CRISIS PROJECT MANAGEMENT
THE RELOCATION OF THE FACULTY OF ARCHITECTURE

D.M. Caelers
CRISIS PROJECT MANAGEMENT
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“FAST(ER) TRACKING TRANSFORMATION OF BUILDINGS”
This research is focused on a project management technique called fast tracking. Fast tracking is the integration of design and construction phases by arranging work packages of the total project and overlapping the design and the construction of these packages as well as overlapping the total work packaging. Figure 12 shows the difference between traditional project management and fast tracking management.

The objective of this research is to obtain knowledge on the consequences of implementing fast tracking in order to find a successful way of implementing fast tracking in crisis situations in the Netherlands. A case study is used as research method. By comparing theory on traditional project management with theory on fast tracking management and project management used in the case, conclusions can be drawn about the aspects of fast tracking and the implementation of this technique in a crisis situation in the Netherlands. The processes of project management used in the Project Management Body of Knowledge, the 9 Knowledge Area’s, are used to separate the concept of project management in more tangible pieces. The following sums up the results of the research.

1.1.1 INTEGRATION MANAGEMENT

Theory on project management suggests processes to integrate and coordinate all plans throughout the project. Integration is executed by the architect in traditional situations. Theory on fast tracking suggests subdividing the deliverables into so called work packages and executing them simultaneously where possible. It further suggests appointing a managing contractor as soon as possible to oversee the integration of these work packages. In the case study, a project group with representatives of all aspects of the project was created to perform as a managing contractor. The university wanted to be in complete control of the project, therefore taking up the responsibility to integrate all aspects instead of appointing one person with this task. Lack of experience in fast tracking was counterweighed by the familiarity and success in collaboration with each other.

1.1.2 SCOPE MANAGEMENT

Theory on project management proposes several processes to define and divide the project deliverables and controlling changes in the course of the project. Fast tracking theory suggests investing time in defining the scope, because it can prevent a lot of change orders at a later stage. It suggests designing the project for buildability and speed, thus simplifying it. The case study had the unique situation that most of the brief was already formulated in research undertaken prior to the destruction of the building. This only needed adaption to the chosen building on the Julianalaan. Simplifying the design for buildability and speed was a starting point, but during the course of the project, quality became more important than buildability.

1.1.3 TIME MANAGEMENT

Project management theory describes time management as formulating a schedule based on the sequence and duration of all necessary activities. Fast tracking suggests minimizing the activities, and maximizing the pace at which these activities are executed. The main time management factor in fast tracking is the sequencing and overlapping of the work packages. Theory furthermore proposes the implementation of incentives and penalties to assure timely completion. The use of advanced information and communication technology and additional workforce can be used as well. The theory hardly mentions anything about permit applications and approvals. This was essential in the case study. The project would never have been completed on time without the request for ‘compelling urgency’ and the close collaboration with the municipality, fire department and other approving institutes. Incentives were hardly used.

1.1.4 COST MANAGEMENT

In traditional project management it is not very difficult to estimate the costs since the project is well defined. Some contingencies will be taken into account, but the general picture is clear in the over-the-wall method. Fast tracking deals with a lot of uncertainty regarding the work to be executed. Literature therefore suggests bringing in the contractor at an early stage to make the design as efficient as possible. The theory also points out the division of risk and its consequences in the contracts. The university wanted a certain level of quality, therefore the influence of the contractors in the design were kept to a minimum. The architects still made an effort to keep the design as efficient as possible, trying to reuse as much as possible. Cost control was still problematic as the unknown variables in the designs turned out to be quite more expensive than estimated. High quality and timely delivery were far more important than staying within the budget.

1.1.5 QUALITY MANAGEMENT

Theory on project management describes a quality control system composed from quality planning, quality assurance and quality control. Fast tracking theory suggests adopting standard and easily available elements, applying a cost-benefit analysis and quality assurance through continuous quality checks. It differs from traditional project management only slightly, by suggesting to make the choice of materials depending from availability. Quality management in the case study took place through decision making based on cost-quality ratio rather than the cheapest option. Technical quality control was done by the project leaders at every milestone. The many architects involved were concerned with the aesthetic and functional quality, but since no aesthetic quality level was noted at the start of the project, this was subject to their vision.

1.1.6 HUMAN RESOURCES MANAGEMENT

Theory on project management describes defining roles, responsibilities and relationships as part of human resource management. Fast tracking theory emphasizes the need for experience and flexibility in team members. It also limits the architects’ role, who, in traditional projects, is the manager. In fast tracking he will only do the designing and design related activities. The case study shows the importance of experience. Both the benefits of experience in prior collaboration with one and other, as well as the lack of experience in fast tracking were noticeable. Role definition amongst architects was at some moments unclear, but still worked out in the end.

1.1.7 COMMUNICATION MANAGEMENT

Project management theory states that communication management is determining who needs what information at what time, and who needs to be in contact with whom. Theory on fast tracking suggests the use
of advanced information and communication technology in order to prevent communication problems through the pace of the project. It also suggests appointing a managing contractor at an early stage, who provides everyone with the latest information. The case shows the benefits of communication management through the excellent contact with third parties: municipality, fire department, students, teachers, residents. Having the project team work at the construction site helped a lot in communicating with all parties. The case also provides situations where communication failed. On multiple occasions work errors were made because the drawings used were not the latest version. Apart from documentation problems there were still some communication lines that were too long, slowing down the project.

1.1.8 RISK MANAGEMENT

Traditional project management, the over-the-wall method, has clear definitions on which party bares what risk. In the Netherlands this is stated in the DNR and UAV regulations. In fast tracking the involvement of different parties is ongoing and there are no clear boundaries about who bares what risk. Literature suggests allocating risk to the party best suited to deal with the risk. It is possible to appoint a managing contractor to bare all risk, but this will be an expensive solution. The most remarkable thing about the case is that the university took on almost all the risk. It seemed the fastest way to work with everyone, since fighting over who is responsible for what would only slow down the project.

1.1.9 PROCUREMENT MANAGEMENT

Traditional project management has a straight forward way of procurement. The specifications and conditions are submitted to a tender, where all contractors get the opportunity to provide a bid for the works. The contractor with the lowest bid wins the contract. In fast tracking the cheapest solution might not be able to get the building finished in time. Therefore quality and experience are more important than price, making the selection criteria for the tender more complicated. Procurement in the case study was not always running smoothly. Decisions would take so long that by the time the order was formally agreed upon, the works were already finished, preventing any type of competitive tendering. On a positive note, due to the compelled urgency of the situation, the university was free to decide which contractor to use, instead of submitting to the European Procurement Legislation which would take a very long time.

1.1.10 MAIN CONCLUSION

All nine knowledge areas provide elements that are important to successfully manage a fast tracking project. These nine areas are not completely independent but have strong relationships and affect each other. It is impossible to name just one of the nine subjects as the most important one. Obviously time management is essential since fast tracking is used to speed up a project. Still, communication management seems to turn up at every other element as an influencing factor. In general, one could state that fast tracking deals with a lot of unknown variables. And although good overall management can provide support, it is likely that unforeseen event will take place. It is therefore the flexibility and commitment of the parties involved that, in the end, make or break a fast track project.

1.1.11 RECOMMENDATIONS

The first and foremost thing to realize before starting a fast track project is if it is necessary to deliver the building this fast. There is a driving force needed to maintain the critical deadlines. This can be commercial (being faster than competitors or being able to start production or sales sooner) or social driving force (providing shelter after a disaster). In order to use fast tracking successfully in the Netherlands there are a few points of attention:

- Overcoming scepticism: both (public sector) clients as well as contractors fear the increase of risk involved in fast tracking.
- Avoid excessive paperwork: a lot of time can be saved by reducing the bureaucratic paperwork, especially with regards to public bodies and obtaining approvals.
- Provision of standard forms of contracts: at this time there is no standard form of contract aimed at fast tracking. By creating successful standard forms, some of the scepticism may be overcome.
- Use a managing contractor if possible: having an experienced professional controlling the management aspects can be vital in the success of a project.
- Assure contractors of continued work: make sure that they can keep their key personnel occupied and avoid a ‘hire and fire’ situation, or non-workable hours.
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David Caelers

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PREFACE

It has almost been a decade ago that I first set foot inside the faculty of architecture. If someone would have asked me back then what I aspired to become, I would have told them I wanted to design buildings that would improve society. As the years passed, those wild, creative architectural ideas for buildings made way for thoughts of improvement of society through optimization of the building process rather than a design of a building. The dreams of beautiful buildings were replaced with the harsh reality of the construction world in which so many things have room for improvement.

I have been carrying around this project for almost two years now, one year in the field, and the remainder in literature and writing this thesis. The thesis was written with much joy as the project had become a part of my life. Not everyone gets to be a part of the subject they research and therefore I feel privileged to have been given this opportunity.

The way we interact as human beings has always fascinated me. The collaborations in design and construction management are in fact just that: interactions between people from different organizations with different goals and objectives but yet one mutual goal that binds them together; successfully delivering a building. The depth of these interactions is tremendous, both on a personal level as on a professional level, but it is the professional level that we seek to improve at design and construction management. I would like to think that my study at this faculty has given me more insight in how to do just that.

I would like to take this opportunity for thanks and acknowledgements to people who were helpful to me. Never would I have been able to get all the information I used without the position that Louis offered me in the project organization. Not only has he given me the opportunity to observe and participate in the project organization, he has also been my leading mentor throughout the research. Fred’s support as my second mentor has been much appreciated as well. I would also like to thank Theo van der Voordt, for helping me with my analysis method, and Hans Wamelink, who helped me out every now and then as he is not only the head of the department but also the chief project manager in this project. A thank you goes out to all the participants in the project that helped me in one way or another, especially the people at FMVG. Last but not least I would like to thank family, friends and colleagues for their support, patience and understanding.

This report is dedicated to the former faculty building of architecture; Berlageweg 1.

David Caelers

6/26/2010, The Hague
1 INTRODUCTION

This first chapter is meant to explain the structure of this thesis and results it aims to achieve. The chapter starts off with a brief description of what happened to the Faculty of Architecture on May 13th, 2008. The second paragraph will explain the motivation for writing this report. The objective of this report is discussed in the third paragraph. The chapter ends with a fourth paragraph in which a reading guide will clarify the structure of this report.

Figure 1 Newspaper clippings

“TU becomes tent camp”

“Fire destroys TU Delft”

“Facility of Architecture in ashes”

“Brand verwoest TU Delft”

“Historische collecties voor een deel uit ‘t puin gered”

“TU wordt tentenkamp”
1.1 A CATASTROPHE TAKES PLACE...

