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# The interplay between formal and informal contracting in integrated project delivery

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This research examines the interplay between formal and informal contracting in integrated project delivery (IPD). It investigates how the interplay enables parties in health-care construction projects to cope with uncertainty and complexities, due to, among others, changing demands. New delivery models based on collaborative interaction, such as IPD models, often rely on relational contracting principles, defined as the simultaneous use of formal contracts and informal relational mechanisms to govern relationships between partners. Five case studies of IPD health-care construction projects in the USA and Norway are presented and analysed. The results show that the projects rely heavily on the formal contracts and structures to stimulate collaboration between the project team members and to enhance problem-solving. However, informal mechanisms play just as an important role. While formal mechanisms facilitate the building of trust and personal relationships between the partners, the formal mechanisms are in turn created and recreated through informal practices, illustrating a mutual constitutive relationship between the two types of mechanisms. The findings also indicate that previous experiences reinforce informal mechanisms in the project. The paper concludes that IPD models involve a complex interplay between formal and informal mechanisms, which engenders commitment resulting in joint problem-solving and responsibility throughout the construction process. The findings also indicate that even if the dynamic context and future uncertainties in health care are taken into account, dealing with such flexibility issues is not at the core of the current IPD model.

*Keywords:* Case study research, flexibility, formal and informal contracting, health-care construction projects, integrated project delivery.

## Introduction

Designing and constructing health-care facilities require a variety of disciplines in order to develop an integrated service. It is increasingly acknowledged that traditional design-bid-construct contracts are inappropriate in delivering such complex projects. Instead, project delivery models based on a collaborative approach are seen as the panacea to handle such projects. Such models include public private partnership, integrated project delivery (IPD), project alliancing and partnering. Lahdenperä (2012) noted that IPD, project alliancing and project partnering are often used interchangeably. However, even if they have their differences, 'early involvement of key parties, transparent financials, shared risk and reward, joint decision-making, and a collaborative multi-party agreement are some of the features incorporated in all the arrangements to a varying degree' (p. 57). These delivery models are often based on relational contracting principles (Rahman and Kumaraswamy, 2004), incorporating both the formal contract and the informal and relational mechanisms for enhancing the collaboration. The models also often include the use of Lean Construction, and 3D Building Information Models (BIM), developed by teams of engineers and builders from the participating firms, working co-located in a 'Big Room' to facilitate spatial and technical coordination (Kim and Dossick,

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2011). In this paper, the concept of IPD is used to refer to delivery models that incorporate the above features. This means models aimed at integrating the design and construction process to safeguard the variety of requirements and providing incentives for collaboration to create value for the client.

A basic assumption underpinning the paper is that IPD models include an interesting interplay between formal contracting, such as the written contract, and more informal and relational mechanisms of interaction between project partners, such as shared value and understanding. The latter is often supported by enabling technologies such as shared BIM models. Many previous studies have focused on the formal contracts that guide inter-organizational transactions (Kamminga, 2008). The enforceability of such contracts has been a common theme in the general literature on inter-organizational exchange (Williamson, 1975). It is increasingly recognized, however, that more relational mechanisms such as trust play an important role in governing the exchange between parties (Williamson, 1979). Similarly, there has been a steady increase in studies within the construction literature focusing on informal and emergent aspects (Chan and Räisänen, 2009), including informal social processes (Bresnen and Marshall, 2002), trust (Laan *et al.* 2011), norms, values and routines (Kadefors and Laan, 2010), informal (psychological) contracts (Dewulf and Kadefors, 2012) and temporal embeddedness, such as past experiences and future expectations (Kamann *et al.* 2006). Common to these studies is an interest in studying these aspects' impact on the degree of collaboration within the project. For example, it is acknowledged that different strategies are needed to attain and sustain the structures associated with relational mechanisms to achieve expected benefits (Henisz *et al.* 2012). Cicmil and Marshall (2005) warn, however, about believing that structures, such as collaborative procurement methods automatically facilitate collaboration and improved construction performance. Just as important are the processes of project organizing, goal setting, habituated behaviours and accomplishment of action (Scott, 2014). In addition, operations of power and interaction among project parties also play an important part in achieving the expected benefits from collaboration in terms of improved project delivery (Cicmil and Marshall, 2005). Thus, on the basis of literature, we may assume that formal and informal mechanisms are not substitutes, but complements to each other (Bresnen and Marshall, 2002).

The aim of this paper is to examine the interplay between formal and informal contracting in IPD projects. We studied how these mechanisms enabled contract partners in five health-care construction projects in the USA and in Norway to cope with flexibility needs. Health-care construction projects deal with a large array of uncertainties and, therefore, flexibility during the course of the project is a major requirement. Health-care construction projects are often characterized by a highly dynamic and uncertain context, and coping with uncertainty in relation to changing patterns of demand is a core challenge (Barlow and Köberle-Gaiser, 2009). Due to the high degree of changes in technology, demography, policies and medicine, there is a strong need for flexibility in the construction and operation of health-care facilities. In addition, this need for flexibility is often highlighted by the uncertainty and coordination challenges introduced by non-standard products or processes. Finally, flexibility needs are reflected in the construction parties' ability to adopt solutions to obviate unexpected problems during the design and construction process (Walker and Shen, 2002). Hence, we were particularly interested in how the complex interplay between formal and informal mechanisms enabled the contract parties to deal with changing needs. Our study fills then a gap mentioned by Barlow and Köberle-Gaiser (2009), who concluded that the IPD delivery model still needs to be much improved before it meets the expectations of enhancing adaptability, innovation and more collaborative ways of working.

