Applied GIS

ISSN: 1832-5505
Vol-11 Issue-01Feb 2023

Application of contractor's expertise in public sponsored infrastructure projects in Germany

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Abstract

In Germany, the processes of planning and building public works are often seen as distinct entities. The design phase is when the customer and designer come up with a game plan for putting the project into action. After the planning phase, one or more contractors will carry out the actual building. German construction projects show that there are problems with the information sharing between the planning and building stages. The design phase planning is very theoretical and may benefit from the contractor's assistance. Due to insufficient planning during the design phase, overall project duration and budget tend to balloon. Therefore, there are a number of possible benefits to utilising the contractor's experience during the design process, including faster project completion. In this article, we'll look at four different ways that Germany may put execution expertise to use on publically funded infrastructure projects.

Introduction

The rising demands impose a greater level of complexity on building projects, particularly those involving civil infrastructure. In this regard, it seems that the situation is essentially the same everywhere in the globe. There are often significant budget and schedule overruns on such projects. In addition to a lack of cooperation between the client and contractor at the project's conclusion, the two contractual "partners" also fail to work together effectively during the project's execution (Black et al., 2000). The following facts represent the normal position in the German and worldwide construction and plant market, as described by Ingram & Bennett (1997), Girmscheid (2005), and Spang (2009):
The "lowest price-principle" has resulted to a loss of information, increased costs associated with managing claims and counterclaims, a rise in the total number of disputes, strained relationships between clients and service providers, and unhappy customers.
• Contractors face a high failure rate and a low rate of return. As a result, experts began exploring other methods of project delivery. Latham (1994) was one of the first publications to investigate the causes of the unsatisfactory state of affairs. He recommends rethinking the client-contractor dynamic in his study and suggests changing the bidding process so that contractors aren't judged just on price. Finding the best contractor for the job requires using both quantitative and qualitative factors. Furthermore, Latham asks for an environment where partnership and win-win circumstances are conceivable, rather than the combative approach often used while managing a building project.
Four years after the publication of this study, Egan (1998) recommended using successful methods from other sectors to enhance construction industry procedures based on the findings of this and other related studies. Both the client and the contractor need to have the same end in mind. In big, complicated infrastructure projects, the standard approach to project management often fails to provide the desired results (Sakal, 2005). From these preliminary studies, researchers have developed novel approaches to fixing the drawbacks of the old ways of doing things and delivering better results for the project's customer and contractor. The following chapter will detail one such innovative approach: incorporating the contractor's expertise into the preliminary stages of project preparation. It's widely utilized in the private sector in Germany and beyond. Using the contractor's expertise in the planning stage results in increased cost and time certainty, a higher contractually agreed score, a deeper awareness of risk, and smoother transitions from

ISSN: 1832-5505
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design to execution. In the business world, it is helpful to make advantage of contractors' expertise. However, strict government laws prevent its usage in the public sector. This study will examine the limits imposed by the law. The contractor's expertise will be used as early in the planning process as feasible using the models developed from this data.

Research Design

A literature review serves as the project's foundation. The expertise of the contractors was put to use in an analysis of the models. At this point in the study, researchers were interested in building projects of all types, not simply those related to infrastructure. The techniques of other cultures were also examined. Although the legal systems of other nations provide various methods to exploit the contractors' information, any model evaluated might provide suggestions for the research process and, ultimately, for the German model. Based on the findings of the literature analysis, a field study was designed to learn how professionals in the construction industry see the use of contractors' expertise. We wanted to see what they thought about using contractor expertise at various stages of the design process. Third, various strategies for incorporating the expertise of contractors into German infrastructure projects funded by the public sector need to be developed.

Basics for using contractor's knowledge

There are two primary ways in which the contractor's expertise might be put to use:

Therefore, the two scenarios must be differentiated in order to create a model for Germany. In both circumstances, the contractor is brought in before the actual work begins, at a time when his insights may do the most good. The next chapter will also demonstrate the underlying legal distinctions between these two options, which contribute to this differentiation.

The German Design Method

The modern planning method will be described first, so that the context of the study project in Germany may be grasped and its purpose made clear. As illustrated in table 1, there are five main stages to this procedure. Following the planning stage come the tendering phase, the actual bidding procedure, and finally the building stage.

Traditional roles and the stages of planning are outlined in Table 1.

Planning step	Responsibility
Preliminary assessment	Client
Conceptual design	Client
Basic engineering	Client
Approval planning	Client
Detail engineering	Client / contractor

Typically, the customer or an expert hired by the client handles all of the planning, leaving the contractor free to concentrate on building. Clients seldom have the contractor take on the task of detail engineering.