On the 13th of May 2008 a short-circuiting in a coffee machine caused a fire that devastated the Faculty of Architecture at the Delft University of Technology. This disaster shocked the employees and students and robbed them from their ‘academic home’.

Immediately after the fire had ravaged the building, the faculty turned to the adjacent sports field for shelter by setting up a tent camp. This was obviously meant only as a temporary relocation. Shortly after the move to the tent camp, a project team was composed to start relocating the faculty as soon as possible to a more permanent place. In less than a week, the project group had narrowed the possibilities down to a few options. After these options were discussed, the choice was made to refurbish the old main building of the university.

Figure 2 Destruction of the faculty building

Many ideas and views were discussed at this time, but three criteria stood out above all. On September 1st of 2008 the new faculty needed to be finished and operational. This meant there was only 3 months to relocate the entire faculty. Time was the number one criterion. The new location for the faculty needed to be in Delft, and preferably near the university campus. This excluded many offers that were made regarding real estate in the surrounding area of Delft. The third criterion was that all staff members and all students needed to be located in the same faculty building.

Figure 3 Temporary shelter in tents

1.2 MOTIVATION

1.2.1 PRETEXT

A crisis situation occurs: Due to a disaster a building is lost including all of its facilities. The situation was obviously unforeseeable and the organization that was located in the building is suddenly homeless. The number one priority is to obtain a building as soon as possible with comparable facilities to minimize the loss of activity by the organization. There is no time for a standard building process.

1.2.2 FAST TRACK CONSTRUCTION

In order to save time, the design process and construction process will take place simultaneously. This is done without the implementation of a design-build contract, or any other integrated contract. The organizational structure of the process is traditional; also known as the over-the-wall method. When overlapping the design and construction phases in the over-the-wall method, a fast track project is created. Fast tracking can occur in various intensities, but in this case the concurrency of the phases needs to be as extreme as possible.

1.2.3 PROJECT MANAGEMENT

Overlapping design and construction phases to the extreme will have consequences for the project management. Fast tracking is not very common in the Netherlands. There are many uncertainties and risks to
be dealt with in fast tracking. In normal situations the delivery time is already calculated into the project at its inception. Accommodation is secured by overlapping the stay in one location with the construction of the future location. A disaster eliminates this option.

### 1.3 AIMS OF THE STUDY

The research is aimed at gaining knowledge on the impact fast tracking has on the design and construction process. By analyzing both project management and fast tracking in theory, and a fast track construction example as a single case study, conclusions might be drawn that can benefit the successful implementation of fast tracking in the Dutch building industry.

### 1.4 STRUCTURE

Chapter 1 is meant to acquaint the reader with the subject of this report and the reason why it is written. The occasion that led to this research is mentioned here as well.

In Chapter 2 the framework of the research is clarified. The problem is defined and with it the objective of the research. In this chapter the relevance of the research is advocated. The chapter ends with and explanation of the research method and the method used to analyse the data.

The theoretical background is explicated in Chapter 3, Chapter 4, Chapter 5 and Chapter 6. In these chapters terms like crisis management, project management and fast tracking are addressed and supported by a literature survey. This chapter embodies the research framework from the previous chapter.

Chapter 7 describes the empirical research. It shows the findings of the research of: case study, the relocation of the Faculty of Architecture to BK City. The full data collection can be reviewed in the appendix. This chapter only shows the highlights that were relevant to this particular research.

In Chapter 8 the research framework, as described in the second chapter, completed with the relevant literature from the third chapter, is used to analyse the data collection from the fourth chapter. Try to imagine a pair of spectacles: chapter two being the frame, chapter three the lenses and chapter four the item you are looking at through the spectacles.

The analysis is used in Chapter 9 to formulate conclusions on the researched matter. A bridge is made between theory and practice in order to find a solution the problem as stated at the beginning of this report. Some of these conclusions can be considered lessons learned from the specific case, other conclusions are applicable to other projects.

Some recommendations are suggested in Chapter 10. Suggestions on how to implement the conclusions are stated here as well as ideas on what research can still be undertaken in the future, to complete or supplement this work.

Chapter 11 is a postscript including my personal opinion on both theory and the case study. This afterword is a personal reflection on the research undertaken and the results it has produced.
2 RESEARCH FRAMEWORK

A well-defined research framework is the backbone of an academic research. It gives insight to the problem(s) that motivated the research and provides insight in the possibilities with the outcome. The chapter starts with a description of the situation and the problems that arise from this situation. After analyzing the problem, a definition of the problem is stated and a hypothesis is assumed. The objective of this research will be described before formulating the research question. In order to enclose the field of research, the scope is defined in the research outline. The relevance of the research will be discussed before finalizing this chapter by describing the research and analysis methods.

2.1 PROBLEM DESCRIPTION

With organizational structures becoming more complex, our society is confronted with an increasing susceptibility to numerous and diverse catastrophic events. All too often, the impact of man-made or natural disasters is compounded because policymakers have prepared neither themselves nor the public for appropriate responses once tragedy strikes.2

When a disaster occurs, and a building is lost, finding an adequate new location is the primary objective. In order to obtain such a building as soon as possible, a faster delivery method is needed. The consequences of speeding up a construction project are not always foreseen, especially when the time pressure affects the decision making process. This research will try to gain knowledge on the effects the acceleration of a construction project has on project management, and what measures can be taken to successfully manage such a project.

2.2 PROBLEM ANALYSIS

The problem analysis starts with the description of the situation that needs to be resolved, and ends with a problem statement on which a research can be based.

2.2.1 NEED FOR SPEED

With regards to the building industry, a disaster usually leads to the loss of one or more buildings. Especially when a disaster is unforeseen, like for instance a fire, it is impossible to prepare for such an event. The first response after such a tragedy is to make sure all users of the building will be able to continue the activities that they performed in another location. In some cases it is possible to accommodate the users in available vacant premises. This would often lead to the group of users to be divided, due to limited vacant spaces. In some situations dividing the group is not an option. A new building is needed to accommodate the entire population from the destroyed building. The need for such a building is much higher compared to any other circumstance. This leads to the delivery time of this new building to become the most important factor of the relocation.

2.2.2 TIME VERSUS COST VERSUS QUALITY

One of the very basics of project management, which is applicable to many things in life, is the triangle of Cost, Time and Quality. The triangle works on the principle that as more emphasis is placed on one element, less is placed on the others. The theory states that you can have at most any combination of two of the forces in your favour, but the third will suffer.

Example: you can have a project that is high quality with fast delivery, but you will pay higher costs for it. Similarly, you can have a project that delivers quickly at a low cost, but the quality will suffer.

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2.2.3 FAST TRACKING

Nokes, et al (2007)³ describe four ways of accelerating a project:

1. Reducing scope; if speed has priority, compromises have to be made in other areas, like the scope.
2. Changing the relationships between tasks (structure); for example; delete unnecessary tasks, review dependencies, try overlapping tasks
3. Shortening individual tasks; re-examine task estimates and adjust resource levels
4. Re-allocating resources on critical chain tasks

The first thought that comes to mind when expediting a project delivery time will be to accelerate the different phases of a building project. These phases of a building project are named differently in all sorts of management books, but let us use this general idea as an example:

1. Programming; also known as the brief.
2. Design; in different phases: conceptual, preliminary, final
3. Approval; by the municipality, or other government body. Obtaining all necessary permits.
4. Bidding; and negotiations, resulting in contract award.
5. Construction; and finally completion

By shortening the time scale by means of increasing productivity, that is, by completing each function as efficiently as possible and starting each new phase immediately upon completion of the preceding phase, some time will be saved. Yet this means that all phases of the project undergo the same stress by placing more emphasis on the ‘time’ element. Furthermore it is based on the assumption that all phases have room for more efficiency, meaning they are slacking in the ‘normal’ situation.

Another way of saving total elapsed time would be by compression of the time schedule. That is, by overlapping some of the functions; doing two things at the same time. This would be accomplished by starting a new phase of work where possible before the preceding phase is completed. Time saved by concurrent work will accumulate and appear at the end of the construction period in the form of early overall completion. Organizing the project to produce early completion by the technique of concurrent or overlapping time scheduling is the essence of fast track construction.

Figure 5 shows an example of fast tracking. Whether the phases are executed overlapping each other or the stages within a phase does not matter. This will be further discussed in Chapter 3: Theoretical Framework,

2.3  PROBLEM DEFINITION

When confronted with a disaster, a situation might occur which forces a construction project to be accelerated. Through concurrent designing, engineering and construction it is possible to gain a considerable amount of time. However, the consequences of these actions are not completely clear. We assume that if the element ‘time’ is emphasized, other elements will suffer. Does this mean that a fast track project is doomed to fail?

2.4  OBJECTIVE

In order to successfully complete a fast track project it is necessary to understand the consequences of the fast tracking aspects with regard to the project management. The cause for implementation of fast tracking needs to be specified as well as the area it is executed, since they influence the possibilities of fast tracking due to laws and regulations. Through using the transformation of the Main Building of the Delft University of Technology into the Faculty of Architecture: BK City as a single case study, the research field is narrowed down to crisis situations in the Netherlands.

The factors that are of importance in fast tracking need to be identified and analyzed. The functions of participants in fast tracking are important as well. A balance should be used to weigh the benefits and risks of fast tracking in order to form a recommendation. This recommendation is aimed at improving the application of fast tracking in the Dutch building industry.

2.5  MAIN RESEARCH QUESTION

In order to find a solution to the problem discussed in this chapter, one main research question is proposed to direct this research:
In order to find the solution to the problem statement there are three fields to be researched. The field of project management needs to be documented in order to form a framework. Project management can be divided in different aspects that need to be addressed individually. The second field is the area of fast track construction. By using the framework created by the project management research the differences between traditional project management and management of fast track projects can be analyzed. The third field is a case study which can be used to compare the theory with practice. Moreover, the case study can be used to see to what extent fast tracking can be implemented in the Dutch building industry. The following questions will be answered in order to obtain a satisfying answer to the main research question:

- What is project management?
- What are the knowledge areas of project management, and how do you control them?
- What is fast tracking?
- What are the consequences of fast tracking for project management and its knowledge areas?
- Which aspects of fast tracking are applicable for the Dutch building industry?
- How did project management take place in the case study of BK City?
- What lessons can be learned from the case study for further implementation of fast tracking in the Dutch building industry?

2.6 RESEARCH OUTLINE

It is crucial to determine the outline of the research since research can continue indefinitely otherwise. Therefore the scope of the research needs to be clear from the start.