The structure of the paper is as follows: The following section presents the theoretical basis of the paper and the research undertaken. Then, findings from the five case studies are presented, analysed and discussed in relation to the theoretical framework. The paper concludes with key implications of the findings for theory, practice and future research.

## Theoretical background

### The concept of IPD

Many have stressed that the construction industry needs to move away from the traditional adversarial behaviour towards more collaborative and integrated approaches to deliver more predictable results to clients and improve project performance (Egan, 1998). Not surprisingly, there has been a huge interest in concepts such as project partnering, project alliancing and IPD (Lahdenperä, 2012). IPD is generally seen as a project delivery system that encompasses strong team cooperation, early involvement of subcontractors, risk and benefit sharing models and joint responsibility for the success of the project (Kent and Becerik-Gerber, 2010), and where the aim is to integrate all the necessary knowledge and expertise in the design and construction stage (Matthews and Howell, 2005). Different collaborative models and concepts share a common aim of integrating design and construction (and sometimes

maintenance) teams and fostering collaborations in order to deliver more value to the client. They are particularly seen as appropriate in 'complex, lengthy, and evolving transactions, as seen in construction projects, where the underlying contractual scenario may change considerably over time' (Rahman and Kumaraswamy, 2004, p. 148). However, they also have different roots and meanings (for an overview, see Lahdenperä, 2012). The increasing interest in these collaborative approaches in practice is reflected in a growing number of papers being published in recent years in the construction literature. Many of the papers address the impact of closer coordination, integration and collaboration on cost, quality and time effectiveness, or what Jha and Iyer (2007) term the 'iron triangle'. Evaluations of partnering contracts and closer collaboration have demonstrated a large reduction in costs and waste (Walker et al. 2002), and closer integration and improved collaboration are seen as necessary conditions for fostering innovations (Rutten *et al.* 2009). Partnering and associated concepts have been considered 'the most significant development to date as a means of improving project performance' (Wood and Ellis, 2005, p. 317). However, Kent and Becerik-Gerber (2010) argued that despite the growing interest in IPD, the current adoption status by the UK construction industry is still unknown.

## Formal and informal contracting in IPD projects

Various studies have emphasized that establishing and maintaining collaboration between project team members are very complex processes and that contractual arrangements and attitudes of individuals interact (Kadefors, 2004; Laan *et al.* 2011). Behavioural studies have shown that extrinsic rewards and punishments may act to undermine or crowd out intrinsic motivation (Deci *et al.* 1999; Frey and Jegen, 2001). In IPD contracts, various financial incentives are common including target costs and forms of painshare/gainshare or risk/reward arrangements. Besides the formal contract structure, several other arrangements might be introduced to stimulate collaboration or team cooperation. Mollaoglu-Korkmaz *et al.* (2014) found, for example, that the implementation of IPD depends on the climate and the value fit of the IPD, which is considered an organizational innovation, as well as communication mechanisms and behaviours. Furthermore, technologies such as BIM and Lean Construction approaches are seen to enhance cooperation (Matthews and Howell, 2005). Other collaborative arrangements to improve the cooperation are co-location of team members and the use of shared administrative systems. Kim and Dossick (2011) identified five key elements that contribute to the integration of the project delivery: (1) contract type, which includes an Integrated Form of Agreement, (2) culture, (3) organization, (4) lean principles and (5) building information modelling (BIM). These elements support and reinforce the integration. In a similar way, Dewulf and Kadefors (2012) showed that the formal (IPD) contract and the informal relationship, such as trust, interact. After signing the contract, a process starts where partners jointly and gradually make sense of what the relationship implies in both contractual and behavioural terms. This finding confirms Cicmil and Marshall's (2005) argument that structural intervention, such as contractual arrangements, is not sufficient to deal with the inherent paradox of the relationship between project performance and control, on the one hand, and the processes of cooperation, collaboration and learning, on the other. It is neither sufficient to deal with the complexity of construction projects. In a similar way, Bresnen and Marshall (2002) found that partnering depends on a complex interplay between formal and informal mechanisms. Social processes and relationship dynamics play just as an important role as the more formal mechanisms, and the formal mechanisms are continuously interpreted and enacted. An interesting question is how this interplay unfolds over time.

## The case of health-care construction projects

Health-care construction projects are confronted with many uncertainties (Barlow and Köberle-Gaiser, 2009). Changes in demography, technology and policy require that contract arrangements be flexible. The demand volume, for instance, is very sensitive to demographic developments causing variations in the hospital's catchment population. Patterns of hospital activity change over time due to the development of novel medical technologies. Another major uncertainty is public policy. Increasingly, health-care clients are committed to the IPD concept (see e.g. Kim and Dossick, 2011; Dossick *et al.* 2013). However, how IPD health-care contracts incorporate abilities to respond to future contingencies is still unknown, as is the way construction parties use both formal and relational governance mechanisms to cope with changes and needs for flexibility and adaptability throughout the design and construction process. The use of innovative non-standard products or processes in health care is another source of uncertainty for health-care projects. Adherence to the Lean Construction methodology drives IPD project teams to collaborate across disciplines to examine more efficient construction products and processes to achieve project goals. However, adoption of these new products and processes requires

appropriate flexibility to deal with the inherent uncertainty and increased coordination associated with new technologies.

