

# **BUILDING CONSTRUCTION CULTURE**

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In the course of a study of mega building construction projects in Germany, the need arose to identify and analyze the characteristics of the local construction culture, particularly upon realization that these characteristics may constitute significant contextual factors in equipment and site logistics planning. The study of the German building construction culture was based on (1) a focused literature review; (2) case studies of multicrane construction sites; and (3) structured interviews with experts of various professions from the German construction industry. The findings highlight the role of the following factors: (1) the typical German professional character; (2) various systems of contractual relationships; (3) state and city regulations; (4) technology and industrialization; (5) workforce sources; (6) rooted safety culture; (7) protection of the environment; (8) the crane market; (9) relationships between planning, engineering, and construction; (10) logistics concepts; and (11) additional unique features of Berlin as a major construction hub. Some of the German culture characteristics detected were further supported by a comparison with other advanced European construction cultures.

*Keywords:* Equipment planning, Contextual factors, Multicrane sites.

## **1 INTRODUCTION**

An ongoing study of equipment and site logistics planning (ELP) for mega building construction projects, conducted in Germany, called for the identification and analysis of the characteristics of the local construction culture, given the understanding that these characteristics may constitute significant contextual factors in ELP. Such characteristics should also be considered factors that may limit the generalizability of the study's results. Hence, this paper aims to provide an answer to the question, what are the unique characteristics of the building construction culture in Germany? The answer was sought mainly through 15 case studies of multicrane building construction sites in Germany, located in urban surroundings. The paper first presents a concise review of the relevant literature. Then, the data collection method is presented, followed by a presentation of the findings. The paper closes with some concluding remarks.

## **2 LITERATURE REVIEW**

German construction companies have traditionally relied on skilled and trained workers. Qualified individuals are required to attend various professional courses (Syben 1998) in order to obtain the degree of *Meister* (Richter 1998). Due to the flow of guest workers (*Gastarbeiters*) into Germany, based legally on bilateral agreements between Germany and countries that are not part of the EU (Rudolph 1996, Rixler

2003), the competence of the construction workforce has declined sharply in recent years. Construction companies have had to change their policy of employing workers, hiring less trained (but cheaper) workers, on the one hand, and tightening control and management, on the other. The issue of employing guest workers in big numbers has caused a chain of conflicts and structural changes in the German construction industry (Faist 2003). Nowadays, construction activities are increasingly executed by general contractors under turnkey contracts (Rixler 2003), which are highly regulated by the German construction contract procedures (Johansen and Walter 2007).

The German construction process is traditionally controlled by the owner or client and their representative, the architect. While this contractual mode places emphasis on maintaining success measures such as cost and quality, it also causes various problems for the construction companies (Syben 2000). Companies are hindered from taking part in the construction process until all important decisions have been made by the owner, ignoring the other players' potentially relevant abilities and resources. The dominant character of the owner also influences project concepts for dealing with uncertainties, often lacking a much desirable holistic view of the overall uncertainties (Bryde and Volm 2009).

The German construction industry is considered advanced and modern, using innovative techniques mainly in residential projects (Thuesen and Hvam 2011) and office buildings (Hegger 1996). Construction systems are based, among other things, on optimization of cost and derived value, control over the predicted project duration (Stoy *et al.* 2007a), construction speed (Stoy *et al.* 2007b), and implementation of the principles of lean construction (Johansen and Walter 2007).

### **3 RESEARCH METHOD**

Following a focused literature review, data were collected through (1) case studies of complex building projects, which included on-site visits and interviews to expose the influence of local characteristics; and (2) a series of structured interviews with experts of various professions (engineering, management, finance, legal, authorities) from the German construction industry.

#### **3.1 Case Studies and Interviews**

Each of the 15 case studies consisted of one to three in-depth structured interviews with the contractor's project manager, site visits, and an inspection of exclusive project materials provided by the site management. The interviews contained both open-ended and structured questions and addressed, among other issues, topics that characterize the German construction culture. Selection criteria for the case study mega building projects included the following (mean values are given in parentheses): (1) gross built area  $\geq 40,000 \text{ m}^2$  (80,800  $\text{m}^2$ ); (2) construction budget  $\geq \text{€}100\text{M}$  (€125); (3) number of tower cranes on site  $\geq 5$  (6.5, with max. of 12); (4) distinct horizontal dimension; (5) single building; and (6) busy urban location. Seven of the projects were located in Berlin, and the rest in Frankfurt, Hamburg, Leipzig, and Stuttgart. All 97 cranes used on the projects were of the top-slewing type (of which 92 had a trolley jib and 5 had a luffing jib). The 15 projects were executed by nine different construction companies known in Germany (and several also out of Germany) as leading contractors. The

projects included various uses such as shopping centers, office buildings, residential, and a variety of mixed uses. The number of workers per project at peak time ranged between 400 and 1200 and site administration staffs numbered between 40 and 80 persons.

### 3.2 Interviews with External Experts

Structured interviews were also conducted with senior representatives of several independent firms and disciplines, mainly to gain a deeper insight and understanding of the issues addressed in the current study. The interviewees had professional affinity to the German construction culture with regard to ELP, project management, engineering, finance, law, and regulations. The total number of these interviewees was 26, and their mean length was about two hours per interview.