Three approaches to project management were explored to find a satisfying structure to create the foundation of the research framework. There are obviously many more approaches to project management to be found in literature but in the context of this research it seemed sufficient to have a look at these three.

The amount of literature to be found on the topic of fast tracking is quite scarce, and close to none-existing in regard to Dutch literature. Furthermore, different articles and books describe fast tracking in a slightly different matter. Since it is not the objective of this research to redefine the notion ‘fast tracking’ a select number of views are discussed after which one is adopted.

The empirical part of the research is based upon a single case study. The paragraph Research Method discusses in which way a single case study can still provide a basis for a valid research. Certain aspects of this case are explicitly used to determine the outline of the research. Legislation and regulation have an enormous impact on the building industry. Furthermore, there are differences in working culture that need to be taken into account. This research focuses on implementation of fast track in the Dutch building industry, so local legislation and work ethics / business culture is taken into account. The aspect of a crisis situation is important to consider as well. It influences both local and European legislation, and is therefore part of the research question.
2.7 RELEVANCE

Relevance is a term used to describe how pertinent, connected or applicable something is. Something is relevant if it serves as a means to a given purpose. Definition: Something is relevant to a task if it increases the likelihood of accomplishing the goal, which is implied by the task.5

This research has relevance in more than one way. There is a social relevance, which will benefit society. There is also a commercial relevance, making it lucrative for market parties and other participants. Eventually there is even an academic relevance as this research will add to the currently available information on this subject.

2.7.1 SOCIAL RELEVANCE

This research has relevance in a way that will hopefully benefit society. The starting point is the need for a sheltered place where people can come together. Whether this place is a factory, a school, an office or a housing complex, the need for the building is so severe that time is essential. A successful implementation of fast track construction can therefore provide a service for those people that suffer from the crisis.

2.7.2 COMMERCIAL RELEVANCE

The commercial relevance of this research originates from a the famous quote by Benjamin Franklin: “Time is money”. A successful implementation of fast tracking should lead to all parties benefitting from the time saved. If the time saved does not directly result in a financial benefit, it will definitely benefit in another way. For instance, the user/client might not necessarily gain direct financial benefits from fast tracking, he WILL be able to utilize the building much faster compared to a normal situation.

2.7.3 ACADEMIC RELEVANCE

There is also an academic relevance for this research. Up to now only little has been written in the Dutch literature on fast tracking in design and construction. Not much is known about its opportunities and its weaknesses. Therefore this research could be used as a starting point to explore the options of fast track construction in the Dutch building industry.

2.8 RESEARCH METHOD

2.8.1 RESEARCH APPROACH

An inductive research approach was used, iterating between empirical findings and concepts, to draw inferences about the processes required to deliver projects to meet cost, time, budget, quality, and other targets.6 The difficulties of building theory from a single case study are recognized and it is suggested that the framework is treated as a proposition, for further rigorous testing and refinement on multiple case studies and surveys of comparable projects.7 The case was selected because there was unusual research access to explore a significant phenomenon, providing conceptual insights about how fast tracking is used to improve project performance.

2.8.2 ACTION RESEARCH

My involvement in the project made this case study research slightly different from the typical methods used. My affiliation with the project and thus the case defined this research as ‘action research’.

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Definition of action research: Action research may be defined as an emergent inquiry process in which applied behaviour science knowledge is integrated with existing organizational knowledge and applied to solve real organizational problems. It is simultaneously concerned with bringing about change in organizations, in developing self-help competencies in organizational members and adding to scientific knowledge. Finally it is an evolving process that is undertaken in a spirit of collaboration and co-inquiry.8

2.8.3 CASE STUDY RESEARCH

The foremost method of research used is the case study research. The case study method is generally used when:

1. The research question is typically seeking to answer questions like “how” or “why”.
2. The investigator has little or no possibility to control the events.
3. The circumstances of the subject to be studied is a contemporary phenomenon in a real-life context.

A case study is an empirical inquiry, in which the focus is on a contemporary phenomenon within its real-life context and the boundaries between the phenomenon and its context are not clearly evident. The procedural characteristics include many variables of interest, multiple sources of evidence and theoretical propositions to guide the collection and analysis of data.9

Case studies can be descriptive, exploratory or explanatory. In a sense, this research covers all three of these types.

EXPLORATORY

Exploratory research involves gathering information and developing ideas about a relatively under-researched problem or context (fast tracking in design and construction management in the Netherlands). The value of exploratory research could be that it clears the ground for other kinds of research, or that it throws up interesting differences and comparisons between more well-studied topics (traditional project management) and those that are less well-studied (fast tracking). The prime purpose is to develop understanding in an area that is little understood. Since 'exploratory research' implies there is less of a basis from which to conduct research, and that a given area is not well understood, it is more appropriate to carry out this kind of research using qualitative methods (single case study). Though one might develop hypotheses, this kind of research would not involve testing particular hypotheses.

DESCRIPTIVE

Descriptive research involves describing a problem, context or a situation. This is a feature of exploratory research as well of course; however descriptive-type questions are generally more structured, and more reliant on prior ideas and methods. You would more usually be describing what was happening in terms of pre-existing analytical categories, or relying on other ideas in some way. The basis for investigation might be a body of ideas in a given field, or related area, and it could be the case that you develop hypotheses and explanations for what is going on. This type of study could be suited to either qualitative or quantitative methods: for example a case study is a descriptive piece of research; but statistics and numerical data can also be used to describe.

EXPLANATORY

Explanatory research can be thought as being concerned with causes. The focus here is on seeking and providing, or evaluating an explanation between two or more phenomena (emergency situations and fast-tracking). Explanatory research typically seeks to identify and explain a causal relationship that is substantively important or meaningful. In this kind of research, people typically develop hypotheses to be tested and, then

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see whether the data they have collected can be called on to support or refute those hypotheses. This type of approach is more likely to employ quantitative methods, typically a survey, but one could also seek explanatory type research using case study, or observational data.10

2.8.4 DESCRIPTIVE RESEARCH

As a starting point in this research, the descriptive research method is adopted to collect a lot of knowledge. A methodological way to collect knowledge is the precise description of reality. The subject of description can relate to facts and wishes, to people and material objects, to plans and realised buildings. Two questions are of prime importance: ‘What is going on?’ and ‘How is it going?’11

It is characteristic for descriptive research that it is restricted to factual registration and that there is no quest for an explanation why reality is showing itself this way. Another characteristic of descriptive research is objectivity or neutrality; descriptive research is making inventories.12

The approach of descriptive research can vary greatly. The advantage of a case study (casuistry) is that it allows deeper penetration into the core of the matter. The corresponding disadvantage is that it is often difficult to generalise on the basis of one single case and to draw general conclusions.13

<table>
<thead>
<tr>
<th>Players / Responsibilities</th>
<th>Initiative</th>
<th>Preparation</th>
<th>Design</th>
<th>Construction</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objectives</td>
<td></td>
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<td></td>
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<tr>
<td>Activities</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Aimed result</td>
<td></td>
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<tr>
<td>Time schedule</td>
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</tr>
<tr>
<td>Time spent</td>
<td></td>
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<tr>
<td>Costs</td>
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<tr>
<td>Information / tools</td>
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<tr>
<td>Positive/negative experience</td>
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</tr>
</tbody>
</table>

Table 1 Possible framework for a systematic description of a plan process14

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14 Jong T.M. de & Voordt D.J.M. van der (2002). *Ways to study and research urban, architectural and technical design* ed. by T.M. de Jong and D.J.M. van der Voordt. Delft: DUP Science
A lot of descriptive research is trying to describe reality according to a systematic approach rigorously followed. Usually it is based on theoretical considerations and is dependent on the objective of the study as well. Table 1 shows an example of a framework for the systematic description of a plan process. It was endeavoured to get specific information about a project per stage of the project. Based on this example, a framework was constructed to describe the findings of the case study.

2.8.5 DATA COLLECTION

The case study data collection has taken place from the beginning of September 2008 till October 2009. By joining the project organization the opportunity presented itself to have full access to all aspects of the project. During this time data was collected in several ways. This will be further explained in Chapter 4: Empirical Research.

The result of this data collection is a vast dossier including all documents, drawings, calculations, correspondence, minutes and interviews. In order to make this information tangible, a selection had to be made. The primary sources of information and the only official moments of decision-making where located in the minutes that were often, but not always, kept. During these meetings, conversations with participants and the site visits I would make more personal notes that include my point of view on the situation at hand. A summary of the minutes and my weekly notes (memoirs) are the foundation of the data collection.

An overview of the data collection shows the organizational structure on one axis, and time on the other axis. The memoirs are not part of the organizational structure, but meant as a second perspective on the events taking place. This gives an idea of the process that was going on in different levels of the organization, during the length of the project.

<table>
<thead>
<tr>
<th></th>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
<th>Week 5</th>
<th>Week 6</th>
<th>Week 7</th>
<th>Etc...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steering committee</td>
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<tr>
<td>Project group</td>
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<td></td>
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<tr>
<td>Design team</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Construction team</td>
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<tr>
<td>(Memoirs)</td>
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</tbody>
</table>

Table 2 Framework for data collection

This overview is the foundation but not the only result of the data collection. I was given the opportunity to interview some of the project leaders. Project leaders were managers in charge of a sub-project within the project. I have spoken with the project leaders of the mechanical installations, electrical installations, fire safety, security, acoustics and asbestos sanitation.

Another source I have used is the recently published "The Making of BK City" in which all parties involved are interviewed. Although I was not the interviewer, some of the results of these interviews are useful for this research. Since this data is not set against a time line but rather a look back onto the project by individuals involved, it will be kept separated from the overview.
2.8.6 LITERATURE SURVEY

The literature survey consists of books and articles concerning the field of project management in general and fast track construction. Countless books have been written about project management with many different theories that overlap for the larger part. With the data collection in mind, I chose to proceed with the Project Management Body of Knowledge from the Project Management Institute. It is not really of great importance what framework is used because the content is generally the same. In contradiction to the subject project management there are not that many books written about fast track construction. The books that refer to fast tracking and concurrent construction were combined with articles in different construction and management magazines and articles on-line to obtain a complete view on the matter.

An overview of the literature survey in Table 3 shows traditional project management and fast tracking on one axis, and the knowledge areas of project management, as described by the Project Management Institute on the other axis. This makes the different aspects of project management comparable in traditional and fast track projects.

<table>
<thead>
<tr>
<th>Integration</th>
<th>Scope</th>
<th>Time</th>
<th>Cost</th>
<th>Quality</th>
<th>Human resources</th>
<th>Communication</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project management</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fast track management</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The cells should include a short description of what the literature states on the subject

Table 3 Framework for literature survey

2.9 ANALYSIS METHOD

2.9.1 DATA ANALYSIS

The framework, created by the literature survey, is used in the data analysis as a strainer to capture the process of the case study in terms of project management. It also gives the opportunity to compare traditional project management, fast track project management and the specific project management aspects in this case study.

