

ALTERNATIVE PROJECT DELIVERY SYSTEMS FOR TRANSPORT INFRASTRUCTURE IN GERMANY

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Transport infrastructure projects are important for the development of the economy, industry and mobility. Such projects are long-lasting and have huge budgets. In addition, they are affected by the needs of the public owner, and usually involve many stakeholders. The current project delivery system in Germany is characterised by its traditional nature, in which the processes of design and construction are sequential. The owner contracts separately with the designer and the contractor. This separation hinders the collaboration and communication between the designer and constructor. Furthermore, the traditional procurement method based on the lowest price aligns with diverse challenges which often results in cost or time overruns, as well as in adversarial relationships amongst the involved parties. This fragmented structure of the construction industry is dissatisfying for the project participants. This paper examines the actual situation of project delivery and its shortcomings and it therefore investigates the reasons behind the problems of project delivery such as poor planning, scope changes or inappropriate risk allocation. In the 80s and 90s, the Anglo-American construction industry suffered from similar problems. This situation has been analysed by many reports, where suggestions for changes were made and solutions to overcome the adversarial situation of the industry were offered. Consequently, new delivery systems were developed. This paper provides an overview of the problems and obstacles associated with implementing alternative systems regarding the procurement law of public projects in Germany.

Keywords: alternative delivery systems, procurement law, transport infrastructure.

INTRODUCTION

Transport infrastructure projects are important for the development of the economy and industry. They are also needed to meet the increasing demands of mobility. The location's advantages of Germany as an industrial country at the heart of Europe are hardly conceivable without a modern and efficient infrastructure system. Over their life cycle, transport infrastructure projects are fraught with risks and uncertainties (Spang and Riemann 2011, Naumann 2007). They have immense budgets, often billions of dollars. Furthermore, their impact on the environment is huge. Transport infrastructure projects are long-lasting. It can take decades from inception until realisation. In addition, they are affected by the needs of the public owner, and usually involve many stakeholders (Hertogh *et al.* 2008).

A large number of infrastructure projects are confronted with cost and time overruns. Furthermore, the relationship between the owner and the contractor is often adversarial. This situation is no-longer satisfying for all project participants. This paper examines the current situation of project delivery in Germany, which is

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characterised by its traditional nature. It also describes its shortcomings and potential of improvement. Subsequently, the paper shows an overview about the drivers for change at the international level and highlights some of the alternative project delivery systems in infrastructure projects. Last but not least, the paper discusses barriers associated with implementing alternative systems, regarding the procurement law of public projects in Germany. Finally, conclusions for research are drawn.

AN OVERVIEW OF INFRASTRUCTURE PROJECTS

Transport infrastructure in Germany

There is no unified definition of infrastructure in literature. Infrastructure projects provide “*basic services to industry and households*” (Grimsey and Lewis 2002). Generally, infrastructure projects are divided into “*economic infrastructure*” such as bridges, road, rail, and air transport facilities and “*social infrastructure*” including health and tourism facilities (Ng and Loosemore (2006). The European Commission defines transport infrastructure as “*all routes and fixed installations of the three modes of transport being routes and installations necessary for the circulation and safety of traffic*”.

Germany has one of the largest and most advanced transportation systems in the world, which demonstrates Germany’s position as transportation and communication centre in Europe. Germany’s road network with a length of 651,000km is one of the densest networks worldwide. Besides, the German railway has an extensive network of 41,500km (International Transport Forum 2012).

In Germany, the entire investment for new construction, replacement and maintenance of state-owned railways, highways, waterways, and projects of public transport between 1991 and 2005 amounted to approximately € 165 billion. The plans for the years 2006 to 2010 come to € 11 billion annually (Naumann 2007). For realising infrastructure projects for the period (2012 until 2013, partly 2017) in Germany a new program (Infrastrukturbeschleunigungsprogramm) was introduced in 2012. The projects will receive an additional 1 billion Euros, 600 million for roads and 100 million for rail (International Transport Forum 2012).

Planning, decision-making and financing of infrastructure projects are mainly politicised at national level (Short and Kopp 2005). In Germany, the federal government, the states and the local authorities are responsible for the development, evaluating and financing of infrastructure projects.