## 4 FINDINGS: CHARACTERISTICS OF GERMAN BUILDING CULTURE

The study's field findings constitute first-hand evidence and highlight the role of various characteristics of the German construction culture as significant contextual factors. Main findings are as follows (the number of case study projects exhibiting the finding is given in brackets):

- Contractual relationships: In response to the dominant role played by the owner in project planning and control, leading construction contractors now tend to execute their project using a turnkey delivery system [9]. Exceptional proactive involvement of owners in equipment and site logistics planning was revealed in several projects [4].
- Productivity: High productivity rates are reflected by the low mean number of workers per crane – 12 to 18. These numbers are much lower than those observed in other developed countries (Shapira *et al.* 2012) [8].
- Regulation: Strong involvement of state and city regulatory agencies is visible with respect to construction and planning codes, workplace safety, environment and wildlife protection, underground water contamination, etc. [12].
- Technology and industrialization: Contractors are using the most advanced technologies and construction methods; innovative solutions are encouraged by company managements; and the high level of mechanization and industrialization is indicated by the number of cranes and the high rate of prefabricated elements, respectively [10].
- Workforce: Teams of guest workers are supervised by local senior foremen who are responsible for training and quality control [7]. Most of the crane operators are outsourced together with the teams of guest workers; to a lesser extent, subcontractors employ their own crane operators. No cases of operators who are on the permanent payroll of the construction company were observed [8].
- Crane market: A clear preference for locally manufactured cranes was observed: 80% of the 97 cranes were German made. A near balance between

cranes owned by the construction firms (43%) and rentals (57%) was maintained. Major rental companies also report a state of supply-and-demand balance in the current construction climate and volumes.

- Berlin as a major construction hub: (1) Berliners have become used to “living in a construction site” and have developed a compliant attitude toward noise, traffic interruptions, and oversailing cranes in the vicinity of their homes; (2) project planning, cost and schedule are affected by engineering issues such as high levels of underground water, proximity of construction sites to each other (requiring the coordination of logistics and work envelopes of overlapping cranes), and the vast number of unexpected obstacles (such as old bombs from the war).

## 5 COMPARISON WITH OTHER CONSTRUCTION CULTURES

A comparison with other construction cultures – an unavoidable byproduct of the current study – was also assisted by case studies conducted earlier in four mega building projects in the United Kingdom and France as part of a pilot study (Shapira *et al.* 2015).

Germany is positioned high compared with other construction industries in advanced European countries. The German construction industry, among other characteristics, is more highly regulated (Mahapatra *et al.* 2012) and more productive (Clarke and Hermann 2004) than countries such as The United Kingdom, and is based more on professionalism and less on contractual formal procedures (Syben 2000). Several studies that compared productivity rates indicated clearly that the construction industry in Germany is more efficient than in other European countries such as France and The United Kingdom (Proverbs *et al.* 1998a, Proverbs *et al.* 1998b, Proverbs *et al.* 1999). In recognition of the virtues of the German construction culture, a study was conducted by the British Government, Department of Trade and Industry, in order to acquire knowledge regarding innovative off-site manufacturing technologies in Germany for implementation in the United Kingdom (Venables *et al.* 2004). The advanced level of construction systems in Germany compared with those in the United Kingdom, France and other European countries was the topic of various other studies (Stoy *et al.* 2007a, Thuesen and Hvam 2011) that indicated the superiority of the German construction industrialization

Findings of the case studies conducted in the United Kingdom show similarity to Germany with regard to state and city regulations – a strict attitude toward meeting the legal construction regulations concerning the environment, safety, and public order. Regulations concerning noise, dust, pollution and contamination produced by construction sites in urban areas were also well enforced by the authorities.

In terms of workforce, the greater emphasis placed on training is rooted in the German tradition. Richter (1998) found that, compared with other European countries such as the United Kingdom, France, and the Netherlands, German workers – albeit mostly foreigners – are more highly trained and professional, which in part explains the high quality and productivity achieved by the German construction industry.

## 6 CONCLUSION

Based on the relevant existing literature, on 26 interviews with experts from various disciplines and sectors of the German construction industry, and mainly on 15 case studies of mega building construction projects in Germany, this study exposed the characteristics of the local construction culture. The comparison with other cultures, which was limited in its scope, was assisted by four case studies conducted in the United Kingdom and France. Although most findings are in favor of the German construction culture, the local industry certainly faces difficulties, including, among others, the opposing views of owners and contractors regarding uncertainties and risk management, the involvement of owners in typical construction planning issues commonly addressed by the project's management, and the structural changes the industry underwent following the influx of cheap foreign and less trained workforce. Full exposure of the strengths and weaknesses of the German construction industry requires a comparative investigation of "regular" and not only mega building projects, which is indeed the next phase of the current study. In addition to gaining deeper insights, this will also allow to accord statistical significance to the findings. The current study was conducted within a broader research aimed at identifying and quantifying the influence of equipment and site logistics planning on the overall success of construction projects. Recognizing the role played by contextual factors in construction planning in general, and in ELP in particular, the findings will help pinpoint those characteristics of the local culture that should be given greater attention, as opposed to those of lesser effect.

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