Integrated project delivery: the designer as integrator

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Abstract

Process innovation related to integrated project delivery is an important topic in the building industry. Studies on process innovation through the use of integrated contracts usually focus on contractors, and particularly on the possibility of forward integration into the building process.

Three years ago, the first author investigated the process innovation capabilities of architectural firms by using the concept of system integration. This led to the idea that architects could take on the leading role in design-build contracts. Based on the results of that study, the conclusion was drawn that architects certainly have opportunities to act as a system integrator in the building process. By broadening their activities, architects can reclaim their central position, in which design and managerial skills can be combined.

As a result of this promising view, a major client (a Dutch school board with a number of schools under its jurisdiction) and an architectural firm decided to develop a new concept. Together with the authors they developed the organisational and juridical aspects of the concept into a designer-led design-build method and implemented it in practice: the design and realisation of school buildings. Two projects were intensively monitored. It turned out that the concept has a lot of advantages for both the client and the architectural firm. This paper describes the specific concept and the results of the two pilot projects, and shows that the recognised advantages are consistent with the literature.

Keywords: Designer-led design-build, integrated contracts, process performance
1. Introduction to integrated project delivery

Since Egan’s report on rethinking construction, process innovation has attracted intense interest. Various studies on process innovation show the considerable potential of the concept of integrated project delivery (IPD) (Elvin, 2008; Gann, 2000). Compared with the traditional project organisation in construction, IPD is characterised by a collaborative approach of aligning the incentives and goals of the project team through shared risk and reward, the early involvement of all parties, and a multi-party agreement. The term ‘integrated practice’ refers to a collection of organisational contract structures that include some degree of integration of the traditional phases of design, construct and maintain (Elvin, 2007).

Since the emergence of the concept, several clients have applied IPD in practice. A number of best practices on the use of IPD are described in an emerging literature on applying the concept (Wamelink, 2007). A few years ago, PSIBouw (National Research Programme on Innovation in Construction) carried out extensive research on IPD in the Netherlands. As a result of this study, several key clients (e.g. the Netherlands Government Buildings Agency and the Netherlands Ministry of Infrastructure and the Environment) decided to move from traditional projects to IPD, especially design-build (DB). Volker (2010) states that in the near future, these key clients will work with these integrated contracts in 80% of their projects.

Within the concept IPD different variants or types exist. In the Dutch construction industry, the most common structures are total engineering and Design-Build (DB) (Vogels et al., 2007). While traditional tendering is characterised by the separation of design and construction activities, DB is a delivery method in which the design and the realisation are put out to tender together. The contractor is thus responsible for both the design and the realisation risks. This can be done on the basis of either functional requirements or a preliminary design (Volker & Klein, 2010). In this method, the executive knowledge of the contractor is entered into the design.

The integration of design and realisation brings considerable benefits to the client. Many traditional legal responsibilities are transferred to the contractor, who coordinates the design and construction process and is largely responsible. Integrated delivery strengthens the project team’s understanding of the owner’s desired outcomes, thus improving the team’s ability to control costs and manage the budget, all of which increase the likelihood that project goals, including schedule, life cycle costs, quality and sustainability, will be achieved. In addition to the benefits to the client, the contractor derives some benefits as well (AIA, 2007).

Frequently mentioned benefits to the contractor are the possibility to negotiate on the price rather than having to participate in competitive bidding, and the improvement of the relationship with subcontractors. The AIA (ibid.) states that:

The integrated delivery process allows contractors to contribute their expertise in construction techniques early in the design process resulting in improved project quality and financial performance during the construction phase. The contractor’s
participation during the design phase provides the opportunity for strong pre-construction planning, more timely and informed understanding of the design, anticipating and resolving design-related issues, visualising construction sequencing prior to construction start, and improving cost control and budget management.

The integrated delivery process allows the designer to benefit from the early contribution of constructors’ expertise during the design phase, such as accurate budget estimates to inform design decisions, and the pre-construction resolution of design-related issues, resulting in improved project quality and financial performance.

Although the architect is a member of the joint venture, in most of the current Dutch DB projects, a contractor or professional developer leads the consortium (figure 1).