Parts of the project's intricate engineering (such the engineering buildings) might be included here.

The customer is still responsible for the remainder of the detail engineering, such as for the track. Planning for permission is another major consideration. The planning approval process is included in this. In other words, this is a particularly German-specific practice. Everyone who stands to lose or gain from the initiative needs to have their voices heard. It is necessary to weigh all of their concerns. Approval of the idea is unlikely until all concerns are addressed. However, impacted parties still have the right to file a lawsuit within a certain time frame following the approval decision if they have complaints that were overlooked. Due to the many parties involved, this procedure might drag on for months, if not years, before a final, binding judgment is reached.

The Value of the Contractor's Expertise, Section

Several variations of ECI are in widespread usage around the globe. It may take the shape of various cooperation arrangements or, at its simplest, early contractor involvement in the project. In the 1990s, the UK deployed ECI for the first time in the Andrew Project (Rooney, 2006). It originated from the need for expertise in carrying out a massive undertaking. Australia has adopted ECI as well (Swainston, 2006) since its implementation in 2005. The 'pure' version, or Alliance contracting, is how it is often utilized (Ross, 2009). The ability to include the contractor's or

ISSN: 1832-5505
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construction company's expertise into the planning phase of the project is a major benefit of ECI. As was previously shown, conventional project delivery models often include either the client or the client's appointed engineer or consultant completing the design. One major drawback is that the contractors' execution expertise is seldom considered. Designers, whether engineers or architects, may have excellent technical understanding, but they lack the execution skills of contractors, particularly in the area of job preparation. This results in insufficient input for the designers to enhance future initiatives. This is exactly where the contractor's expertise might come in handy. In the design phase, it might help to ensure that the whole project runs smoothly (Gil et al., 2000).

In their study of Saudi Arabian construction projects' adherence to schedules, Assaf and Al-Hejji (2006) demonstrated why the design phase is so crucial. Fifteen customers, as well as fifteen consultants and contractors, filled out the survey. Assaf and AL-Hejji identified the following variables as potential contributors to project length during the planning stage:

Errors and omissions in the design papers

• Delays in the creation of the design documentation

Reasons for this include:

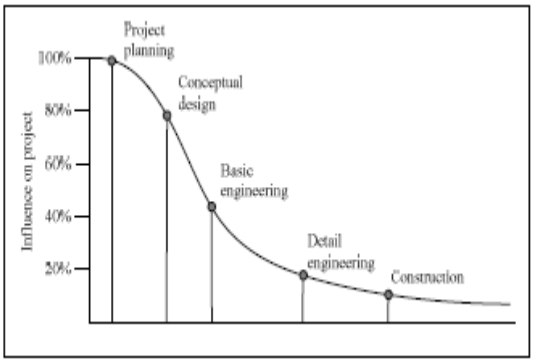
• Inadequate or unclear drawings • Overly complex project design

• Design engineer's misunderstanding of owner's expectations

• Lack of expertise among design team members.

They observed that ECI has the potential to mitigate these effects, and in some instances totally eliminate them. Incorporating the contractor's execution expertise into the design phase offers the additional benefit of improving constructability (Proverbs & Holt, 2000). The cumulative time and money savings are substantial. It's possible to cut costs by as much as a third (Gottlieb & Jensen, 2011; Bourn, 2001). According to Chan et al. (2005), railway infrastructure improvements may save up to 40% in cost and roughly 7% in time.

Figure 1 displays the impact on the project at various phases of planning and construction. In contrast to the c. 10% that may be altered during construction, almost 80% of the project can be modified during conceptual design, one of the very early phases of the design process. The contents of the various design stages explain why stakeholders have less of an opportunity to have an impact as the project progresses. The path must be decided upon in the first stages of road planning. One example is deciding how many tunnels to include in the route, a choice that might drastically alter the total cost of the project. In the final stages of design, only minor choices remain, each of which has a negligible impact on total project expenses.



Impact on the Project, Figure 1 (Scott, 2001).