Relational contracting and collaboration can enhance the capabilities to cope with conflicts and find solutions for unforeseen events. Lessons from alliance contracting research revealed improved problem-solving and a collaborative culture that enhanced dealing with future risks and uncertainties (Jaafari, 2001; Turner and Simister, 2001). Although these studies do not focus on IPDs, it could be argued that successful uncertainty management is a key success factor for IPDs. But, another lesson is that the early post-contractual phase is important for how the project team deals with uncertainties. On the basis of three large alliance projects, Dewulf and Kadefors (2012) revealed that how project teams handle unforeseen circumstances decides how the relationship between the partners will develop. Still, little is known on how integrated project teams are dealing with unforeseen events and, more in particular, how formal and informal mechanisms enable contract partners in health-care construction projects to adapt to these circumstances.

## Research design and methods

A multiple case study design was applied to study the interplay between formal and informal contracting in IPD projects, where five health-care construction projects in the USA and Norway were investigated and compared. Multiple cases are useful to develop theory because they are based on varied empirical evidence that allows for broader explanation of a research question (Eisenhardt and Graebher, 2007). The cases were theoretically sampled, which means that they were perceived as particularly suitable for illustrating and extending the relationships and logic among the key constructs (i.e. formal and informal contracting), and together contributing to the building of theory through pattern recognition (Eisenhardt and Graebner, 2007). All the five projects could be categorized as IPD projects; they focused on integrating the design and construction process to safeguard the variety of requirements, and providing incentives for collaboration among multiple parties to create value for the client. They all relied on a mix of formal and informal mechanisms (i.e. relational contracting) to enable the collaboration, although in different ways. We chose a variety of IPD projects, which were different in scale, scope, time horizon, contractual arrangements, previous experiences and institutional contexts, enabling us to study the complex interplay between formal and informal contracting in various contexts. We looked particularly into how the parties dealt with flexibility needs, since this was likely to reveal the parties' use and reliance on formal and informal mechanisms. Flexibility in this setting referred to situations where alterations of the initial design of the building had to be made or when the partners had to cope with unforeseen events occurring throughout the construction process.

The cases provided abundant opportunities for descriptions and the identification of patterns of relationships between the various constructs across the cases. The initial proposition was that short-term IPD projects can be characterized as routine-based and rely more on formal contracts. Long-term projects, however, do need more emphasis on relational and informal mechanisms to be able to cope with unforeseen events over time. The respective projects were delivered recently, which enabled us to reconstruct the construction process retrospectively by interviewing people who were involved in the projects. Table 1 shows an overview of the individual cases.

**Table 1** Overview of the individual cases

| Case | Type of project | Size | Construction period |
|---|---|---|---|
| Pacific Medical Center, USA | New Surgery Center | 40 million USD and 75 000 sq ft. | 12 Months |
| West Hospital, USA | Building of tenant spaces | 24 500 sq ft. | 8 Months |
| The California Hospital, USA | New hospital | 320 million USD and 230 000 sq ft. | 4 Years |
| Norwegian Hospital | New university hospital | 2.1 billion USD and 2.4 million sq ft. | 12 Years |
| Suburban, USA | Cancer care center | 120 000 sq. ft. | 3 Years |

Formal contract arrangements can be studied by analysing formal documents. However, to be able to get more information about the contracts and formal procedures and structures, and to reveal the informal mechanisms too, we interviewed representatives from the client and the main contractor in all the cases. The Norwegian case was based on a slightly different method. The method was a longitudinal case study, where several interviews were conducted with the client and the main contractor, as well as with the consultants and the technical contractors and subcontractors. We have included this case since it showed how formal and informal mechanisms enable contract

partners to deal with unforeseen events. Across all the cases, the interviews focused on the role and use of the two types of mechanisms throughout the projects, particularly in relation to how the parties had dealt with critical events and needs for flexibility throughout the construction process. The questions concerned (a) the regulative framework, such as the contracts and other formal procedures and structures; (b) informal mechanisms, such as relationship dynamics and the development of shared understanding, norms, value and trust; and finally (c) how the partners used the different mechanisms to deal with situations requiring flexibility. We acknowledge the limitations of personal accounts reported in the interviews as a means for understanding practice (Alvesson, 2003). However, the interviews provided an understanding of how formal and informal mechanisms were used, their interplay and their role in dealing with flexibility needs. For example, while the contract and formal structures are relatively easy to observe and study, the interviewees' view on these were captured by asking them to elaborate on how these were established and used in practice. They were also asked about the appropriateness of these formal mechanisms in relation to dealing with flexibility concerns. Furthermore, to capture the informal mechanisms, the interviewees were asked about the relationships between the parties and how these unfolded throughout the course of the projects. Quotations from the interviews are used to support our interpretation.

The analysis of the cases was undertaken in three steps. First, each case was analysed individually, looking for the formal and informal mechanisms present in the projects and how these were used when flexibility was required. We used insights from previous literature to identify indicators of the two types of mechanisms, particularly from Bresnen and Marshall (2002), Chan and Räisänen (2009) and Dewulf and Kadefors (2012). Indicators of formal mechanisms included selection procedures, the written contract, plans, incentive systems and other formal structures and procedures that were established for governing the relationships between the parties. Indicators of the informal mechanisms included relationship dynamics, such as personal relationships and trust, direct interaction, shared understanding, norms and values, ad hoc problem-solving and previous experiences. The latter was seen in relation to both the construction partners having worked together previously and experiences with the IPD model and associated concepts. The next step was a cross-case analysis, where findings from each of the case studies were compared and patterns of relationships between formal and informal contracting were identified across the cases, taking their specific context into consideration. Finally, the empirical patterns were compared with the theoretical framework based on the extant literature on relational contracting and IPD. This final step allowed for analytical generalization (Yin, 2009) and theory building (Eisenhardt, 1989; Dubois and Gadde, 2002) of how the interplay between formal and informal contracting is reflected in IPD health-care construction projects. It is important to notice that even if several cases are included, no statistical generalizations are made. The analytical generalization means that the findings and pattern recognition are compared with the theoretical framework, contributing to theory development (Eisenhardt and Graebner, 2007; Yin, 2009).

