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The Design of the Organisation of a Building Process of an Underground Multimodal Station
With a case-study of station Amsterdam Zuid/ WTC, a ppp-project

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ABSTRACT

The progress of the cooperation between the several actors in a building process of a station is difficult. All actors want to build their own part; there is not an integrated approach. The two models which are formulated in this report provide such an integrated approach. With the use of a Design-Build-Maintain contract it is possible to structure the building process. A project-based organisation should be responsible for the design, the construction and the maintenance of the building. All actors (like modality-owners, modality-users and landowners) will receive their own role in the building process. This will only be possible when they transfer their properties and most of their competences. An underground multimodal station where all modalities are geared should be the goal of the project-based organisation.

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1. INTRODUCTION

1.1. The problem

In the next twenty years the largest urban development project of the Netherlands will take place in Amsterdam, called the 'Zuidas'. It is located between the urban areas of Zuid and Buitenveldert, close to Schiphol Airport. For a distance of 1200 metres the total infrastructure will be channelled underground. The phased lowering of infrastructure underground will create space for the new centre; totalling 1,000,000 m² in area.

Amsterdam Zuid/WTC station, located in the middle of the Zuidas area, will expand to a major transport intersection where busses, trams, metros, trains and high-speed trains gear: a multimodal underground station.

Figure 1 and 2 give an impression of the location.

Figure 1. Aerial view Zuidas, projectbureau Zuidas
The process of the development of an underground multimodal station brings along several problems, which can be divided in four subjects: underground buildings, multimodality, station development and building process.

One of the problems for underground buildings is, for example, the unsatisfactory experience in the Netherlands. It will also be hard for the client to choose one of the several variants. How do you balance the cost of an underground and an aboveground variant? The lack of local and national legislation makes the building process more difficult.

A multimodal station involves two major problems; the design and the organisation. The problem of the design means how the different modalities will be connected in the space. Multimodality stands for many modalities. Each modality has an owner (responsible for build and maintain) and a user (responsible for use). The organisation problem concerns the amount of actors, which are involved in the project. It links the problem of station development. Generally the modality train is the most influential modality, the other modalities are subordinate. Even when those modalities will process more travellers per day. In most cases, the actors for a station development are: ProRail (a task organisation of the Dutch government) as owner of the railways, NS (Dutch railway company) as owner of the station hall and the municipality is owner of the forecourt. The last problem in this research is the building process/organisation. In such a complex projects the traditional approach is not sufficient. New and innovative ways of collaboration or contracting have to get the attention. The above-mentioned problems are summarized in the next quotation: "The progress of the cooperation between the several actors in a building process of a station is difficult. Especially the short term commercial interest and the long term maintain interest clash. There is no unequivocal
control and there is a focus on austerity and profitability. That's why the stations are fragmented" (ProRail and NS, 2005). This quotation characterizes the subject of this research project.

2. RESEARCH QUESTIONS

The problem which is introduced in section 1.1 has formed the next definition of this research:

How does a diagram of the organisation, necessary to build a multimodal underground station, in this case Amsterdam Zuid/WTC station, look like?

The final results will be given as an advice to the initiator of the project.

Partial (general) questions for the research are, divided in the four subjects:

- Underground constructions: What does constructing underground mean, and what does it contain? Which forms are there? What makes it different than other projects (aboveground), for the building organisation?
- Organisation of the building process: What do we known about this subject, in literature and in practice? Which models, methods and forms are there? How do you design an organisation? What is the difference between project- and process-management?
- Station development: What is the definition of a station? What have we learned of the experiences that have been raised at the development of other stations? What makes a station development special, comparing with other projects (for example an office building)?
- Multimodality: What is the definition of multimodality? What are the experiences of constructing a multimodal building? What kind of influence is there on the building organisation with multimodality, in comparison with a building with only one modality?

3 METHOD OF RESEARCH

3.1 Method and approach

With the definition and the objective of this research, a plan and approach is formed. This led to six parts, each uses its unique own research method. Because of the complexity of the project, a demarcation is made in the next section: the scope of this research.

Part one of the research is the literature survey (see paragraph 3). It is an exploring qualitative survey, concentrated on the four main subjects. The partial questions are answered in this part. Each subject has its own
literature survey. In this part there is no connection between the literature and the case study. The values of each literature survey have been checked by interviewing experts.

The second part is a case study. Because the redevelopment of the station hasn't been started yet, it is difficult to make a profound study. This part uses the information of interviews and the available (internal) information. Because the case makes part of a large project, the Zuidas, the first section of the case study will be a description of that project. The case study discusses only one case, what makes the final results of the research not universal applicable. The result of the case study has also been checked with an expert panel.

In the third part of the research there is a combination and analyse of the founded information. This will lead to the most essential points of attention.