Figure 1: Commonly used design-build organisational structure

Previous studies showed the potential of an integrated project led by the architect or designer (Kornelius & Wamelink, 1998) (Renier & Volker, 2008). It is expected that the typical design competences of an architect really support the process of integration.
2. Designer-led design-build

As mentioned, the leading role in integrated practice in the Netherlands is usually taken by large construction companies. However, various studies show the willingness of architectural firms to play an important role. Volker and Klein (2010) conclude that approximately half of all Dutch architects are interested in developing activities on the market for integrated practices, such as total engineering and DB projects. Volker and Klein (ibid.) state that “although integrated practice has not been the main part of the current portfolio of Dutch architectural firms, it appears that a substantial part of the firms is seriously considering adjusting their organisational strategy for integrated project delivery. It was found that these firms are motivated by the factors that relate to dissatisfaction about the current situation”.

The situation is the same in other countries. For example, the Design-Build Institute of America states that only 17% of the DB projects delivered are designer or architect/engineer (AE) led; the vast majority are general contractor led. An often cited reason for this lack of designer-led DB (DLDB) is that architectural firms do not have sufficient financial strength. Most architects want to be involved in a DB as a designer in the consortium contract where the contractor has the final responsibility as contracting party (cf. figure 1). An investigation by Klein (2009) shows that only 3.6% of Dutch architects opt for a DLDB. In this scenario, the architectural firm acts as the party responsible for both design and realisation. The kernel of this approach is that the design profession is responsible for the entire DB process (Quatman, 2003). Figure 2 shows the contractual relations in the case of a DLDB.

![Figure 2: Contractual relations in designer-led design-build](image)

Besides the general advantages of IPD, the supplementary advantages of a DLDB are mainly related to the positioning of the architect at the centre of the process. For example, the architect can guarantee prices related to the quality of the object and can avoid design changes, or even change the design...
during the realisation phase without having to engage in irrelevant discussions on change orders. Another frequently mentioned advantage is that the architect can manage the original ambitions during the later stages of the project.

The risk management profile of a DLDB is an important issue. It is mainly for this reason that most architectural firms are reluctant to take on such a key coordinating role. They are aware that they have to combine several new competences, such as knowledge of financial issues, onsite working methods and managerial skills. The need to have this combination of new competences means that only a few architectural firms are capable of entering the market of DLDB projects. Since the decrease in the number of projects in the Dutch construction industry, it appears that a substantial number of firms are seriously considering adjusting their organisational strategy for IPD (Klein, 2009). This applies to both the larger and the smaller architectural firms. According to the typology of Coxe (1997), it is thought that strong service architectural firms of some significance have the right competences to join a DB project. This applies both to a contractor-led DB and a DLDB. In the case of a contractor-led DB (figure 1), the architect needs substantive power in order to facilitate his wishes. In the case of a DLDB (figure 2), a considerable size is needed to bear the organisational and financial risks. In the Netherlands, only approximately 10 architectural firms meet these requirements.

Clients also have to get used to the idea of designers leading a DB project. As in a lot of other examples of process innovation in construction, clients play an important role (Egbu, 2008). Clients must be willing to invest in new relationships and a new way of working.

3. Designer-led design-build: a study of two pilot projects

As stated, although DLDB is a promising development, Dutch architectural firms are reluctant to exploit this opportunity. At the moment, only a few architectural firms and clients are experimenting with the development of a DLDB. One of them is ABC Architects PLC (the firm’s name has been changed to provide anonymity).

Over the past few years, ABC Architects concluded that the architect’s influence on the quality of the end result had declined, and that the architect’s role had been reduced to that of a specialist in the design team. The firm also concluded that parts of the design and engineering process were being subcontracted to other parties, such as the engineering departments of contractors. Together with one of their clients (a Dutch school board that has a number of schools under its jurisdiction), the owners of ABC Architects decided to develop a new working method: the bouwmeestercontract. This contract is an example of a DLDB according to figure 2. By using the name bouwmeester, the client and ABC Architects show that the contract aims to reposition the architect in the centre of the process. Translated into English, bouwmeestercontract means ‘master builder contract’. In other countries, the term ‘master builder’ has different meanings. To avoid the chance of misunderstanding, the original Dutch term (BMC) is used in the rest of this paper. ABC Architects PLC selected two pilot projects to test the BMC method in practice. Both pilot projects involved the design and realisation of a school
building. The building costs were about 5 and 10 million euros, respectively. The design and realisation of the two buildings were completed in 1.5 and 2 years, respectively.