## Findings from the individual case studies

### The Pacific Medical Center

The new Surgery Center of the Pacific Medical Center, a private hospital, is an Ambulatory Surgery Center in the Northwest of the USA. The IPD contract to build a new Surgery Center was a tripartite contract among the owner representative, the architectural firm and a general contractor. The architect and the contractor were selected separately, and based on negotiation. According to the general contractor, the selection of the partners and the contract specifications were established on the premise of trust based on previous experience. In the interview, the contractor acknowledged that the bad economic situation at the time the contract was signed and the mere fact that the hospital was a major client motivated the contracting partners to agree with the IPD terms. Although this was the first IPD type of contract the client had implemented, the hospital had a long tradition of more than 12 years of experience with the implementation of Lean principles to improve efficiency of the hospital. The IPD construction contract can then be seen as a continuation of that experience. Moreover, the architect, contractor and client had a long tradition of cooperation, and as both the client and the contractor noted in the interviews, this was a major precondition to develop trust in order to make the IPD successful. The client had in-house knowledge of Lean and the architectural firm had previous IPD experience. In the interview, the representative from the contractor characterized the process as 'learning by doing'.

The budget was set first and then the hospital was designed according to this budget. The general contractor was involved early in the design process based on the principle that a larger initial investment would result in large savings in the end. The client paid for the early involvement, and this involvement of the contractor and architect was mentioned by both the client and

the contractor representatives in the interviews as key to the success. The vice president for facilities of the hospital indicated at the start of the project in a local magazine: 'The theory is by having everyone at the same table and allowing the contracting team to be a bigger part of design, you get a more efficient building and a faster and cheaper construction process'. The contract comprised several incentives to collaborate. The contract eliminated or strictly limited the ability to sue, and mandated joint decision-making. The principle of the contract was that profit and losses would be shared. Thus, a target price contract was set that included a shared risk and award system. Cost overruns of more than 3% of the target budget were entirely for contractor or owner. On the other hand, savings of more than 3% were entirely for the owner. Within the 3% margin, costs or overruns were shared equally by the three parties involved.

Shortly after signing the contract, the budget was reduced with 5 million USD. In the spirit of the IPD contract, the three parties discussed jointly how to solve the budget cut. The contractor's project manager emphasized in the interview that the atmosphere of the contract is very important: 'Lawyers have to be out of the room. Lawyers like traditional contracts. Besides, we had challenges with the insurances about the risks we took'.

The formal IPD contract had a major impact on the mindset of the various team members. The team members emphasized in the interviews that decisions were made as a team and everyone was equal. This is also confirmed in an in-depth study of this same case by Kim and Dossick (2011), which showed the importance of the IPD contract on communication and team cooperation.

### West hospital

The West hospital case, a private entity, was an IPD contract for the building of tenant spaces in a new realized building. Compared to the other cases, this is a relatively small project with a construction period of eight months. For the construction of an addition of one level to accommodate three medical departments, four teams were invited to present their understanding of the vision of the project. The client representative noticed in the interview that the Request for Proposals was very brief and included only the major requirements. Being able to meet the time and budget goals as well as engaging all stakeholders were key elements in the selection process. All three contract partners had previous experience with IPD, but were new to each other. This was a deliberate choice of the hospital client. The client wanted to stimulate innovative ideas and selecting a new team was seen as a major condition for innovation. Another reason for selecting this team was the way they presented how BIM could support the project. To develop a joint proposal, the architect and contractor worked together for approximately 10 weeks.

The IPD contract was a target price contract. The design and construction fee was 1% of the total construction costs. The risks for not achieving the estimated max price were split among the three parties: 23% for the architect, 48% for the construction firm and the rest for the client. Before the target budget was set, several design iterations took place and, as a result, the target price was continuously updated.

Both the client and contractor representatives stressed in the interviews that implementing the Lean principle had a major impact on the csonstruction time and hence on the success of the IPD contract, arguing that the construction time was reduced. When asked about how they dealt with changes, both the client and the contractor mentioned that demand changes were affecting the hospital equipment, but not the spaces. Or as the contractor stated: 'Their space is right here'. Moreover, this interviewee mentioned that the introduction of Lean resulted in 'very predictable outcomes' and a very fast construction process. He further compared this Lean process to industrial engineering and stressed the importance of work simplification. As a result, the entire construction process could be planned accurately. The client emphasized that strong commitment was essential. Remarkably, the client worked in a similar collaborative way in another project with another contractor, although that contract was not an IPD contract. Moreover, according to the client interviewee, 'IPD-ish' is a mentality issue, and even without a formal IPD contract, you can work according to the principles. It is important to stress that the West hospital had a long tradition with lean management.

Despite the fact that team members were new to each other, they rapidly developed a joint collaborative culture. The contractor mentioned that the intensiveness of working together with the architectural firm to develop a proposal created a joint team culture. Once the contract was signed, a kick-off meeting was organized among the three team members. In a study on how the collaboration among team members evolved over time in this case, Dossick *et al.* (2013) found that various relationship building events led to a joint collaborative norm, not only among the three team members but also with hospital stakeholders, engineers and subcontractors. For instance, these players convened to test design alternatives by using physical mock-ups. Although subcontractors and other stakeholders had not signed the IPD contract, the team was able to develop a collaborative spirit through these sessions.