Making adjustments early in a project's development is not only simpler, but also more cost-effective. As the design progresses, the adjustments become more labor intensive due to the need of altering or redoing various components of the final product. In the worst-case scenario, some adjustments cannot be made because, for instance, they need substantial alterations to the design, and the effort required to alter the plans outweighs the benefits. It's not only the customers that benefit from the ECI approach. If contractors are hired for both the planning and the building phases, they may reap the benefits of their early participation in the design process. Contractors have a limited amount of time in conventionally bid projects to read the materials, plan how to construct it, and identify risks and uncertainties. They learn the ins and outs of the project from the ground up by taking part in its design. This will help them avoid overlooking any potential construction-related issues. One of the questions asked in a field research done by the chair of Project Management in 2006 was, "How obvious are risks in the tender documents?" (Figure 2). A total of 126 professionals (57 clients, 54 contractors, and 15 intervenors) took part in the research. Risks are either

ISSN: 1832-5505
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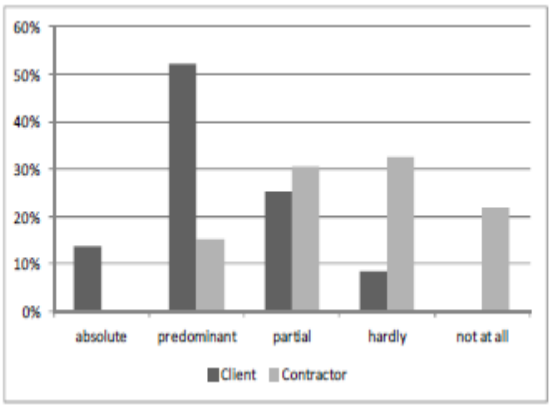
completely or overwhelmingly clear from the tender materials, as stated by over 60% of respondents. However, just 15% of the contractors shared this view. While 8 percent of customers agree with contractors' assessment that risks are not made clear in bidding papers, 55 percent of contractors say the opposite. When the contractor is part of the design process, he learns about potential problems ahead of time. This will allow him to plan for how to deal with them and make a more prudent offer to you.



Risks that are readily apparent in the tender materials are shown in Figure 2 (Spang et al., 2009).

Having an open dialogue about potential dangers may help keep construction sites peaceful. Conflicts might also emerge for other reasons, such as a disagreement about the scope of the agreement (Figure 3).

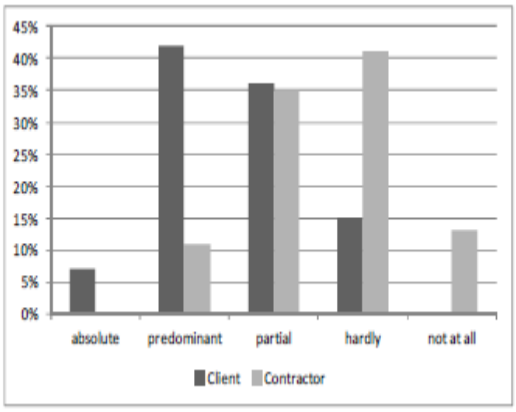


Figure 3: Clarity of the Agreed-Upon Scope (Spang et al., 2009).

When asked about the clarity of the contractually agreed scope, 49% of customers said it was at least mostly apparent, but just 12% of contractors concurred. 54% of contractors said there is little to no clarity on the agreed-upon scope of work. This is a common source of tension between the client and the contractor, and may even result in legal action. Using the contractor's expertise would help the project avoid these planning flaws and improve the quality of the work as a whole.

As a whole, ECI has the following advantages (Riemann & Spang, 2012):

Utilization of contractor expertise Improved communication between design and construction phases Clearer awareness of risks Enhanced constructability Greater overall project performance

Challenges to ECI in Germany

In Germany's private sector, early contractor participation is on the rise. The reason it isn't employed in the public sector is because the latter is subject to different rules. These include the need for an open system for bidding, the budget legislation, the encouragement of small and medium-sized businesses, and the idea of equal treatment or opportunity for all bidders. As a whole, they make it more difficult to import many successful foreign practices. The legislation in the United States and Europe both contribute to these stringent guidelines. Also, they had to cope with them when implementing "Best Value Procurement in the Netherlands" (Kashiwagi, 2011; van Leeuwen, 2011). Instead of an open bidding process, "competitive dialogue" might be used to include the contractor in the planning stage. Unless exempted by particular restrictions, all public projects in Germany must be offered through the open method. These are demanding prerequisites. It is necessary to identify the project that satisfies these requirements. One necessary but difficult-to-prove requirement is, for instance, that the public customer is unable to articulate the contractually agreed scope. However, even if a project seems to satisfy these characteristics, there may still be barriers to adoption on the part of the customer and the contractor. To begin, it's important to note that the CD is a lengthy process that needs significant investment from the customer and the bids. The customer would likely incur more financial burdens as a result of the bidding process. These expenses originate from two sources: his time and the cash made to the bidders. In turn, the bids may incur expenses if the customer only covers a portion of their work. These further expenditures should be covered by a skillfully optimized project by the contractor. Also, unlike the open process, which is well established and well recognized, the jurisdiction

ISSN: 1832-5505
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around the competitive dialogue is still developing. This presents opportunities for both customers and contractors but also has certain dangers.