The fourth part is a design part. In this phase a process collection will be arranged, based on literature and the case. With interviews the collection will be checked and redefined (see paragraph 4).

These essential points of the last part will be placed into the collection. Out of this situation it is possible to make a demarcation, so the demands of the process will be clear.

The fifth part gives several possible solutions, based on the demands of the last part.

After an analysis, which clearly shows the consequences of each solution, a choice will be made. The chosen solution will be checked with an expert panel (see figure 3)

The sixth and finishing part of the research is to formulate a conclusion and an advice (see paragraph 5).

3.2 Research scope

The complexity of the project is that high, that it is necessary to make a demarcation. This research concentrates on an underground station, what means that the platforms and the station hall are underground. The real estate on the tunnel and the access tunnels fall outside the scope. The client shall formulate a schedule of requirements, which contains the requirements for the station (taken the tunnels and the real estate in consideration). The client for the whole project, the Zuidas, is a Public-Private-Partnership, with the government and the municipality of Amsterdam on behalf of the public part. For the private part of the partnership, some large financial companies are involved. This PPP will be formed in the summer of 2006. All involved actors are now formulating their demands, in preparation to set up. The PPP will be responsible for the development of the whole project area (Brinkman 2004). The complete PPP will be the starting point of this research.
4. LITERATURE

4.1 General

The dividing in subjects of the problem is also found in the literature. Remarkable is the fact that the most of the literature discuss the station area development, and not the station building.

4.2 Underground constructions

About the subject underground constructions there have been written a lot, even though there is insufficient experience in the Netherlands. The last 10 years the COB (the Centre of Underground Constructions) initiated and stimulated many projects, mostly infrastructure. The definition for this research for underground constructing is: the creation of an underground constructions, situated completely under ground level. The cost aspect of underground constructions is very difficult, because it is hard to make an assessment between several variants. How do you balance inconvenience during the building process or the inconvenience of infrastructure above ground level? Material and immaterial values have to be count. The client, usually the government, should also dare to invest in the future.

Underground construction gets more attention in the legislation (public and private law). A major problem is the still missing zoning plan, in public law. By private law it is only allowed to build in own property. For complex projects it often means expropriate, which will take a long time.

The organisation aspect of underground constructing is not different from constructing aboveground. It depends on the building method, where actors are involved in. The final and maybe the most important two aspects of underground constructions are risk management and safety. The costs to repair the incurred damage are that high, they should anticipate on it. The safety-aspect is a social issue and has to be handled carefully.

A conclusion of underground constructions is that many aspects still have to be discovered or redefined.

4.3 Station buildings

In comparison with the number of stations in the Netherlands, 385, the amount of literature governing this subject is very small. Most found is about the stations area, like Brull et al (2004), and not especially about the station building. The literature that is available shows the function of a station, in his environment. This type of stations used to be located outside
the city, now it is a central place in a city and has an intermediary function between urban areas.

The development of internationalisation is very important for the rail industry, and also for the station development. Pol (2002) wrote "As prosperity increases and incomes rise, people want to travel further and faster". When the government decided to join the High-speed train network, it was a starting point for many station redevelopments. Important in this issue is that it is (theoretically) a network model, which means that the diversity of functions on a junction specifies the competitive position.

In theory a station area (with building) is divided in four sections; Transfer, Service, Meet/Commerce and Urban functions (Van Hagen and Peek 2001). This research concentrates on the first three. It is also possible to give different definitions for the station. There are several words for the building, each with his description. This research uses the definition of the term Connector (Van der Spek, 2002), what means; a station where the central point of notice, is the transfer between the several modalities. There are a lot of dilemmas mentioned in the literature. Most of them are related to the management of the development process, in which many different actors are involved. These actors are related to the modalities and to the municipality.

A conclusion of station development is, that it is a dynamic building and not only in organisation, but also spatial.

4.4 Multimodality

The third subject for literature search is multimodality. Not a common word, but it simply means that there is more than one modality. The connection between those modalities in a junction is the difficult and critical point. In the modern society there is a clear demand on multimodal junctions, where travellers can transfer between modalities.

To make such a building implies cooperation with all the actors. In this case the actors are the modality-owners and -users. Therefore multimodality means a multi-actor organisation. The functional and the organisational complexity rise with a multimodal building.

4.5 The organisation

The final subject in this problem is the organisation of the building process of a complex project. A lot of available literature governs this subject. Clear is that a normal and traditional approach is inadequate. Complex projects have many actors, innovative techniques, large risks and a big social impact.

To get an unequivocal control of the project, it is important to choose a clear management method. In the literature survey two methods
have been studied; project management and process-management. The difference between those methods is that project-management tries to realize a project; on the other hand process-management gives more attention to the social aspect, the process between the actor and the decision making. Technical complex projects demand a multi-project-management approach.