An overview of the analysis in Table 4 shows traditional project management, fast track management and the organizational structure (the elements from the data collection) on one axis, and the knowledge areas of project management on the other axis. The interviewees from the data collection, both from my interviews and the books’, will be added to the organizational structure. This overview will show, per aspect of project management, the differences between traditional project management, fast track project management and the specific project management in this case study.
Now that all information has been dissected into tangible pieces it is time to compare and conclude. These conclusions will form the base for recommendations regarding fast track project in crisis situations in the Netherlands. For example: cost management will be explained from the Project Management Body of Knowledge point of view, after which the implication for fast tracking are stated, followed by a description on ‘who’ did ‘what’ in the case study with regard to cost management. By comparing these three, conclusions will be drawn.
3 THEORETICAL FRAMEWORK: CRISIS MANAGEMENT

Our society is susceptible to catastrophic events, including all sorts of disasters and crises. Risk, uncertainty, crisis, collective stress, and "normal accidents" need to be incorporated into a broader understanding of how governments and decision makers respond to the un-ness of crisis situations: unpleasantness in unexpected circumstances, representing unscheduled events, unprecedented in their implications and, by normal routine standards, almost unmanageable.15

3.1 CRISIS DEFINITION

Hermann defined a crisis in 1972 as a situation that threatens high priority goals of the decision-making unit, restricts the amount of time available for response before the decision is transformed and surprises the members of the decision-making unit by its occurrence.16 However, this is a very classic definition and even though it seems accurate at first glance further examination and application to social, political and organizational circumstances has led to reformulate the definition of crises: "[Crises are] a serious threat to the basic structures or the fundamental values and norms of a social system, which -under time pressure and highly uncertain circumstances- necessitates making critical decisions".17

3.2 CRISIS DECISION MAKING

Decision-making in crisis situations is often perceived as a completely unique approach to decision-making. Research has shown that some of the decisions made in crisis situations are just routine decisions and only some are complex, crisis decisions. Crisis decisions are very similar to complex decisions and have many of the same characteristics, like; many actors with conflicting interests, decision-making tied up with other problems, uncertainty regarding the nature of the problem, information issues, chaos between long-term and short-term considerations and the irreversible nature of the decisions.18 The difference between crisis decisions and complex decisions are two elements that are added to crisis decisions: threat and urgency. Decision-making in crisis situations implies the deliberation and selecting of policy plans, of which the consequences will have effect far beyond its time and place, under critical circumstances.19

3.3 DO’S & DON’TS IN CRISIS DECISION MAKING

Some do’s and don’ts on crisis decision making, according to Boin & McConnell (2007), to take into account when reviewing the empirical data.20

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### Table 6 List of do’s and don’ts in crisis decision-making

<table>
<thead>
<tr>
<th><strong>DO’S</strong></th>
<th><strong>DON’TS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Create expert networks</td>
<td>Sticking with the plan</td>
</tr>
<tr>
<td>Facilitate systems for the identification of capable partners</td>
<td>Waiting for all facts and figures before making critical decisions</td>
</tr>
<tr>
<td>Learn how to support and facilitate emerging nodes of coordination</td>
<td>Acting as if the command and control structure still exists</td>
</tr>
<tr>
<td>Train for situational and information assessment</td>
<td>Waiting for outside help</td>
</tr>
<tr>
<td>Organize outside forces</td>
<td>Spreading unverified rumours</td>
</tr>
<tr>
<td>Work with the media to provide a crisis rationale</td>
<td>Initiating the ‘blame game’</td>
</tr>
<tr>
<td>Initiate long-term reconstruction</td>
<td>Berating the public</td>
</tr>
</tbody>
</table>

Treat the media as an enemy

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4 THEORETICAL FRAMEWORK: PROJECT MANAGEMENT

Project management is the core subject of this research. It goes without saying that there are many views on what project management portrays. Libraries are stacked with literature on project management. In view of this research, a project management theory/approach is needed to build a research framework for the case study and the information on fast tracking. An approach is needed with elements that benefit the framework in such a way that it helps analyzing the studied data. In light of this research three proven approaches are looked into in order to make a choice.

Projectmatig werken (PMW) is an approach that is very commonly used in the Netherlands. It is built on three core elements: Phasing, Deciding and Controlling. "Projectmatig" could be literally translated as "by means of projects", but project management covers the idea as well. It intends to accomplish activities through balance in singleness of purpose, efficiency and adaptability.22

PRojects IN Controlled Environments (PRINCE2) is a registered trademark of the Office of Government Commerce (OGC), an independent office of HM Treasury of the United Kingdom. It covers the management, control and organization of a project.23

The Project Management Body of Knowledge (PMBOK) is published both by the Americans (The Project Management Institute, Inc) and the British (The Association of Project Managers). In this case, the American version is reviewed.

4.1 PROJECTMATIG WERKEN (PMW)

Wijnen, Renes, & Storm (2001) define ‘projectmatig werken’ or ‘PMW-management’ as one of three methods of executing activities. The other two are ‘routine-management’ and ‘improvisation-management’. Routine-management is focused on efficiency, improvisation-management provides flexibility but PMW-management offers a result-oriented and effective approach. Using the routine approach is helpful when a certain result has to be reached over and over under the same circumstances. The improvisation approach is the logical way to follow when the objective and the circumstances are completely unknown and the means to obtain the required result are unfamiliar. PMW is the best approach when the objective is not unknown, but holds a number of unknown elements. When the result has to be obtained by combining different disciplines and limited resources, PMW is the best approach. The basics of PMW are the elements Phase, Control and Decide.

4.1.1 PHASE

This means defining, arranging and executing all activities and tasks necessary to determine and achieve the desired objective. All activities and their correlative relation are essential in getting the job done. A project is defined by six fundamental phases:

1. **Initiative phase**: In this phase the reason/relevance for this project (the ‘why?’) is considered. The objective is formulated and the scope is determined.
2. **Definition phase**: The goal of this phase is to thoroughly identify demands and wishes regarding the end result. These requirements are categorized in precondition, functional demand, operational demand and draft limitation.
3. **Design phase**: The objective of this phase is to draft solutions. It stipulates what the requirements will look like in the final stages.
4. **Preparation phase**: The activities during this phase should guarantee a flawless realization phase. The switch is made from ‘top-down’ thinking to ‘bottom-up’ thinking.
5. **Realization phase**: This is the phase in which all prior phases are integrated. It is the fabrication, implementation, execution and performance needed to obtain the end result.

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6. **Follow up phase**: this phase is needed to make sure the objective is reached and maintained. During this phase all interferences, failures, malfunctions and breakdowns are remedied and prevented.

### 4.1.2 CONTROL

This is the management aimed at efficient, flexible, creative and accurate planning and supervising of the activities mentioned in the phases. These activities are divided in five categories:

1. **Time management**: making sure the project will be delivered on time.
2. **Cost management**: making sure the project gets delivered within the allocated budget.
3. **Quality management**: translating the requirements in measurable quality demands and making sure the quality level gets delivered.
4. **Information management**: identification, registration, distribution and supervision of all information.
5. **Organization management**: making sure all participants are aware of how they are supposed to collaborate with each other.

### 4.1.3 DECIDE

This refers to the activities that lead to unambiguous and integral decision making. These activities take place in-between phases and provide solid integration of the phases. These transition moments are the so called ‘decision moments’. Each ‘decision moment’ also provides a so called ‘decision document’. Every decision document has a similar structure. It has a description of the *project result*, a description of *project path* (detailed for the next phase, global for the following phases) and a description of the *control plans*. The contents are schematically drawn in Figure 6.

![Figure 6 The structure of a decision document](image-url)
When all elements of PMW are combined, including their aspects, the following schematic (Figure 7) becomes clear. This is the quintessence of PMW and summarizes this paragraph.

(Paragraph 3.2.1 is based on a few Dutch sources\textsuperscript{24} that were interpreted and translated)

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure7.png}
\caption{Overview phasing, deciding and controlling}
\end{figure}

\textbf{4.2 PRINCE2}

PRINCE2 was initially developed as a UK Government standard for information systems (IT) project management; however, it soon became regularly applied outside the purely IT environment. PRINCE2 is sometimes incorrectly considered inappropriate for very small projects, due to the work required in creating and maintaining documents, logs and lists. However, this may often be because of a misunderstanding about which parts of PRINCE2 to apply: PRINCE2 is fully scalable.\textsuperscript{25}

\begin{itemize}
\end{itemize}
4.2.1 THE STRUCTURE OF PRINCE2

The PRINCE2 method addresses project management with four integrated elements of principles, themes, processes and the project environment:

The **Principles** - These are the guiding obligations and good practices which determine whether the project is genuinely being managed using PRINCE2. There are seven principles and unless all of them are applied, it is not a PRINCE2 project.

The **Themes** - These describe aspects of project management that must be addressed continually and in parallel throughout the project. The seven themes explain the specific treatment required by PRINCE2 for various project management disciplines and why they are necessary.

The **Processes** - These describe a step-wise progression through the project lifecycle, from getting started to project closure. It defines 40 separate activities and organizes these into seven processes. Each process provides checklists of recommended activities, products and related responsibilities:

1. Starting up a project
2. Initiating a project
3. Directing a project
4. Controlling a stage
5. Managing stage boundaries
6. Managing product delivery
7. Closing a project

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Tailoring PRINCE2 to the **Project Environment** - This chapter addresses the need to tailor PRINCE2 to the specific context of the project. PRINCE2 is not a 'one size fits all' solution; it is a flexible framework that can readily be tailored to any type or size of project.27

Figure 9 shows the integrated framework in which elements of principles, themes, processes and the project environment are structured:

![PRINCE2 integrated framework](image)

### Figure 9 PRINCE2 integrated framework

#### 4.3 PROJECT MANAGEMENT BODY OF KNOWLEDGE (PMBOK)

The Project Management Institute considers the work organizations perform generally to be either operations or projects. Operations are ongoing and repetitive while projects are temporary and unique. A project is considered a temporary endeavour undertaken to create a unique product or service. Project management is the application of knowledge, skills, tools, and techniques to project activities in order to meet or exceed stakeholder needs and expectations from a project.28

The three main elements described in the Project Management Body of Knowledge are:

1. **The Project Management Framework**: this provides a basic structure for understanding project management. It contains the phasing of a project, called the **Project Life Cycle**. It also acknowledges the **Project Stakeholders** and **Organization**.