Current project delivery system

The current project delivery system in Germany is characterised by its traditional nature, in which the processes of design and construction are sequential. The owner holds separate contracts with the designer and the contractor. Infrastructure projects go through the following phases (figure 1): feasibility, technical design, legal approval, tendering and execution. The owner assigns a designer to do technical design and legal approval for a project (Spang 2011). Hence, participation of many stakeholders and considerations of a large number of regulations, the planning approval procedure of infrastructure projects is sophisticated and enormously time-consuming (Sözüer and Spang 2012). Once the design phase is completed, the owner announces for bidders within an open bidding procedure.

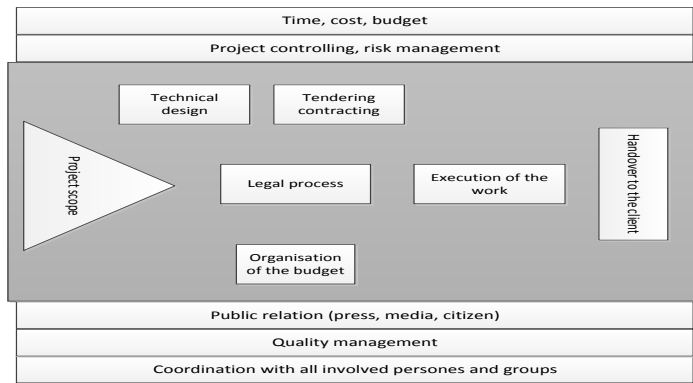


Figure 1: Project tasks in infrastructure projects (Spang 2011)

According to the VOB (German Construction Tendering and Contract Regulations), the standard form for awarding construction public projects in Germany is “*Die Einzelvergabe*”- a single award. In contrast to the general contractor, the project will be divided into work packages and each package will then be awarded separately by the public owner to a single contractor (figure 2). In most cases, the public owner is obligated to select the contractor on the basis of the lowest price. Unit-price contracts have to be used exclusively for public projects. Whereas Lump-sum is only allowed to be used in rare exceptions.

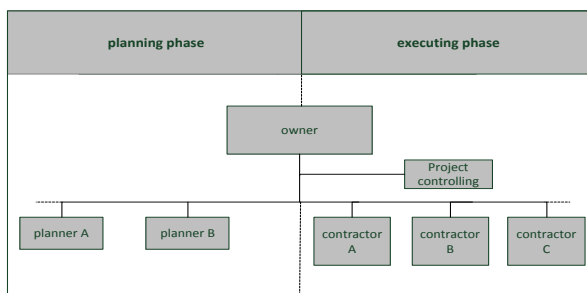


Figure 2: single award (Girmscheid 2006)

Shortcomings of traditional delivery system

Infrastructure projects appear to have common problems worldwide. Generally, they don't have a good reputation because of their cost and time overruns (Hertogh *et al.* 2008). A Study of Flyvbjerg *et al.* (2002) examined construction costs of 258 large transport infrastructure projects worth US\$ 90 billion, which are located in 20 nations. Main conclusions of this study are:

- Cost escalation occurs in almost nine out of 10 projects,
- Rail projects seem to be particularly prone to cost escalation (44,7 %)
- Road projects appear to be less predisposed for cost escalation (20,4 %)

Germany's infrastructure projects are no exception. Several examples for infrastructure projects with cost overruns can be given, e.g. Mega Project City-Tunnel-Leipzig and Underground Station Stuttgart 21. Reasons of project cost overrun include design changes or mistakes, long-lasting delivery phases, inappropriate contractors and cost underestimation. (Gaddis 1994, Flyvbjerg *et al.* 2003, Sözüer and Spang 2012)

Short and Kopp (2005) state that planning methods of transport infrastructure vary from one country to another, but they have one thing in common that transport

planning processes take a long time (up to 20 years). Hertogh *et al.* (2008) noticed that the reasons of delays in infrastructure projects are mostly in the planning and not in the construction phase. On the other hand, delays within the construction phase could be the result of unexpected weather conditions, errors in the plans, change orders, inadequate project preparation and poor coordination.

Because design and construction are separated, the collaboration and communication between the designer and the constructor are limited. A field study at the University of Kassel, concerning the relationship between clients and contractors in the German construction industry, shows that 54% of the participants (clients and contractors) find the current situation as partially cooperative and 39% as barely cooperative. For about 44% of all participants there is no winner from this situation (Spang *et al.* 2009).

In addition, because of the separation between the design and construction phases, the design and build entities follow different financial goals within the same project (Spang 2011). While the owner and his designer desire optimising the project at the lowest cost, the contractor aims to complete the project within time and price and maximizing his profit. This often leads to disputes between them. Public owners have to award their projects upon the current regulation of VOB/A (German Construction Tendering and Contract Regulations-award).