### 3.1 The master builder contract

The *bouwmeestercontract* (BMC) is a DLDB contract in which the architectural firm takes full responsibility for the project. The architectural firm is responsible not only for the design quality, but also for the integrated project quality, scheduling and budgets. The architectural firm also accepts a certain proportion of the associated financial risks.

![Organisational and contractual structure of the BMC](image)

*Figure 3 Organisational and contractual structure of the BMC*

Figure 3 illustrates the organisational and contractual structure of the BMC. In order to make the DLDB feasible, ABC Architects PLC decided to establish a sister company: ABC Project PLC. As indicated in figure 3, ABC Architects PLC is contract party with the client in the first phase of the project (briefing and specification). In the second and third phases, ABC Project PLC acts as the contract party. The architectural firm is then formally a subcontractor of ABC Project PLC. This distinction is made in order to separate the special risks with respect to the financial aspects and liability during the realisation phase from the firm’s on-going business.
The contract was carried out in three phases: briefing & specification, design, and realisation & delivery. Each phase finishes with a specific document (project book, design book and delivery book, respectively). Each time, this document is the starting point for the next phase.

The project book comprises the brief, the sketch design, a budget and a time schedule. The brief is composed of two parts: a part with ‘the basic quality’ and a second part with additional options. The additional options are to be realised in a later phase of the project if no financial setbacks arise.

In the next phase (design), the project book functions as a contract document between the client and ABC Project PLC. The design book includes the architectural and technical elaboration of separate packages from which the project is built. These separate packages are put out to tender separately. After approval of the design book by the client and receiving the necessary permits, the realisation phase starts. After completion, the project will be evaluated and the delivery book finished. Based on the project book, the client and ABC Project PLC establish a ‘project-plus fund’. This is a kind of a reward mechanism, a financial reserve with a pre-determined size (approximately 5% of the total costs). During the project, this fund can be used for several purposes, for example to finance unforeseen costs or to increase the building quality. The size of this project fund changes continuously. Sometimes money is needed from the fund. When special packages are put into market for less costs than estimated, the amount of money in the project fund increases.

The BMC contract brings a shift in roles and responsibilities within the project organisation and in the way they work together. The architectural firm enters as coordinator of the realisation phase and manages all kinds of subcontractors. The architect is responsible not only for the quality, but also for the budget and the schedule. During the realisation, the responsibility for the coordination lies with ABC Project. The daily onsite management on site is outsourced to one of the subcontractors as part of one or more packages.

### 3.2 Pilot research method

To learn more about the applicability of the BMC, we chose to conduct a qualitative monitoring study, which combines ex-ante and ex-post elements. The objective of the study was to discover the (dis)advantages of the BMC contract and compare them with the common tendering procedures in the Dutch building industry. Conclusions can be drawn whether it makes sense to proceed with the development of the BMC and to initiate more projects with the BMC in the future. It’s self-evident that monitoring these pilot projects doesn’t give conclusive evidence of the BMC’s applicability.

The study started in 2009 and finished at the end of 2011. The selected projects were monitored periodically. This was done on the basis of two interview rounds: during the design phase and at the end of the realisation phase. The first round of interviews was aimed at the expectations of the client and the architect regarding the application of the BMC (the contractors were still unknown). The interviews with delegates of the client and the architect took place separate. After the interviews feedback reports were written and delivered to the respondents. Finally, the findings on expectations were discussed in the steering committee of the project. The second round of interviews was carried
out in the same way, but focused on the fulfilment of the aforementioned expectations. Also in this

It was decided to focus and monitor the following subjects:

- Optimising the price/quality ratio
- Process transparency
- Risk control
- The role of the architect.

The reason to choose these subjects is the expected change compared to the traditional processes.

### 3.3 Observations

At the end of the study expectations and their fulfilment were compared, leading to the following

**Optimising the price/quality ratio**

- Both the architect and the clients are quite satisfied with the price/quality ratio. They concluded that a high price/quality ratio was realised. Several design options were realised at significantly lower cost than previously budgeted. This effect was probably partly achieved due to the current climate in the construction market. In one project the difference between the estimate and the realised cost price is so inordinate that the effectiveness of the BMC at this point can be assumed.