2. **The Standard for Project Management of a Project**: this standard describes the nature of project management processes in terms of the integration between the processes, the interactions within them, and the purposes they serve. The application of the project management processes to a project is iterative and many processes are repeated and revised during the project. An underlying concept for the interaction among the project management processes is the plan-do-check-act cycle (Deming cycle).29 The integrative nature of the Process Groups is more complex than the basic plan-do-check-act cycle. The processes are aggregated into five groups, defined as the Project Management Process Groups:
   a. **Initiating Process Group**
   b. **Planning Process Group**

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c. Executing Process Group  
d. Monitoring and Controlling Process Group  
e. Closing Process Group

Figure 10 Deming’s Plan-Do-Check-Act Cycle

3. The Project Management Knowledge Areas: this organizes the 39 processes from the Standard for Project Management of a Project into nine areas. This is the essential part of the PMBOK. These nine areas are described in the following paragraphs and shown, with their integrative project management processes, in figure 11. 

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4.3.1 PROJECT INTEGRATION MANAGEMENT

A subset of project management that includes the processes required to ensure that the various elements of the project are properly coordinated. It consists of:

- Project plan development: integrating and coordinating all project plans to create a consistent, coherent document.
- Project plan execution: carrying out the project plan by performing the activities included therein.
- Integrated change control: coordinating changes across the entire project.

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4.3.2 PROJECT SCOPE MANAGEMENT

A subset of project management that includes the processes required to ensure that the project includes all the work required, and only the work required, to complete the project successfully. It consists of:

- Initiation: authorizing the project or phase
- Scope planning: developing a written scope statement as the basis for future project decisions
- Scope definition: subdividing the major project deliverables into smaller, more manageable decisions.
- Scope verification: formalizing acceptance of the project scope.
- Scope change control: controlling changes to project scope.

4.3.3 PROJECT TIME MANAGEMENT

A subset of project management that includes the processes required to ensure timely completion of the project. It consists of:

- Activity definition: identifying the specific activities that must be performed to produce the various project deliverables.
- Activity sequencing: identifying and documenting interactivity dependencies.
- Activity duration estimating: estimating the number of work periods that will be needed to complete individual activities.
- Schedule development: analyzing activity sequences, activity durations, and resource requirements to create the project schedule.
- Schedule control: controlling changes to the project schedule.

4.3.4 PROJECT COST MANAGEMENT

A subset of project management that includes the processes required to ensure that the project is completed within the approved budget. It consists of:

- Resource planning: determining what resources (people, equipment, materials) and what quantities of each should be used to perform project activities.
- Cost estimating: developing an approximation of the costs of the resources needed to complete project activities.
- Cost budgeting: allocating the overall cost estimate to individual work activities.
- Cost control: controlling changes to the project budget.
4.3.5 PROJECT QUALITY MANAGEMENT

A subset of project management that includes the processes required to ensure that the project will satisfy the needs for which it was undertaken. It consists of:

- Quality planning: identifying which quality standards are relevant to the project and determining how to satisfy them.
- Quality assurance: evaluating overall project performance on a regular basis to provide confidence that the project will satisfy the relevant quality standards.
- Quality control: monitoring specific project results to determine if they comply with relevant quality standards and identifying ways to eliminate causes of unsatisfactory performance.

4.3.6 PROJECT HUMAN RESOURCE MANAGEMENT

A subset of project management that includes the processes required to make the most effective use of the people involved with the project. It consists of:

- Organizational planning: identifying, documenting, and assigning project roles, responsibilities and reporting relationships.
- Staff acquisition: getting the needed human resources assigned to and working on the project.
- Team development: developing individual and group skills to enhance project performance.

4.3.7 PROJECT COMMUNICATION MANAGEMENT

A subset of project management that includes the processes required to ensure timely and appropriate generation, collection, dissemination, storage, and ultimate disposition of project information. It consists of:

- Communications planning: determining the information and communications needs of the stakeholders: who needs what information, when they will need it, and how it will be given to them.
- Information distribution: making needed information available to project stakeholders in a timely manner.
- Performance reporting: collecting and disseminating performance information. This includes status reporting, progress measurement, and forecasting.
- Administrative closure: generating, gathering and disseminating information to formalize phase or project completion.
4.3.8  PROJECT RISK MANAGEMENT  

Risk management is the systematic process of identifying, analyzing and responding to project risk. It includes maximizing the probability and consequences of positive events and minimizing the probability and consequences of adverse events to project objectives. It includes:

- Risk management planning: deciding how to approach and plan the risk management activities for a project.
- Risk identification: determining which risks might affect the project and documenting their characteristics.
- Qualitative risk analysis: performing a qualitative analysis of risk and conditions to prioritize their effects on project’s objectives.
- Quantitative risk analysis: measuring the probability and consequences of risks and estimating their implications for project objectives.
- Risk response planning: developing procedures and techniques to enhance opportunities and reduce threats from risk to the project’s objectives.
- Risk monitoring and control: monitoring residual risks, identifying new risks, executing risk reduction plans, and evaluating their effectiveness throughout the project life cycle.

4.3.9  PROJECT PROCUREMENT MANAGEMENT  

A subset of project management that includes the processes required to acquire goods and services to attain project scope from outside the performing organization. It consists of:

- Procurement planning: determining what to procure and when.
- Solicitation planning: documenting product requirements and identifying potential sources.
- Solicitation: obtaining quotations, bids, offers, or proposals, as appropriate.
- Source selection: choosing from among potential sellers.
- Contract administration: managing the relationship with the seller.
- Contract closeout completion and settlement of the contract, including resolution of any open items.

4.4  SELECTING A PROJECT MANAGEMENT METHOD FOR THIS RESEARCH  

After reviewing these three project management methods, it became apparent that even though these methods are different in some ways, they still have a lot in common. One remarkable similarity is that they all advice, when applying project management in practice, to look carefully at the project at hand and adapt, rescale or adjust the theoretical approach to fit the specific project. This is why the decision of selecting a project management method for the framework of this research is based upon the applicability to the case and the theories regarding fast track management. The Project Management Body of Knowledge was selected as best perspective for this research. The nine knowledge areas create a complete framework to use in structuring the knowledge on fast tracking and arranging the data from the case study. The processes and phasing that are used in PMW and PRINCE2 or not less suitable, but in light of this research these aspects are left out. This resulted in a comparison between the five control activities of PMW, the seven themes of PRINCE2 and the nine knowledge areas of PMBOK.
5 THEORETICAL FRAMEWORK: FAST TRACKING

Fast tracking is a managerial approach to the achievement of early project delivery, involving the application of innovations in the management of construction procurement and recent advances in the industrialization of the construction process, bringing into play:

- The integration of design and construction phases;
- The involvement of the contractor in both design and construction phases;
- Work packaging, i.e. the arrangement which breaks down works into trades or skills, or to a group of closely related trades or skills;
- Overlapping the work packages to enable construction of sections of the project to proceed while the design for other sections is being considered or progressed. This is illustrated in Figure 12 (following Fazio etc model) and compared to both traditional and phased construction methods; time saving in fast tracking is immediately apparent;
- The employment of the expertise of works contractors and the recognition of their active participation in both design and construction.

Thus, the essence of fast tracking is production speed achieved by analysis and co-ordination of the minimum requirements for work packages, tendering and commencement. The method aims to transpose to the building site the economies of speed associated with an assembly line, especially by meticulous planning ahead to eliminate down time due to supply or other production difficulties created by delay.32

[Diagram of traditional and fast-track approaches]

Figure 12 Traditional and fast-track approaches compared33

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5.1 STRATEGY OPTIONS

Fast tracking can be used in several situations and in many strategic ways. The desired objective may be achieved by adopting the following: 34

- Early appointment of managing contractor
- Architect’s role redefined
- Price not the only criteria for contractor selection
- Capital intensive methods of construction
- Advance purchasing of essential materials, etc
- Discrete work packages overlapped
- Standard and easily available components preferred
- Project designed for build ability and speed
- Flexible budget made available
- Prompt decisions required
- Deadlines that can be penalized
- ‘Design and construct’ sub-contracts
- Client pays more in fees
- Variations at construction phase not entertained
- Odd hours (night) working
- High calibre staff required
- Higher than average intensity of work

The project management needs to ensure that the implementation is tailored to its specific objectives and business strategy. Some of the main considerations in concurrent engineering implementation include the following: 35

- The availability of a robust project development process;
- The existence of an organisational framework and policies that support both individuals and teams, and enables the project development process to be controlled;
- The need for a clear business strategy that outlines an organisation’s objectives with regard to interaction with clients and other project team members;
- The agility of an organisation and its capacity to respond quickly to changes in its operating environment;
- Appropriate selection and delegation of authority to team leaders; The provision of training to enable team members to fulfil their roles and the institution of reward structures that recognise both individual and team achievements;
- Maintaining focus on the client’s requirements and having the capacity to respond to any changes that might occur;
- The institution of appropriate procedures and policies for quality assurance;
- The development of designs that are flexible, robust and informed by the client’s requirements;
- The use of an integrated project model and systems that facilitate integration between members of a project team;
- Use of common hardware and software platforms to ensure the seamless exchange of information on projects;
- Use of standard and proven information and communications technologies.

5.2 BENEFITS OF FAST TRACKING

Even though it is generally accepted that the use of fast tracking costs more, due to extra fees, inefficiencies and claims, the financial benefits usually compensate for these extra costs. By quickly converting available capital in real estate, the investment is safe from inflation. Due to fast tracking, a client will be able to use the facilities at an earlier stage, which releases revenues early. A fast delivery of a building can also reduce market

uncertainties. Still, in some cases there is a non-financial objective behind fast tracking. This usually involves a specific event or other fixed deadline.

The chief benefit of fast tracking a project is evidently the time saved. Yet, there are many more benefits that can be derived from expediting a project in this manner. Some of the possible benefits of concurrency in projects are: 36

- Better co-ordination and management of the construction process;
- Better informed decision making and co-ordination, with decisions taken at the right time and by the right person(s);
- Improved competitiveness of the construction industry;
- Improved integration of life-cycle considerations;
- Enhanced collaboration and teamwork between members of the project team;
- Greater client satisfaction, given the improved focus on the client’s requirements and the delivery of greater value;
- Reduced scope for conflicts and litigation;
- Greater profits for construction companies due to the ability to control more aspects of the project, reducing overall construction time, and improved interaction with designers and other team members;

5.3 ECONOMIC EVALUATION

Given that all buildings could be built faster, it is necessary to be able to estimate the implications of building faster than the norm. Figure 13 illustrates what happens to costs when a works contractor operates at any level of efficiency other than ‘A’ at which he can optimize operating cost.