## The California hospital

The California hospital project was a direct result of a new law in California that was passed after the 1994 Northridge earthquake in which several California hospitals were critically damaged. This law required that every hospital meet rigorous requirements for earthquake safety by 2013. As a result, the old hospital required either an extensive and costly retrofit or an entirely new replacement. After careful consideration, the board of the hospital decided to build a new facility. The concept of medical care has changed significantly since the original hospital was built in 1954. The interviewees note that doctors use far more outpatient procedures, requiring fewer beds, and many hospitals have moved to a one bed per patient model. Additionally, technological developments have changed the spatial requirements for modern hospitals. The board decided that given the cost of retrofitting the existing facility, it made more sense to invest in a state-of-the-art medical centre. By late April of 2008, the plan that had emerged involved building a new facility to replace the existing facility. The objectives of the board were: (1) ensuring that the facility was opened by January 1, 2013, (2) keeping the cost at or below 320 million USD and (3) delivering a world-class facility. The construction phase took less than four years. Building fast was important to comply with the new seismic codes.

The California hospital decided to enter an IPD contract. The IPD Integrated Frame of Reference (IFOA) contract was signed by 11 members: contractor, client, designer and the subcontractors. Several of the partners had previous experiences with each other and with IPD elements such as lean construction and BIM. The hospital was completed with an aggressive schedule. During the construction, no compromise was made of scope and schedule of costs. The team kept 80% of their estimated profits. The hospital had a long history with IPD, and, in the same period, the hospital group signed another IPD contract for another hospital. Selecting the project partners carefully is seen by the client interviewee as a major condition for success. He further emphasized that the performance of an IPD project depends not only on the level of team cooperation of the contract partners but also on the collaborative mindset of all stakeholders in the project. For example, there was a misalignment of interests between IFOA and non-IFOA members.

Both the client and the contractor mentioned in the interviews that the IPD contract stimulated people to try something new. For instance, significant cost and schedule savings were achieved by involving the steel erection and fabrication sub early on. The IFOA made all partners vulnerable to each other's actions. Builders got focused on assisting the designers to finish the design to high standard of detail, and designers allowed the builders to help them do that because of how it lowers the risk of failure during construction. As the client's project manager said in the interview:

> The new contract was key in aligning the business interests of the 10 signatories with [the owner] own goals. Especially important is that it puts designers at risk for failure during construction, and builders at risk for failure during design. If you don't have a contract with a business deal that does this alignment, you end up with a team, each of whom has to manage two potentially conflicting goals: (1) success for the project and (2) success for their company. These goals are aligned when things are going well, they conflict when the going gets tough. And on a hospital project in California, the going gets tough the day you walk into the first meeting and stays tough till the building opens.

Regular meetings and workshops proved to be essential to develop commitment. The IPD included a collaborative team work mentality including the willingness to help others. Since project team members were physically and organizationally dispersed, a major effort was made to bring members together. The collaboration was further supported by the establishment of a Big Room where the entire team co-located every two weeks for approximately three days during the design phase to discuss and update the project. Co-location enhanced rapid problem-solving.

The IPD contract as such did not directly guarantee flexibility. Demand changes were still expensive and it was emphasized that the client' stakeholders had to realize that changes would have a major impact on the project budget. The client's project manager explained in the interview:

> I worked very hard on the relationship with the CEO and the COO at the affiliate so that they felt part of the team so that they would filter any requests coming from vendors and staff for changes in the building. (…) got them to get as much certainty into to the project during design as they could. Internal processes support this now.

It is interesting to notice that Alarcon *et al.* (2011) found in a study of the same case that reducing uncertainty was a fundamental and a minimum requirement in all actions undertaken in this project. The project manager even called this the 'dragon of uncertainty' to stress the importance of decreasing uncertainties to be able to deliver within time and control budgets.

**The Norwegian hospital**

The construction project concerned the construction and refurbishment of a University hospital in the Middle of Norway. The hospital is a public trust, and one of several hospitals owned by the Central Norway Regional Health Authority, which in turn derives its funding from the Ministry of Health. On behalf of the owner, a temporary client organization was established for the project. The project was undertaken simultaneously as the hospital was in operation. The construction was split into two phases, of which the latter phase was also split into two parts. A design team, consisting of consultants and architects, won the design contract for both phases. The case concerns the first part of Phase 2 of the project, which included, among others, the construction of three medical centres, and where a new collaborative delivery model was applied. The reasons for this were perceived problems with the traditional design-bid-build model in Phase 1 (i.e. coordination problems, conflicts and accidents) and because the budget was unexpectedly reduced with 10%. The collaborative model was encouraged by the client organization's new CEO, who came from a contractor experienced in partnering. He stressed that it was impossible to reach the project's aims with a traditional delivery model.

Design and build contracts were signed with five contractors (i.e. building, ventilation and heating, electro, plumbing and technical integration). The contract with the building contractor was awarded based on several criteria, of which price comprised only 20%, something which was unusual in these types of public procurement contracts. The contract also included a partnering agreement with a target price, open books and a 50–50 risk and reward sharing. No partnering agreements were established with the technical contractors. None of them had any experience with partnering and the client did not trust them to be able to comply with the specific requirements of partnering. However, it was clearly stated in all contracts that the project should be collaborative, and the project was planned through two formal collaboration phases. The first phase involved joint planning and discussions among the client, the design team and each of the contractors respectively, and the second phase involved all contractors to jointly plan the delivery of project. This joint collaboration period resulted in the signing of a common agreement stating a commitment to collaborate. There was also a shared reward system, where achieving bonus for reaching specified milestones presupposed that all contractors had met the target.