According to the study (Spang *et al.* 2009), 25% of the participants see that the VOB (2002) doesn't promote a "partnership". 42% of the participants agreed with "partially" promoting a partnership (Spang *et al.* 2009).

In the traditional method, the project owner attempts to transfer all possible risks to the contractor. The contractor in turn shifts the risks to the subcontractors. In the end, the risks will be undertaken and managed by the party, who can handle them the least. In the field study of Spang *et al.* (2009), 42% of the participants (owners and contractors) approved that a fair risk allocation is not present, and 36 % of the participants see that a fair risk allocation is only partially existent.

NEED FOR CHANGE

Literature review

As shown above, the current stalemate in Germany often finds its main cause in the traditional method, which signifies the awarding of contracts to the contractor with the lowest price.

On the other side, the advantage of the traditional delivery method is undoubtedly linked to its long tradition and is thus well-established and well-understood by the project participants. The roles, functions and responsibilities of each party are laid down in standards and regulations. The procedures of the traditional method are accepted and common ground for all participants. Another advantage is that the design remains under the owner's control and the design team looks out for the interests of the owner. Because a total price is not agreed in this case, design changes are possible even during the construction phase. Tendering on the basis of low price allows the owner to receive a reasonable cost for the project (Greiner *et al.* 2009).

In order to overcome the fragmented situation in Germany, especially in the public sector projects, rethinking by the project participants and significant changes particularly in the public procurement method are required. While some studies in the private sector have experimented with the implementation and transfer of alternative approaches in order to achieve better project outcomes including reduced disputes as

well as time and cost delays, this is not the case in the public sector. In Germany, comparative scientific studies in the field of transport infrastructure are very few. Calls for change have been raised recently. Doing everything a little better than before is not enough anymore (Spang 2006). Girmscheid (2008) considers that there is an urgent need for a paradigm shift, which requires a rethinking by the project participants. According to Spang (2006), a paradigm shift is necessary to enhance collaboration between owner and contractor.

Potential for improvement

Spang (2006) identifies a number of aspects for improving the delivery of infrastructure projects. These include:

- Improving the cooperation between the owner and the contractor through “*partnering*”-relationships, in order to achieve a win-win situation for all project participants.
- Integration between design and construction phases: An early contractor involvement in the planning stage can optimize the design phase through his know-how.
- Fair risk management between the project participants: The owner and the contractor identify all known and potential risks, and assess and evaluate them. Risks should be allocated to the party which is considered to manage them most effectively with appropriate compensation.
- Clearly defined decision-making procedures: The execution of projects takes place in a dynamic environment, where decisions must be made rapidly and continuously. Delayed decision making increases the potential for conflict between the project participants and jeopardizes the costs and scheduled targets. Therefore, clear decision-making should be created contiguously with clear responsibilities.
- Alternative dispute resolution: As a result of conflicting interests, unfair allocation of risk or non-timely decision-making, conflicts arise between the parties. Conflicts are usually associated with cost and scheduled consequences. Therefore, alternative dispute resolution methods are essential for the construction industry.
- Alternative procurement criteria based on experience and qualifications: The low-bid must be no longer seen as the decisive criterion for the award. Technical and operational expertise and successful experience with similar projects should also play a role in the selection of the proper contractor.

Drivers for change-international review

The Anglo-American construction industry suffered in the 80s and 90s from similar problems as the actual situation in Germany: Increasing complexity of construction projects, a growing number of disputes among contract parties, cost and time overruns. Besides, the traditional method (Design-Bid-Build) could not meet the technical and economic requirements of the accelerated construction (Dorsey (1997), Morton (2002)). Many owners and contractors voiced displeasure with this situation. Therefore, many reports analysed this situation, made suggestions for change and offered solutions to overcome the adversarial situation of the industry, through moving from traditional approaches towards alternative and more innovative ones.

The Latham Report (1994) focuses on the adversarial nature of the construction industry and considers this as a main factor for poor communication. Therefore, the

report emphasises on the importance of team work based on fair and partnering relationships. This leads to the improving of performance as well as to a win-win situation for all participants. Furthermore, the Report makes a large number of important recommendations, such as making a greater use of alternative tendering procurement procedures, dispute resolution and partnering arrangements.