To design a building organisation it is also important to determinate the right contract, which will arrange the actors. For building contracts there are many different forms; from the traditional contract, the construction process is put out, till an innovative contract like the concession model which will put out the design-, construction-, maintain-, operate- and finance-process. Each approach has advantages and disadvantages. Complex projects demand an innovative contract.

5 RESULTS

5.1 Analyse of literature and case study

The literature and case study has led to the following list of essential points of attention, for the development of an underground multimodal station:

1. Process properties, like technical and the total time span;
2. Communication with the environment;
3. Layout and design problems;
4. Integral balance frame;
5. A clear view on public law, for the use of the underground;
6. Organize the many actors;
7. Different interests, for example commercial and travel interest;
8. Project management;
9. Safety;
10. Trust between the actors;
11. Different landowners;
12. Risk management.

Most of the time, the responsible actor of the essential points is the project organisation.

5.2 Process collection

For projects of this size, it is necessary to frame a process collection. This means a flowchart of all the processes which have to be passed to develop a project, in this case an underground multimodal station. The term 'process collection' probably confuses, because it is a project management
method. The phases (objective, phasing, control, decision, tuning and cooperation) of project management will be explained below.

The objective of the process and of all actors has to be the development of an underground multimodal station. Innovative thinking about a space which connect and gear modalities, where people can transfer or stay, should be the starting point of the actors.

In complex projects an innovative contract is necessary. That’s why the phasing of this project is different. There are four phases; definition/feasibility-, preparation, realisation and use/maintenance. To control the project they normally use the five control aspects (Money, Organisation, Time, Information and Quality). Because risk management and safety are very important in complex- and underground projects, these two aspects have been added.

Making the right and clear decisions, it is important to have so called ‘decision documents’. Each document will describe the seven control aspects. It will close a phase and it will be a moment to look back and forward on. There are eight different decision documents.

In the tuning phase of project management, there are two important points: the tuning with the environment and the tuning inside the project. The environment in this case is not only the neighbouring people, but also the surrounding working people (and companies) and the project organisation of the tunnels. The tuning inside the project particularly means the anticipation on the coming processes.

The cooperation phase, the most important for this research, centralizes the collaboration between the several actors. To arrange a clear organisation the actors are divided in eight function groups (like government, modality-owners, transporters etc).

After placing this general information in a process collection (or process model), see research report, an overview arises. Together with the essential points of section 3.1, it is possible to make a demarcation for this research. Most of the points concentrate on the cooperation phase. This will be the main point of this research.

The next step is to determine the demands of the process. The process model makes clear that there is a demand for an executive contract, which integrates the design-, build and eventually the operate- and/or the maintenance phase. The executive actor wants to be involved in the designing phase. Another demand is that not all actors are directly involved, some have an advising role.

There are several possible solutions to satisfy the demands of the last paragraph. Four forms have been studied in this research: Design-Build, Design-Build-Maintain, Design-Build-Maintain-Operate and Design-Build-Maintain-Operate-Finance. An analysis decides that the Design-Build-Maintain contract is the best solution. A project organisation will be responsible for the three phases, which means they will be integrated. The design of the building can be tuned in accordance with future maintenance.
Because the project organisation isn't responsible for the operate phase, the travellers interest can be used as a starting point.

Figure 3 is the result of this research. It shows an organisation model, which makes clear the role and the responsibility of each actor. The client is responsible for the first phase, the definition and feasibility. After tendering, a project organisation will be responsible for the design- and constructing phase. In the last phase the client has to hand over his responsibilities to several other actors. The maintenance will also be done by the project organisation. This model is a dynamic organisation diagram, which differs from the models usual used.

These results are a solution of the problem mentioned in this section, the cooperation between the actors in a development process of an underground multimodal station.
Figure 3. Organisation diagram
6. CONCLUSION

The discord in interest, ownerships and obligations make station development projects very complex. For the initiator it is difficult to make an unequivocal decision. Most of the time, this situation will turn out to be at the expense of the travellers. In the current station developments, each actor develops his own part. An integral solution for the traveller is missing. Modalities do not gear. Even when the value of a well organized station is recognized, the actors don’t collaborate to reach this goal. The dividing in roles should be based on traveller numbers, to get an equal division. The models of this research can contribute to get a clear organisation. The responsibilities and part of the competences have been transferred to a project organisation. This organisation will be responsible for the design-, build- and maintenance. The travellers’ interest should be the starting point and not the commercial interest, like the current developments.

The new gained knowledge is that it certainly is possible to create advantage in the organisation of complex projects as railway stations combined with the construction of highways and roads for pedestrians.

The proper approach is in this case to combine the multimodality theory with the traditional process management theories.

7. REFERENCES

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