In the interviews, client representatives emphasized that building formal structures was a key success factor for enabling collaboration and achieving benefits in terms of better coordination, communication and overall construction process. As the client's director explained in one interview: 'Culture is something you'll achieve as a result of purposeful work, it cannot be decided. Structure can be decided, and it is the structure and the methods that over time give the culture'. Interviewees both from the client and from the contractors emphasized that collaborating in early phases enabled the development of a common understanding of the project and its requirements. One year into the project, problems occurred in relation to delays and cost overruns, and the contract with the building contractor had to be revised. The client attributed the problems to insufficient time and resources being allocated in the beginning of the project, particularly acknowledging that they had underestimated the need for a proper contract because of the partnering agreement. Nevertheless, when the problems occurred, they also realized that because of the partnering agreement, they had to solve the problems together. The jointly signed commitment to collaborate and co-location of the partners were also seen by interviewees from both the client and the contractors to ease the communication and enabling the partners to solve things on a day-to-day basis, in addition to making it harder to sustain conflicts. However, the new way of working was also perceived as more difficult than the usual design and build contracts. One of the contractor's project managers explained in an interview: 'We fight just as much as in phase 1, but the difference is that while in phase 1 there were known rules in accordance with the traditional contract regime, we lack rules in phase two'.

Similarly to other complex projects, the project had to deal with changing demands. Flexibility and the opportunities for making changes to new demands and medical equipment/methods were from the beginning of the project a requirement from the central health authority. As the client's CEO noted in an interview: 'The hospital authorities were planning twenty years ahead when they started to plan the project, and now it is twenty years later and new discussions about the future hospital are already taking place'. To deal with changing demands, user involvement was perceived crucial and became more structured over the years in the project based on lessons learnt. The client noticed that since neither they nor the contractors had experience in running hospitals, they depended heavily on the specialist to inform about needs and consequences of different choices. During the construction period, changes were treated according to the standard regulations included in the design and build contract. In cases of changes, for example, based on users' input, the client would send a change order, and then the contractors considered it and reported on the possibilities

and consequences in a joint effort. Thus, changes were dealt with in a standard way, but the contractors worked together on how to solve the need.

**The Suburban project**

The Suburban project concerned the replacement of an existing medical office building with a two-storey building, including a community cancer care center. Because of site restrictions, the building was constructed on top of a two-storey parking structure. Suburban is not an overnight hospital and therefore avoids additional regulatory codes. The Suburban project used a full IFOA contract signed among three parties: the architect, the contractor and a joint venture of owners (one regional and one national). All three parties had previously worked together on an IPD project and many of the same team members carried over to the Suburban. The general contractor explained in the interview:

> For this industry, it is tempting to put a bid package on the street and get a free market competitive number and that is how you minimize the cost. That is kind of conventional thinking. What [the owner] has found is with that method, on the tail end of projects, their projects were grossly over budget and grossly late. Ultimately, they could not—they were really suffering by opening facilities late. Their challenge was how to deliver projects with certainty and this idea approach came up. When you do this and you are okay with committing to a core construction design team early and giving up this temptation to bid it, then studies have shown that you will have much more schedule certainty and also much better costs. It is a paradigm shift in expectations that you have the developers do everything. It is about maximizing your profit and minimizing cost.

The team used Target Value Design methodologies to achieve desired project costs. Project participants explained in the interviews that the shared risk/shared reward aspects of the IFOA agreement motivated the team to try new ideas. For example, according to the general contractor's project manager:

> We then challenge ourselves. We have not cracked open the can of innovations yet. We have not thought about different ways to do this yet. It is essentially an open sketchbook with a rough order of magnitude of costs. Now, if everyone is smart and can bring ideas and we expect those ideas to be on the table for consideration, what do you think we can bring this building in at? It is not 111 million dollars. Can we take off five percent? Is it reasonable to think that we can innovate five percent out? Whatever that may be and it is an open discussion and so a target value is set.

One such process of integral innovation was the decision to re-sequence construction of the parking structure. The original logic was to spend 15 months building out the complete parking structure followed by construction of the building. Instead, the team decided to pour the top deck of the garage first to accelerate the start of construction for the building. Although some additional cost was incurred to build the remainder of the garage from the top down, the innovative solution reduced the schedule by three months and provided a net savings of 300 000 USD. This was the result of a discussion with the entire team including the structural engineers, the mechanical engineer, the architect and the owner. The team discussed how they could save on the order of 300 000 USD by taking out three months of work. The team members discussed how they could solve these challenges while keeping the benefits.

The guaranteed cost and shared risk/shared reward provided the flexibility to adapt to this innovative thinking. Additional cost for the structural engineer's rework was covered by the IFOA. As one of the project members stated in the interview:

> Imagine yourself as a structural engineer. You have already designed this building. You have done all of the calculation. You have designed the structure already and all of a sudden your contractor is coming in and saying, "I can save the client time and money, but it is going to require re-detailing a lot of construction connections." You are thinking how I am going to get paid for this because it is a lot more work.

The Suburban project team was co-located on site in a Big Room. Teams were organized around clusters by system (i.e. substructure, superstructure, services and interiors). Target Value Design was used to track cluster cost trends each week. Innovative ideas such as the parking deck innovation that provided overall project savings were allocated to certain clusters while other clusters might absorb the costs. Because this additional cost may impact cluster performance metrics, project leadership made sure to email the entire project team and provide social recognition to both the groups that initiated the innovation, and the groups were flexible to absorb cluster costs. Project leadership highlighted in the interviews how the change had created overall value for the project.