![Figure 13 Optimum time cost](image)

That costs will rise is an obvious consequence of both expedited and extended programmes. Data on the extent of this effect are lacking. Trickey (1983) suggests that there is an optimum time for completion related to the rate of return, which is not necessarily the optimum time for minimizing construction costs. 38

5.4 COSTS OF FAST TRACKING

The stimulus for adopting a fast track construction programme conceals the fact that it can also involve additional expense:

5.5 BALANCING COSTS AND SAVINGS

In practice, the various potential savings and extra costs will vary from project to project, but a rough balance between costs and savings is listed in Table 7.

<table>
<thead>
<tr>
<th>Costs</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inefficiencies imported by inherent variability</td>
<td>Build-ability studies: better post-contract controls</td>
</tr>
<tr>
<td>Higher unit labour costs</td>
<td>Economies of utilisation of site plant on shift working</td>
</tr>
<tr>
<td>Higher unit material prices</td>
<td>Higher reliability of supplies and backup</td>
</tr>
<tr>
<td>Additional fees for project manager and management contractor</td>
<td>-</td>
</tr>
<tr>
<td>Additional fees for quantity surveying services</td>
<td>Effectiveness of better cost controls applied</td>
</tr>
<tr>
<td>The costs of obtaining higher quality management skills for in-house administration</td>
<td>Effectiveness of their contributions.</td>
</tr>
<tr>
<td>Cost of early calls and accelerated cash flow</td>
<td>Shorter period of debt</td>
</tr>
<tr>
<td>Higher tender risk allowances</td>
<td>Risk reliefs inherent in smaller and simpler individual work packages.</td>
</tr>
<tr>
<td>Additional costs of insurance for design work by professional consultants and works contractors</td>
<td>-</td>
</tr>
<tr>
<td>Cost of duplicated services</td>
<td>Savings on time-related costs</td>
</tr>
<tr>
<td>-</td>
<td>Savings due to shorter project duration and earlier purchasing</td>
</tr>
<tr>
<td>Interfacing problems: Allowance for contractor’s claims</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 7 Costs and savings balance

5.6 PARAMETERS OF FAST TRACKING

For fast track projects, it is normally deemed essential to rationalise the management structure and centralise responsibility and decision making. The various functions of site identification, land assembly, appraisal, funding, design, construction and marketing are appointed to a project manager, rather than the architect as commonly done in traditional projects. The fast track technique, therefore, normally employs the project management approach as illustrated by Figure 14. (Following the CIOB model) Some fast track projects have, nevertheless, been executed by adopting traditional management approaches. Note: This management structure is based on situations in the UK. In the Netherlands, the function of Quantity surveyor is non-existing. The contractor and architect do some of these tasks. In light of this research it is not necessary to dwell on this subject.

Kwakye (1991)\textsuperscript{39} distinguishes two established modes for managing the construction process: management contractor or construction manager. In general, the nature of the appointment is determined following an independent or in-house study of known project requirements. It is then the responsibility of the construction manager/management contractor to establish and manage the general site facilities. The site potential for the construction must be maximized, thus enabling work to be carried out as expeditiously and economically as possible. The main difference between the two approaches is that the management contractor enters into contracts with the works contractors on behalf of the client and the construction manager only enters into contract with the client as a consultant.

Since the client bears the most risk, it is vital that the client is aware of this when selecting its project team. Design and construction functions are largely integrated and therefore the manager is involved in both design and construction processes. The architect’s responsibility is limited to scheme design, the obtaining of permission and approval of detail design work submitted to him. This does not mean that the architect’s role is less important. On the contrary, the commitment of the architect to the fast-track process is essential. If the architect feels as though fast tracking has been forced upon them by the owner and/or construction manager, fast tracking is much less likely to be successful.40

Figure 14 Management structure for executive project management41

5.6.1 MANAGEMENT CONTRACT

A management contract may be described as an arrangement in which the client appoints an external organisation (management contractor) to manage and co-ordinate the design and construction phases of a project. The management contractor will normally provide specified common user and service facilities but does not execute any of the permanent works, these being undertaken by works contractors under his direction.42 He enters into contracts with the works contractors and accepts the liability for non-completion. Apart from the possibility of being pursued for professional negligence, the management contractor carries little basic risk. Current trends, however, are for management contracts to include the responsibility for design, works contractors performance, quality of work and defects, programme over-runs, cash flow problems, and losses.43

5.6.2 CONSTRUCTION MANAGEMENT

The construction management contract is similar to the management contract approach, except that the client, and not the management contractor, enters into the contract with the various works contractors.44 The construction manager is a consultant who contracts with the client for a purely professional managerial role. He does not accept any liability for non-completion etc unless resulting from professional negligence.

5.6.3 WORKS CONTRACTORS

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The fast track method of construction procurement makes heavy demands on the works contractors. They are involved with some aspects of building design, co-ordinate closely with the project team and are considered vital to the successful completion of the project. Hence, they are frequently required to attend site meetings to discuss the programme, progress and other matters relating to the successful delivery of the various work packages. Most works contractors are selected by competitive tender based on bills of quantities or a work schedule with preliminaries and specifications. A performance specification may be used. Price is not the only criterion for selection; the prospective works contractor should demonstrate the ability to:

- provide the technical and managerial capabilities required for delivery on a tight programme;
- understand the design implications and coding with particular reference to interfacing;
- offer the requisite design input;

The usual procedure for overlapping functions entails the contractor’s earlier involvement in the project. However, there is no generally accepted standard system or approach. Every fast track project can be different. Some owners will select and engage a contractor to confer with the architect during the early stages of design. The contractor’s advisory input during the early stages will assist the architect in making practical and economical choices from readily available materials and systems. In this case, a project manager is substituted by the architect and the contractor is the construction manager.

In as much as the contractor must be brought in at a very early stage in fast track, it is difficult to obtain genuine general contractor price competition. If bidding competition is an absolute owner requirement, the contractor cannot be selected until after the drawings and specifications are available, at least to the level of 60 or 70 percent completion. This would effectively rule out any contractor input during the early design stages when the most significant cost affecting decisions are being made. Contractors bidding from incomplete documents will be at a distinct disadvantage. If they price the work to include all that is inferable from the unfinished documents, they will not be competitive with other contractors who infer something less. The bidder who infers the least could end up with the low bid and will almost certainly be later involved in a dispute with the owner as to what was reasonably inferable. For these reasons, it would make better sense to select a contractor on the basis of comparative experience, reputation, recommendations, and interviews. The price competition at the level of subcontractors and suppliers will normally be quite sufficient to protect the owner’s interests. As a part of the selection process the contractor remuneration system or formula can be discussed, negotiated, and adopted.

5.6.4 ARCHITECT

The complication concerning fast-track design is that normally the design process isn’t planned as much into detail as the engineering and construction process. Also architects often are reluctant to participate in fast-track design due to the opinion that creative processes can’t be subject to acceleration if architectural quality has to prevail. However recent developments within the area of architectural design management more and more gave evidence that also creative architectural design processes can -and ought to- be planned and managed.

In a fast track design team, design team members have to be carefully selected on their proven experience with the deliverance of the same type of designs as is in the concerning project. Contractors often get a penalty fee every day a project is delivered later as the date of agreement. This procedure also might be applied to a fast track design process. This would imply that only design firms could be selected who have enough volume to take such a risk. In case of high performance teams a rewarding system for delivering design products before the time limits appointed, might be a better approach then a penalty system.

Concerning the organizations to be selected special attention has to be given to the capacity in terms of drafting and calculation. Only if the division of designers, engineers and drafters is well balanced, a design organization is capable to handle real fast track design processes. In most cases this also implies that only the larger design firms can be considered to be selected. Delivering sufficient capacity is another important success factor for fast track design.

While selecting a fast track design team a design manager has to realize that creating an effective and efficient collaborating team will cost several months. Selecting parties, who have already collaborated before, will reduce a lot of time slack. Having more than one team working on a certain special design problem in a kind of design contest can increase speed substantially. Another aspect to be taken into consideration is having the full team working together in a temporally facility on the building spot itself.47

5.7 RISK

In light of the studies conducted on fast-track construction jobs which experienced difficulties with this approach, trouble areas have been identified.48 Fast-tracking a project often results in unexpected extra costs and, as observed in this project, does not necessarily lead to shorter project duration. For the approach to be profitable, particular attention must be paid to the following:

- Design errors and omissions
- Design changes
- Coordination between design and construction
- Coordination between work packages

The above observations reinforce the statement that managing the interface between design and construction proves to be crucial to the project performance. The inherent risks of fast tracking projects include: (1) the loss of financial benefits due to the cost of changes and claims, (2) the loss of planned time savings due to schedule delays, and (3) the reduction of control over project costs due to the early elimination of design options normally encountered, incomplete tender specifications, and overlapping of the construction work. Several recommendations may be made in an effort to reduce these risks:49

- **Spend more effort during the design phase**; more time and effort in terms of coordination and planning, should be spent on the design preparation with special attention to trade and/or work package interface areas. Early in the design phase, decisions which will limit future flexibility in the design should be highlighted and their impact evaluated.
- **Develop an effective design review system**; this precaution would ensure fast and effective review of drawings and would also provide a good interaction between design and on-site activities.
- **Increase information input from the field work**; more than just eliminating the impact of issuing work packages too early, this approach will help integrate the latest field conditions into the plans and specifications of the subsequent work packages.
- **Increase involvement of participants in all stages of the project**; A member of the design/engineering team should be appointed full-time as design coordinator and work with contractors for an improved response to design-originated problems. Innovative and imaginative contractual arrangement and organizational structures should be utilized and enhanced to share responsibility and authority.

The risks borne by participants of fast track projects are many and the project manager should ensure that participants understand clearly the full implications of their involvement. Risks and obligations are divided mainly between the client and the works contractor. However, the management contractor can be sued by the client for negligence or pressured to accept some risks of construction. Table 8 shows an overview of some of the risks and obligations born by the client, manager and contractor collected from literature mentioned in this paragraph.