The Egan Report (1998) stated a need for a radical change in the construction industry. It identified five drivers for change to achieve an enhanced performance: “*committed leadership, focus on the customer, integrated processes and teams, a quality driven agenda and commitment to people*”. Furthermore, Egan emphasised on the need for long term relationships and fair risk allocation.

Consequently, alternative approaches have been developed and widely implemented primarily in the private sector. Traditional methods are still mainly used to procure public projects. Alternative approaches, like Design-Build, Construction Management at Risk or Alliance-Model, have been increasingly used in infrastructure projects.

In the UK, Design-Build or one of its variations is the standard practice for road projects. Based on a pre-design, the owner contracts a design-build contractor to realise the project. This way, the owner has a single point responsibility for both, design and construction (Dorsey 1997). The owner can select the contractor based on quality, price or a combination between them. In the course of Design-Build, the contractor and the designer already work collaboratively in the design phase.

In the USA, Design-Build and Construction Management at Risk have been used for the delivery of infrastructure projects especially by road and highway projects.

In Australia, “*Project Alliance –Model*” is used for road projects. In a project alliance, the owner and none-owner participants, like designer, contractor and service provider etc. work together as an integrated team in order to deliver a specific project. They arrange a contractual framework, where their commercial interests are associated with the project results (Ross 2003).

GERMAN PROCUREMENT LAW

The public procurement law in Germany contains rules and regulations that have to be considered by public agencies for the procurement of works, services and goods. The German public procurement law aims mainly to assure an economical use of public funds as well as avoiding corruption. Furthermore, it makes sure that the core principles of public contracting like transparency, competition, the principle of non-discrimination, the principle of equal treatment and the consideration of medium-sized construction companies, are respected in every tender procedure (Heiermann 2013).

The German public procurement law is influenced by European Regulations. According to certain thresholds, the German public procurement differentiates between contracts below and above the thresholds (figure 3).

At national level, VOB/ A (Construction Tendering and Contract Regulations-award) are obligatory for the public authorities. On the contrary to many alternative approaches, procurement and contract agreements according to VOB do not consist, or even promote innovative aspects like incentive payments, alternative dispute resolution, fair and contractually backed-up allocation of risks, using open book principles, continual improvement processes, simultaneous engineering, partner selection upon qualification and early contractor involvement.

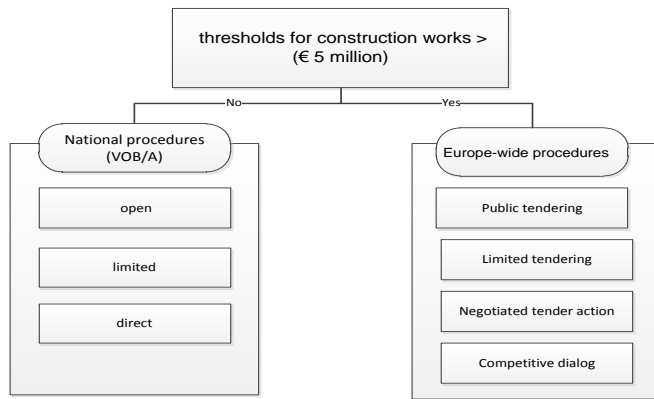


Figure 3: public procurement in Germany (Heiermann 2013)

Furthermore, VOB dedicates dividing the construction work in work packages - “*Fachlose*”, which are to be awarded to separate contractors. The general contractor form is only to be used in exceptions. A Design-Build contractor or a virtual project organisation like an Alliance-Model is absolutely out of question for infrastructure projects. Under the current procurement law, innovative approaches could not be used for transport infrastructure.

CONCLUSION

Considering the previous discussion, it becomes clear that there is a need for change towards using alternative approaches in Germany, which provide a better project delivery. In spite of the advantages and opportunities of alternative project delivery systems, they have not been implemented for infrastructure projects in Germany. Moreover, a systematic analysis has not yet been undertaken concerning such projects. On the other hand, adopting and implementing alternative delivery systems faces a variety of barriers including legal, political, organizational, institutional and cultural issues. In order to surmount the barriers of implementation, researchers should point out the advantages and disadvantages of delivery systems for infrastructure projects. This will enable the public owner to understand these systems as well as their potentials and will provide a comparison with the traditional system. Besides highlighting best practices in this field and understanding the specifics of each approach, choosing the proper approach depends on the project characteristics and framework conditions, as well as on the desired output. A reform in public procurement analogous to international experience is very important. Therefore, the current legal regulations should be modified or new regulations should be issued.

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