also become over-embedded, resulting in a restricted project network and a constricted information flow. This is an interesting aspect to consider especially in long-term, major projects, where a certain relocation or reassignment of people is to be expected during the project’s life cycle. Another aspect to consider is the need for the project manager to rely on interpersonal relationships (i.e. strong ties) for efficient leadership as they lack traditional tools to manage project participants originating from other organisations, such as contractual ties. While strong ties are reported to bring several benefits, such as rapid information exchange and trust, they also carry risks, restricting network development which become relevant for the application of CPDMs in large scale projects.

The challenges of collaboration

The benefits of collaboration are much discussed in literature as improved project outcomes, lower risks of cost overrun and delays and more efficient problem solving (Hansen-Addy and Nunoo 2014, Adami and Verschoore 2018, Volker et al., 2018).

In order to reap the greatest result from these benefits, it is natural that the construction sector has introduced CPDMs.

Our findings show that a collaborative project network can be difficult to achieve if some actors form close relationships in the initial phase of the project, leaving some project participants outside and thus creating an incomplete project network. The resulting dyadic relationship can work well, but since the basis for a CPDM is the equal involvement of all key actors, this partial network undermines this basic tenet of the model. There is also the question of how to include individual actors, a group of project actors with a lot of interchangeability due to the long duration of major infrastructure projects, in the network. Another problem related to the social ties which underpin collaboration within the network are managerial issues. Since a project organisation lacks the formal contractual ties necessary for traditional management practices, the role of the informal social ties grew stronger in the project process.

The dark side of collaboration discussed in the article, however, are the restrictions it can place on the network. Over-embedded social ties and too similar actors can hinder conflict resolution and the introduction of new ideas (Uzzi 1997, Nell and Andersson 2012, McPherson et al., 2001). As our respondents remarked, it is easier to go to those you know for help before approaching someone new. This implies both trust (you want to approach this actor) but also a restriction on the new input (you know them and how they are likely to act).
The benefit of a functioning collaborative project network lies in the balance between different viewpoints and actors. Since the definition of collaboration seems quite similar across the Nordics, although the actions might differ if the views on the project differ, there is hope that enough time spent at the beginning of the project to create a shared understanding will facilitate a functioning project network - if all actors are included from the start and the project process ensures that new actors are introduced into the network properly and are not left outside of the shared project office.

CONCLUSIONS

Collaborative models have been introduced as an alternative to manage complex projects, but little attention has been paid to the challenges of the concept, mainly the risk of over-embedding the ties in the project network, constraining information flow and the introduction of new ideas while creating in- and out-groups within the project network.

Collaboration has several benefits, which is the key reason why CPDMs are introduced in the construction industry. It is, however, difficult to form a collaborative project network if not all organisational actors are included from the start as this creates a dyadic relationship instead of an inclusive network, reverberating throughout the project process. There is also the question of how to include individual actors, who are bound to change during the long duration of major infrastructure projects, in the network. These "dark sides of collaboration" are less explored in the current literature and warrant further investigation. Future research should also consider these more negative elements of collaboration. An interesting approach would be to analyse the interplay between the uncertainty inherent in complex projects and collaboration.

The findings are limited by the geographical scope and nature of the cases studied, as well as the inductive research mode.

REFERENCES

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