## Cross-case analysis—the interplay between formal and informal contracting

Together, the five project cases provide a rich description and understanding of the interplay between formal and informal contracting mechanisms in IPD projects to facilitate collaborative interaction. Across the cases, the interviewees stated that this interplay was vital to ensure desired project outcomes in terms of time, budget and quality. Table 2 gives an overview of the similarities and differences between the cases.

The cases differ in terms of the involved parties' previous degree of experience with each other and the collaborative delivery models. For example, the California Hospital had the opportunity to select suppliers based on previous experience and long-term relationships, and all parties in the West Hospital had previous experience with IPD. The client of the Pacific Medical Center did not have any previous experience with integrated contracts, but had worked for a long time with the contractor and the architect, among others using lean construction. In the Norwegian case, the client's new CEO encouraged the use of a new delivery model, based on his previous experience of partnering. The building contractor for the medical centres was chosen, among others, based on experience in partnering. However, none of the parties had worked together previously. Another difference is that in all the US cases, the IPD model included a formal contract among at least three parties. In the Norwegian case, on the other hand, the collaborative agreement can be seen as the sum of various two-party contracts. These contracts were the result of a public procurement process. However, all parties signed an agreement to collaborate.

In all the cases, the clients used other selection criteria than the traditional 'lowest bidder'. In the Pacific Medical Center, negotiations were applied, while in the West Hospital, teams were invited. In the Norwegian case, there was a competition due to the public procurement regulations, but the bids were evaluated based on several criteria, of which price was but one and counting only 20% of the total. In accordance with IPD principles, all cases also show how the different parties were involved early in the project, making it possible to utilize their competencies and to coordinate among the parties.

Furthermore, across the cases, the importance of developing a collaborative mindset was emphasized by the interviewees as a key issue in the IPD model. The cases revealed the importance of co-location, as the Big Room in the California hospital and the Suburban case, and team building sessions, as for instance, the kick-off meetings in the West hospital case and the team discussion in the Suburban and Norwegian case. When it comes to dealing with changes, the West Hospital and the California Hospital were constructed under strict regimes, not allowing changes in requirements after the design phase. The Norwegian case is somewhat different. In this case, changes followed the traditional contract regimes. In general, the interviewees emphasized that changes are difficult no matter what type of project and type of delivery model. Nevertheless, in all cases, changes (either they were confined to the design phase or during construction) were discussed jointly and there was a shared responsibility and respect for the mutual dependence and impact of changes on time and budget. The joint reply by the contractors in the Norwegian case illustrates shared responsibility. The Suburban case clearly shows how alterations were discussed in the team sessions.

Project managers anticipate 'tough times', and changes do occur in these types of projects, especially in the larger projects such as the California Hospital and the Norwegian Hospital. In both cases, the interviewees said that the IPD model facilitated a collaborative atmosphere, making it easier to cope with these challenges. In all cases, the importance of the formal contract was emphasized. Many of the interviewees stressed that proper contracts reduce conflicts during the construction phase and establishing formal structures, such as formal meetings and incentive systems, are key means to facilitate communication and create a feeling of shared responsibility. Furthermore, the interviewees stressed that trust is an important element in IPD relationships. Some noticed that lawyers tend to overemphasize the importance of formal contracts as a way to mitigate risks. Dealing with contingencies cannot be solved by formal contracts only, however, according to the interviewees. For example, many acknowledged the usefulness of co-location to facilitate informal communication and the development of personal relationships and trust, which in turn were seen to ease the ability to solve problems. This indicates that one of the key strengths of the IPD projects is that direct interaction and the building of personal relationships, trust and shared norms and values are formalized, through for example 'Big Rooms' and co-location to achieve the needed coordination and joint performance.

## Concluding discussion and implications

The findings illustrate how the complex interplay between formal and informal mechanisms unfolds in IPD health-care construction projects as the project participants seek to handle unforeseen events and changes that require problem-solving during the construction process. The results add knowledge to our current theoretical understanding of relational contracting,

**Table 2** Cross-case analysis

| Case | Formal contract | Interplay between formal and informal mechanisms | Previous experiences |
|---|---|---|---|
| Pacific Medical Center, USA | Tripartite target price contract among a private client, architect and general contractor based on negotiations | Early involvement and incentives to collaborate and joint problem-solving and decision-making.<br>Accounts from interviews that this created a team atmosphere | Previous experiences with each other (long-term cooperation). Accounts of this creating trust<br>Experiences of lean construction (client) and IPD (architect). For contractor —'learning-by-doing' |
| West Hospital, USA | Tripartite target price contract among a private client, architect and general contractor based on request for proposals process | Joint development of the proposal between the contractor and the architect. Meetings and workshops involving several actors throughout the project<br>Accounts from interviews that this created a team culture | No previous experiences with each other (means for innovation)<br>Previous experiences with IPD (all), lean (client) and BIM (contractor and architect) |
| The California Hospital, USA | 11-party IFOA contract | Regular meetings and workshops and co-location in a 'Big Room' every two weeks for three days<br>Accounts from interviews that this created commitment and a collaborative atmosphere | Previous experiences between client and contractor<br>Previous experiences with IPD, lean construction and BIM (in various ways among the partners) |
| Norwegian Hospital | Target price design and build contract with a partnering agreement between the client and the building contractor. Design and build contracts with the technical contractors. All parties signed a mutual agreement to collaborate. Price only one of many criteria. | Early involvement in the beginning of the project. Meetings and workshops, and permanent co-location<br>Accounts from interviews that formal structures were important for creating a collaborative culture | No previous experiences with each other, since the client was a public temporary organization<br>Previous experiences with partnering (client), but no experiences with lean |
| Suburban, USA | Tripartite IFOA contract among the architect, the contractor and a joint venture of owners (one regional and one national) | Co-location in a 'Big Room'. Team discussion in design phase<br>Accounts from interviews that this facilitated innovation | Previous experiences with each other on an IPD project (also involving some of the same team members) |