- The end users (the schools’ management and teachers) are satisfied with the functional, aesthetic and technical quality of the buildings. Some outcomes are a direct result of applying the BMC: they were an additional option in the brief and were funded by the project-plus fund. Beside this, the end users see that the realised quality is a result of the involvement of the architect, the ability to change design during the realisation phase and the division into packages.

- ABC Architects PLC is satisfied with the quality achieved. This applies particularly to the finishing and the installations of the school buildings.

- As a result of their early involvement in the process, most subcontractors saw opportunities to achieve a higher quality for the same price.
Process transparency

- The client experienced the intended financial transparency. The client also experienced much transparency about design considerations. This means that in some cases, the client participated in design decisions.

- The end users also experienced a transparent process. The ability to participate in design discussions with the architect was judged positively.

- The subcontractors concluded that the use of the BMC did not lead to greater transparency.

Risk control

- The risk management methodology should be developed further. During one of the projects risk weren’t mapped out properly. Also the allocation of risks to the appropriate project parties led to discussions. In combination with a flexible brief (which distinguished between a basic quality and additional options), windfalls can be used effectively to introduce more quality into the design.

- The serial execution of packages reduced risks related to the time schedule. Both projects were delivered on time.

- The projects also experienced setbacks. In one project, asbestos removal and soil remediation led to considerable upheaval. The transparent process ensured that these risks were more visible to the client.

- The pilot character of the contract itself introduced several new risks. Most striking is the lack of clarity with respect to the relationship between this contract form and European tendering rules.

The role of the architect

- All parties recognise that the architect had a much more dominant role compared to other integrated contracts. Especially the end user and the subcontractors (suppliers/producers) experienced the intense and direct contact with the architect as positive.

- In the eyes of the client, the separation between ABC Architects and ABC Project clouded the principle that the architect is responsible for the project.

- During the realisation phase, the responsibility of the architect was not recognised by all parties. This was reinforced by the fact that the coordination at the construction site was outsourced as part of one or more packages.
3.4 Conclusions

Returning to the objective of the pilot study, it can be concluded that in particular the client and architect are satisfied with the results. They are satisfied with the achieved quality. The quantifiable result is positive, and the quality was realised at costs lower than the initial budgets. The client and some of the contractors experienced the process as highly transparent, and all parties recognise the guiding role of the architect in these projects. The client, end users and subcontractors were most positive about this role. They experienced the direct contact with the architect as an important source of the realisation of quality, and appreciate that they also had a lot of ownership in the project. The party that usually operates as a main contractor in traditional projects was less enthusiastic. This follows from the fact that his role in a BMC project is considerably smaller than usual.

Despite the fact that this study doesn’t give proof of the applicability of the BMC in other situations, the conclusion is justified that there are good reasons to develop the BMC concept and apply it in new projects. The legal aspects (including the application under the European tendering rules), risk management and coordination procedures should be developed further. Since the BMC is a very specific application of a designer led design built contract, the results of the pilot study are also interesting for other countries

4. Discussion

Thus, the BMC leads to advantages for integrated project delivery in general and for designer-led design-build in particular. The effect of repositioning the architect as a coordinator works on many levels in the process. This study confirms the recommendations with respect to the use of DLDB, such as those concerning essential principals and business models from the AIA (2007). Examples of these principles are the concern for mutual respect, mutual benefit and enhanced communication. The AIA states that “in an integrated project, client, architect, consultants, contractor, subcontractors and suppliers understand the value of collaboration and are committed to working as a team in the best interests of the project. Because the integrated process assumes early involvement by more parties, the compensation structure must recognise and reward early involvement. Compensation should be based on the valued added by an organisation and risk should be equitably allocated. Focus on team performance is based on communication among all participants that is open, straight and honest. Responsibilities are clearly defined in a no-blame culture leading to identification and resolution of problems, not determination of liability”. The present study confirms these general principles.

The positive experiences with a DLDB described in this paper should be a key reason for Dutch clients and architectural firms to continue along this path. As mentioned in section 2, about 50% of Dutch architects are interested in participating in DB projects. The Dutch association of architects could foster the idea, collect best practices and develop tools and methods. Finally, the sector needs to incorporate such other developments as building information modelling, which will strengthen the advantages of integrated project delivery.
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6. References