Methods for making the most of contractors' expertise on publicly funded German infrastructure projects

Figure 1 shows that early on in a project is the greatest time to have an impact on both the budget and the final product. Involving the contractor in the planning process is ideal, but if that is not feasible, it is still beneficial to get the perspective of construction firms on the proposed work as early as possible. The worldwide literature analysis and the field research have led to a variety of recommendations for Germany. The first option for making advantage of contractors' expertise is to engage with them after the completion of the conceptual design phase but before the plans are submitted for approval. There has been no formal project approval yet, so contractors may provide recommendations for efficiencies without having to alter the authorized design. It would be necessary to start again with the change's planning if this request was made at a later date. In order to explore optimization options, the customer (project owner) must plan dedicated workshops with the contractors. This method requires satisfying the requirement of treating subsequent bids fairly. In Germany, it is illegal to provide preferential treatment to one bidder over another. All other potential bidders must also be provided with the information provided to the successful one. For this reason, it is essential that the customer only provides project details in writing. This way, he can make sure that all potential bidders have access to the same data. Clients are free to share the same information with any new bidders who emerge during the bidding process even if they were not involved in the conceptual design phase. In fact, these details should be included in the bid packet as well. A second option for making use of the contractor's expertise is to allow for alternative solutions to be submitted by bidders during the bidding process. Many public customers nowadays are unwilling to consider alternative options proposed by bidders, even if doing so might result in cost savings, improved quality, or reduced construction time without increasing project costs.

Clients take this precaution due to concerns that failed bidders may file litigation. They refuse the opportunity to improve their initiatives by incorporating the suggestions of potential investors. Possible sources of contention include the potential for unfair treatment of the bidders due to the several possible solutions. In the event of a lawsuit being filed by an unsuccessful bidder, the bidding process might be halted immediately. The whole bidding process, which is already lengthy, must be redone if he wins the lawsuit. Client and contractor alike should reflect on their methods for dealing with alternative alternatives moving forward. A well-structured procedure is required to guarantee a high standard of tendering. Specifically, the requirements for submitting alternative ideas must be laid down. For instance, the customer is responsible for outlining the bare minimum desired. In addition, contractors must maintain consistency in their variation. By using the contractor's expertise, clients may improve project outcomes in terms of time, money, quality, and customer satisfaction. The opposite is true for unsuccessful contractors, who should consider filing suit even if their chances of winning are slim. This would make customers feel more comfortable experimenting with novel, collaborative approaches to bidding, which in turn helps contractors in a number of ways. Tendering process selection offers a third opportunity to benefit from the contractor's expertise. As was previously noted, the open method is used for tendering most of Germany's publicly funded civil infrastructure projects. Even if a different solution is suggested (which may be vetoed), the open approach leaves no room for improvement. Using the contractor's familiarity with tendering processes in a competitive conversation is a more promising option. In this way, the contractor might contribute his expertise by carrying out the very last stages of preparation. The procedure's benefit lies in the fact that competing bids are incentivized to improve the project before the contract is finalized. The fact that this method can't be used on every project is a drawback. The difficulty of the project is only one of several criteria that must be met. Public customers are obligated to utilize the transparent process whenever possible. This approach incorporates the contractor's expertise late in the planning stage.

Conclusion

The expertise of the contractor is currently underutilized in Germany's publicly funded infrastructure projects. In the open system for tendering, the most common criterion for selecting a contractor is cost. After signing a contract, they have no incentive to send in more information than is

ISSN: 1832-5505
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necessary. The ideal course of action for a project is to include the contractor (or construction business) as early as possible into the planning process so that his expertise may be used. Several methods for carrying out German infrastructure projects were outlined in this report. The options span from holding a workshop with potential contractors at an early stage of the project (if a full involvement in the planning is not feasible) to using the contractor's knowledge at the end of the planning phase (through various approaches) to using the contractor's knowledge after contract close (through a solution) during the execution phase. The opportunities offered for Germany are baby steps, or little pieces of globally utilized methods like Alliance Contracting in Australia. As a result, these models are applicable in these regions, but in Germany, they would need substantial revisions before being put into use.

In light of the present legislative environment in Germany, a Research Project at the Chair of Project Management is doing a more in-depth investigation of these options, how they may operate, and whether or not they are all adaptable in publicly funded infrastructure projects in Germany.

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ISSN: 1832-5505
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