defined as the simultaneous use of formal contracts and informal, relational mechanisms (Rahman and Kumaraswamy, 2004) in general and in IPDs and health-care construction projects in particular. Most of the IPD literature focuses on the importance of team building and early involvement to ease the construction process (Kent and Becerik-Gerber, 2010), but little attention is paid to (a) the interplay between formal and informal contracting, and (b) how this enables the parties to deal with flexibility needs and future contingencies.

The paper makes two main contributions. First, the cases presented highlight that formal and informal mechanisms interact and mutually constitute each other, and that they together enable the parties to deal with changes and flexibility needs. This is in line with previous studies (Bresnen and Marshall, 2002; Cicmil and Marshall, 2005; Kim and Dossick, 2011; Dewulf and Kadefors, 2012). In all the five cases, formal structures such as the contract, incentive systems and communication systems were important, but they were negotiated and adjusted as the partners jointly and gradually made sense of the work and the relationships. In other words, the formal structures were created and recreated through the informal mechanisms, such as

direct interaction and trust building. For contract renegotiations, a certain level of trust proved important. Previous studies have found that establishing formal structures is not sufficient (Cicmil and Marshall, 2005). However, what our case studies show is that even if formal structures are not sufficient, they are nevertheless necessary because they support collaboration. For example, co-location is a formal structure and described in many of the IPD contracts. The key purpose of co-location is to facilitate direct interaction and building of trust, which are considered informal mechanisms. Similar findings have been made in previous studies, where physical sites are seen as vital for interaction and integration (Dossick *et al.* 2013). Another interesting finding, which is in line with previous studies (Kim and Dossick, 2011), is that across the cases, the formal mechanisms, such as the IPD contract and the use of Lean Construction and BIM, were used in some form of combination, and seen by the interviewees as important to facilitate the collaboration.

Moreover, the cases indicate various development patterns for the interplay between formal and informal mechanisms, depending on the characteristics of the projects, including time horizon, budgets, previous experience and nature of the relationships. The need for flexibility in short-term and small projects is less apparent than in larger and long-term projects and, consequently, there is less need for contract arrangements enabling flexibility. The cases also revealed that previous experiences and past performance of contract partners were important for creating a collaborative environment that enabled project partners to discuss required changes in design and construction. Because of existing experiences, trust could be present even in a project with a short-term contract as shown in one of the cases studied. The importance of trust and how it develops has been dealt with in previous studies on the impact of trust on cooperation between project partners (Laan *et al.* 2011; Dewulf and Kadefors, 2012). Studying the impact of trust on the performance of IPD projects would be an interesting avenue for future research, as would a study of the importance of previous experiences in general. It is interesting in this respect to notice that contrary to conventional beliefs and to the results from our findings, Kamann *et al.* (2006) found that previous experiences had little effect on efficiency and project performance. However, individuals' expectations of a shared future did. Thus, studying the shadow of a shared past and shared future in IPD projects would be highly relevant for future studies.

The second contribution of the paper is that it shows how informal and formal mechanisms enable project teams to cope with unforeseen events. The interviews indicated that IPD contracts have some major merits. Due to the risk-sharing models, team members were committed to the project goals, even if commitment ended when construction finished. The client's commitment to the collaborative effort was particularly important to ensure efficient and effective handling of problems and requirements. This is in line with Mollaoglu-Korkmaz *et al.* (2014), who conclude that shared understanding and joint commitment are vital, and lack of client's commitment and involvement of the different parties in change efforts may explain why some IPD projects fail. Health care is changing rapidly, and project requirements must change accordingly. Still, the IPD literature is lacking studies on how to cope with these dynamics. The case studies centred on the importance of relationship contracting to cope with possible unforeseen events and flexibility needs. The findings showed that the mechanisms employed in the cases supported an open discussion and enhanced the development of a joint problem understanding. Informal mechanisms were important to support this process. As is stated in the trust literature, shared understanding and trust are about looking forward and about the willingness to bear risks in the future (Smyth *et al.* 2010). For the short-term IPD projects, such as the West hospital case and Pacific Medical Center case, demand changes could be neglected. In general, also for the larger IPD contracts, the risks involved were largely limited to the construction phase. Demand changes due to changing health-care policies, demographics, medical insights and technologies will have a large impact on the operational phase for which the IPD partners are not responsible for. However, for long-term IPD contracts, changes in demand volume or service demand and significant changes in technologies such as imaging and robotic surgery that impact the building's design are almost certain to occur during design and construction. IPD enhances rapid prototyping and shortens the construction period. The cases revealed that due to the collaborative mindset, changes were more easily made. However, the cases also indicated that major changes in requirements and hence drastic design alterations were not allowed during the construction phase; the aim of the IPD contracts was to deliver on time and within budget, not to enhance operational flexibility and performance of the assets in the long run.

Besides the theoretical contributions, the discussion above offers a practical way to identify and evaluate important elements of IPD, and reflections upon what influences the ability to establish a collaborative model to facilitate efficient and effective problem-solving and dealing with changes and flexibility needs. This might in turn aid project participants to facilitate the development and use of appropriate mechanisms in project settings characterized by complexity and uncertainties.

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