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### Table 8 Distribution of risks and responsibilities

<table>
<thead>
<tr>
<th>Risk Description</th>
<th>Client</th>
<th>Management contractor</th>
<th>Works contractor</th>
</tr>
</thead>
<tbody>
<tr>
<td>No full financial control; flexible budget for inevitable changes</td>
<td>Responsibility for works contractors; for their performance, quality of work, insolvency, maintenance work</td>
<td>Undertake design responsibilities for which they are not well equipped</td>
<td></td>
</tr>
<tr>
<td>Uncertainty as to the financial commitment until a late stage</td>
<td>Responsibility for time over-runs; exemption from liquidated damages if the damages cannot be applied successfully to the works contractors is no longer accepted</td>
<td>Uninsurable guarantees or warranties on 'fitness for purpose' basis</td>
<td></td>
</tr>
<tr>
<td>Claims for disruption or loss and expense resulting from delays experienced by works contractors when designs are being finalised or revised</td>
<td>Responsibility for latent defects; initial rectification costs and sometimes full subsequent cost of maintenance if works contractor defaults</td>
<td>Extension of liability by performance specification taken on without the appropriate insurance cover</td>
<td></td>
</tr>
<tr>
<td>Financial loss in the event of default by a works contractor (instead of the management contractor)</td>
<td>Responsibility for cash flow problems and losses; fixed management fees made adjustable in the event of delay by others</td>
<td>The management contractor leaves following obligations: • cover and protect the whole of the works contract installation until the completed building is handed over to the client • provision of scaffolding and other temporary equipment • checking and responsibility for ensuring that the structures to be fixed to are adequate 'to take the works contractor’s materials • acceleration of the works often without financial recompense • programming of the works to accord with the progress of other trades • termination of the works contract for breach of any of the conditions of the work package</td>
<td></td>
</tr>
<tr>
<td>The cost of finding a replacement in the event of a termination, for the completion of the contract</td>
<td>Responsibility for preliminaries; enforceable fixed prices for uncertain site establishment commitments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liabilities for defective design may be difficult to ascertain and remedies may be not worth pursuing</td>
<td>Responsibility for design failures; where detailed design is by works contractors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No redress against the management contractor in respect of the performance and quality of all sub-contract works; failure to complete on time; recovery of damages for late completion; extra cost of completion of works when works contractors are dismissed</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 5.8 THE PROCESS OF FASTTRACKING

The client will normally appoint a **project manager** with the responsibility to co-ordinate all design, cost control and programmes. The project team should be tailored to the requirements of the specific project and phase, with all pulling in one direction.\(^{(50)}\) Thus, the adoption of fast tracking and its success depend on the project manager’s ability to weld the team into an effective force capable of delivering the project on time and within the agreed budget. The position of project manager should be established as soon as possible after the development decision is made in principle. All communication and control thereafter flow through him. The rest of the project team should be selected on the project manager’s recommendations.

The **management contractor** contributes to scheme design, programming and build ability studies, organizes all tendering and supervises construction on the basis of documents prepared by the architect, engineer and quantity surveyor.

**Works contractors** are selected for the various work packages after competitive tendering negotiation.

A good **design brief** is the key to the success of most construction procurement techniques and fast tracking is no exception. It is essential that the client defines, in unambiguous terms, his requirements in terms of time,

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cost and quality. Such a brief assists the achievement of objectives by minimising changes of mind by clients during the construction phase and the resultant variations.\(^{51}\)

### 5.9 REIMBURSEMENT AND CONTRACTS

#### 5.9.1 COST+ REIMBURSEMENT

![Figure 15 Cost+ Fixed](image1.png) ![Figure 16 Cost+ Percentage](image2.png) ![Figure 17 Cost+ Incentive](image3.png)

The contract payment system that is in widespread use in fast track is based upon reimbursement of the actual cost of the work plus a fixed or percentage fee for the contractor. The reward is set out against the actual costs in figure 16, 17 and 18 for cost+ a fixed reward, a percentage of the costs or an incentive. This can be with or without a Guaranteed Maximum Price. Especially in the case of a cost+ percentage reward the GMP can prevent the contractor from taking advantage of the client. Although the owner may regard the GMP as inviolate, the contractor will rightly expect it to be appropriately adjusted to reflect any deviations from the drawings and specifications and their reasonable inferences. The contractor will also expect that the contract time will be fairly adjusted to unforeseen occurrences and unbudgeted changes in conditions. This is an area rich in the probability of misunderstanding. A contract administrator or arbitrator will be likely to give the contractor the benefit in these situations. The only practical solution for resolving cost and time overruns at this point is to immediately reduce the scope or quality of the project.

#### 5.9.2 CHANGE ORDERS

To correct errors or to change to more advantageous designs will require more change orders than would be common under normal construction scheduling. This will be an inconvenience to the contractor, sometimes an embarrassment to the architect, and usually added cost to the owner. There is also the added risk of jobsite confusion and construction delay. It is also possible that the misunderstandings and erroneous inferences due to incomplete documents inherent in the fast track method will cause a loss of some or all of the overlapping advantages and thus yield a completion date on or after that of a normal time schedule.

#### 5.9.3 CONTRACT FORM

A distinction should be made, by drafting a contract for the services provided in the advisory and costing phase, and another contract for the services provided in the construction phase. This is also known as a Design-Build-Contract. The Construction Management method of project delivery is a similar method amenable to fast tracking.

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5.10 CONCLUSIONS

- **Fast tracking costs more** because the accelerated production rate is above the optimum level of production (the level at which marginal productivity becomes disproportionately expensive). However skillful the planning and programming, once the optimum rate of production is exceeded, it is not economic to further accelerate the pace unless the benefit accruing significantly outweighs the extra costs incurred. Yet, this is the pace at which the fast tracking technique operates.
- **Faster procurement of buildings should be cheaper in the longer term** because the client: saves money on land charges; is not subjected to inflationary pressures; faces less increased costs due to price fluctuations; gains early return on an investment or usage of facilities.
- **Fast tracking should thrive in a booming economy.** A booming economy gives rise to an increased level of construction activity as buildings are urgently required. In such an economy, there is the likelihood that no spare capacity exists in the system and the only way to increase production is by further capital investment. This may lead to substantial financial gain, thereby justifying the extra cost of adopting fast tracking.
- **The fast track technique requires a client who understands the system and has a flexible budget.** The client who opts for fast tracking must be made aware of and accept the risks involved. He must be in the position to give correspondingly fast decisions with major cost implications. He can only do this if he has a flexible budget, understands the benefit of the technique and appreciates the timings of the profits he expects from his project.
- **Fast tracking suits one-off disaster relief projects.** One-off projects in disaster areas requiring urgent completion to avert further disaster or to alleviate human suffering, or projects to meet specific start dates for major events. Some projects also suitable for fast tracking are the head offices of multi-national companies where ‘image’ is crucial.52
- **The owner/designer/construction manager team must guard against rushing into construction too early; it is essential that the project be thoroughly investigated and that an accurate program, estimate, and schedule be developed and be completely in hand.**53

5.11 ALTERNATIVE FORMS

5.11.1 RAPID CONSTRUCTION

The outcome of a continuous drive for construction time reduction is called rapid construction. There is a difference between fast tracking (where speed is a goal in itself) and rapid construction (where speed is also used as a means to achieve other objectives).

Fast tracking is an approach aiming at shorter project duration, having already been practised in construction projects. In literature, fast tracking has most often been understood simply as overlapping of activities: ‘Initial construction activities are begun even before the facility design is finalized’.54 It is an accepted fact that fast tracking costs more: ‘Fast tracking costs more because the accelerated production rate is above the optimum level of production (the level at which the marginal productivity becomes disproportionately expensive)’.55 The major difference between fast tracking and rapid construction is the following: Fast tracking is achieved through operating above the optimum rate of production, whereas in rapid construction, the thrust is in transferring this optimum rate of production (Figure 18). We could also formulate this as follows: Fast tracking leads to an increase of problems, whereas rapid construction aims at decreasing the number of problems.

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Construction time is reduced by means of:

1. **Increasing the speed of tasks.** This can naturally be achieved through increased labour and more effective machinery. However, after the optimal rhythm has been reached, the costs will rise. A more interesting alternative is to eliminate non-value adding sub activities from each task.

2. **Reducing the buffer between consecutive tasks** (as in fast tracking)

3. **Reducing the number of tasks.** The first possibility is the transfer of tasks off-site. This means increased pre-cutting, pre-assembly and pre-fabrication. A second possibility is provided by alternative, more constructible design solutions. Utilization of multi-skilled work gangs also decreases the number of distinct tasks.

In order to implement time reduction efficiently, four key issues are required:

1. **Management commitment:** leadership is needed to realize a fundamental shift of philosophy, with the goal of improving every activity in the organization;

2. **Focus on measurable and actionable improvement,** rather than just on developing capabilities;

3. **Involvement:** employee involvement happens naturally, when organizational hierarchies are dismantled, and the new organization is formed with self-directed teams, responsible for control and improvement of their process;

4. **Learning:** implementation requires a substantial amount of learning.

Time based management seems to be an awaited addition to the armour of improvement methodologies in construction. However, there is still very little experiential knowledge from practical implementation of time reduction in construction. Rapid construction provides for several interesting research themes. From strictly research point of view, the effects of time reduction in construction are still largely unproved.

### 5.11.2 INTEGRATED PRACTICE

The book "Integrated Practice in Architecture: Mastering Design-Build, Fast-Track, and Building Information" preaches about the benefits of applying the integrated practice method of project delivery. The majority of ideas in this book are not applicable since there was never the time to set up an organization with integrated practice. The three primary characteristics mentioned in the book; collaboration, concurrency and continuity do not correspond to the project. In the case of BK City, for the better part of the project, the design and the construction were not in the hands of one company, but several contractors as in a traditional model. The book refers to this difference and calls it "Fast-Tracking".

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CONCURRENCE

The second foundation of integrated practice is the increased concurrency of design and construction activities seen in many projects. Because of their team structure and control over project schedule, integrated firms can often begin construction well before design is complete. This overlapping of design and construction phases allows them to compress the overall project schedule and deliver a building in less time than the over-the-wall method, in which the architect must in principle complete all of the design activities before any of the construction activities can begin.

In the over-the-wall method, attempts to compress the project schedule by overlapping design and construction activities are called fast-track projects. The difference between fast-track over-the-wall production method and concurrency as often practiced in integrated services, however, is that the separation of design and construction in the over-the-wall method makes managing concurrency extremely difficult. Because of this, fast-track over-the-wall projects are often marred by reduced quality, increased cost, frustration, and delay. Many over-the-wall architects express concern that fast-track production prevents them from delivering the level of quality they and their clients demand, and contractors worry that fast-track can compromise craft quality in the rush to completion.

Fast-track can reduce project duration by up to 25 percent, but only if its’ simultaneous design and construction activities are carefully coordinated. The over-the-wall method assumes a separation of design and construction phases that makes coordinating simultaneous design and construction difficult and often undermines fast-track production. Over-the-wall designers working on fast-track projects often find themselves simply reacting to construction activities on site, constantly struggling to stay one step ahead of the construction work. But when design is hurried in this way, project quality suffers. Cost and schedule suffer too: contractors, for example, cite waiting for information from designers - an all-too-common occurrence in over-the-wall fast-track projects - as the primary cause of delay in construction.

Planning is indispensable because critical project contingencies, opportunities, and obstacles could only be identified through meticulous advance planning. Yet traditional project planning often fails to identify these concerns because it is discipline-specific. And when architects plan for design, engineers for structure, and contractors for construction, each in relative isolation from the others, the interdisciplinary questions of constructability, communication, and coordination too often go unanswered. When each discipline prepares its own plan, they too often fail to account for critical interdisciplinary connections and conflicts that must be recognized to achieve integration. Fast-track projects are an acute example, where construction plans that regard design as simply an a priori input to the construction process fail because there is no completed design at the start of construction to use as input to construction planning. And when fast-track project participants try to force simultaneous design and construction activities into a plan based on linear, design-then-build thinking, schedule, budget, and quality may be compromised.

The Austin Company has been practicing design-build for over 100 years. With their expertise in concurrent design and construction, they were able to begin reconstruction of a factory gutted by fire just days after it burned. Austin Manager of Engineering Jim Speicher says, “You can be doing construction while you’re still on schematic design: (Copyright The Austin Company, Cleveland, OH) “We picked up the drawings of the existing factory the same day it burned down.” recalls Jim Speicher, Manager of Engineering for The Austin Company. "The next morning when I came to work I was shown the column grid so I had something to work with. I started doing the design of the new building to replace it, and I meanwhile, our purchasing agent got on the phone and found a steel supplier who faxed me steel sizes. He sent the detailer over that afternoon, by which time I was finished with my design, and I stayed until midnight, working with him doing shop drawings. The next day they were fabricating steel, two days after the fire."

Planning is indispensable because critical project contingencies, opportunities, and obstacles could only be identified through meticulous advance planning. Yet traditional project planning often fails to identify these concerns because it is discipline-specific. And when architects plan for design, engineers for structure, and contractors for construction, each in relative isolation from the others, the interdisciplinary questions of constructability, communication, and coordination too often go unanswered. When each discipline prepares its own plan, they too often fail to account for critical interdisciplinary connections and conflicts that must be recognized to achieve integration. Fast-track projects are an acute example, where construction plans that regard design as simply an a priori input to the construction process fail because there is no completed design at the start of construction to use as input to construction planning. And when fast-track project participants try to force simultaneous design and construction activities into a plan based on linear, design-then-build thinking, schedule, budget, and quality may be compromised.

In order to analyze the data collection it is necessary to convert the theories on fast track management into the same knowledge areas as the Project Management Body of Knowledge. It has to be stated that many of the practical aspects are covered by more than one knowledge area. In fact, all knowledge areas have certain relations between them. For example: certain aspects of fast tracking may lead to higher risks. Those risks can have consequences for the schedule (time) and may result in budget over-runs (cost).

Each paragraph starts with a summarized view of the effects of fast tracking on the specific knowledge area. This knowledge is gained from the previous chapter. References can be found in the same chapter. The paragraph then discusses the processes of the specific knowledge area and its relation to fast tracking. There are a total of 39 processes that take place in the 9 knowledge areas of the project management body of knowledge. Fast tracking does not change all 39 processes, so in some cases the process will be similar to the traditional project management methods.

A Guide to the Project Management Body of Knowledge has been a general source of information for this chapter and will henceforth not be mentioned in this chapter.

### 6.1 PROJECT INTEGRATION MANAGEMENT

Integration is one of the essential parts of fast tracking. Integration management covers all other knowledge areas by stimulating the interfaces between these areas. On a more specific level of integration there is the essence of fast tracking through work packaging and the overlapping arrangements of these work packages. The integration of all these packages is vital to successful fast tracking. Not only is the coordination between the work packages essential, the coordination between design and construction is equally crucial to the project performance. Integration management between the knowledge areas can be supported by using state of the art software and websites to enhance the connection quality of the interfaces between the areas.

*Project plan development:* Due to the complexity of a fast track project, the project management plan is essential. It defines how the project is executed, monitored and controlled. For each of the knowledge areas a management plan is written which is integrated and coordinated to create a consistent, coherent document.

*Project plan execution:* Obviously the execution of the management plans is necessary to obtain the objectives from the scope statement. The project plan is carried out by performing the activities included therein. In fast tracking, extra attention should be paid to the interfaces of the different plans.

*Integrated change control:* This is the most important process of project integration management with regard to fast tracking. Change control is necessary because projects seldom run exactly according to the project management plan. In fast tracking, changes are more likely to happen and their impact can be larger compared to traditional projects. The scope must be maintained by carefully and continuously managing changes, either by rejecting changes or by approving changes so those approved changes are incorporated into a revised baseline.

### 6.2 PROJECT SCOPE MANAGEMENT

The nature of fast tracking is to start construction work while the design has not been finished yet. Although designs may not be finalized yet, the scope of the project can be thoroughly defined prior to commencement of design and construction works. In order to minimize the changes to be made in a later stage of the project, the client's requirements need to be clearly defined in the scope. The scope should bring forth a proper design brief. It is essential that the client defines, in unambiguous terms, his requirements in terms of time, cost and quality. Such a brief assists the achievement of objectives by minimising changes of mind by the client during the construction phase and the resultant variations.
In a fast-track project, schedule rules decisions. For some there is a positive aspect to this parameter. Jim Wilson: President of Ewing Co le Cherry Brott in Philadelphia explains, "I like [fast tracking] because it imposes discipline over the decision-making process. Sometimes with no schedule, things just keep changing."62

The client should acknowledge that changing the scope can have disastrous consequences for the success of the project. The contractor will expect that the contract time will be fairly adjusted to unforeseen occurrences and unbudgeted changes in conditions. An arbitrator will be likely to give the contractor the benefit in these situations. When this happens, the only practical solution for resolving cost and time overruns is to immediately reduce the scope or quality of the project. A change of scope based on improvement of the overall project can therefore result in quality loss or other negative scope changes in other areas of the project. To correct errors or to change to more advantageous designs will require more change orders than would be common under normal construction scheduling.

**Initiation**: A project needs authorization to kick-off. The client initiates the authorization through its need for a building. Each phase needs authorizing as well in order to commence. In the building industry this is done by the manager, possibly after consultation with the client.

**Scope planning**: Scope planning starts with a description of the product which, through analysis, is worked out into a scope statement and a scope management plan. The statement includes the justification for the project, the product, deliverables and objectives. The management plan describes how the scope will be managed and how there will acted when changes occur in the scope.

**Scope definition**: The scope statement mentioned in the former paragraph is detailed in order to create a basis for future project decisions. It cannot be expected that the scope of a fast track project is fully formulated at this time. It will become more detailed during the course of the project. A popular tool for this phase is the Work Breakdown Structure.

A Work Breakdown Schedule is of vital importance in fast tracking. In traditional project management the WBS already subdivides the project work into smaller, more manageable pieces of work, with each descending level of the WBS representing an increasingly detailed definition of the project work. The planned work contained within the lowest-level WBS components, which are called work packages, can be scheduled, cost estimated, monitored, and controlled. The key to fast tracking is in the work packages, as is mentioned several times in this report.

**Scope verification**: The client needs to verify that the scope formulated is correct. It produced a formal acceptance which can also be used as basis for contracts.

**Scope change control**: In a fast track building process there is a higher risk of having scope changes compared to traditional management methods. Scope control focuses on the influencing factors of scope changes and controlling the impact of those changes. Scope control is integrated with all other 'control' processes, like 'integrated change control'.

### 6.3 PROJECT TIME MANAGEMENT

The objective of fast tracking is, above anything else, time reduction. Time management is therefore of the utmost importance. The method of saving time through fast tracking is thoroughly explained in the previous chapter. Other than simultaneously scheduling work packages that have an overlap of design and construction work, there are other ways of contributing to the acceleration of the process.

It is not very uncommon to penalize contractors when they do not keep their deadlines. In the literature, the same is suggested for designers. This procedure might stimulate the fast track process, but it could also work adversely. In case of high performance teams a rewarding system for delivering products or services before the time limits appointed, might be a better approach then a penalty system. This can be arranged in a 'cost+incentive' reimbursement system, but this is of more concern in the procurement processes.

It is also possible that the misunderstandings and erroneous inferences due to incomplete documents inherent in the fast track method will cause a loss of some or all of the overlapping advantages and thus yield a

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Completion date on or after that of a normal time schedule. As much as procurement management can influence time management, through incentives in reimbursement, so can communication management, through advanced documentation and communication techniques (ICT).

**Activity definition:** The activity definition process will identify the deliverables at the lowest level in the work breakdown structure (WBS): the work package.

**Activity sequencing:** This is where the work packages are connected. This process includes identifying and documenting interactivity dependencies. Based on these findings, the possibilities of fast tracking are written down.

**Activity duration estimating:** The duration of each task or work package is estimated during this process. The combination of the sequencing and the duration of the work packages, a schedule can be constructed.

**Schedule development:** The schedule of a fast track project is one of its characteristics. It shows the concurrent design and construction and the interdependencies of the work packages Therefore the schedule is an overview as shown in the bottom schedule of Figure 12.

**Schedule control:** Controlling changes to the project schedule requires extra attention in fast track situations. Because of the compression of the project schedule it has a higher risk of failure. It might not always be possible to foresee these changes. The possibility of additional work force or longer working days can be a great benefit in fast tracking, in order to maintain the schedule.

### 6.4 PROJECT COST MANAGEMENT

Literature has shown that it is acknowledged that fast tracking will have a negative result on the costs. The main reason for this, even in successful cases, is because the participants are not working on their optimal efficiency/productivity level (Figure 13). However skilful the planning and programming, once the optimum rate of production is exceeded, it is not economic to further accelerate the pace unless the benefit accruing significantly outweighs the extra costs incurred. A client will need to have a flexible budget, since the total costs will not be evident until a later stage of the process. If any problems occur due to fast tracking, they are bound to result in a negative influence on the costs. There are also indirect costs to fast tracking. Because of the increase in risk for the contractor, he will calculate that risk into the tender as a contingency. Still, many costs can be compensated due to fast tracking. Table 7 shows what costs and savings can be accumulated.

**Resource planning:** The Work Break Down structure created during scope definition is used during the resource planning because it identifies the deliverables and processes need, and therefore can be used to derive the resources needed.

**Cost estimating:** Developing an approximation of the costs of the resources needed to complete project activities will be harder to do in fast tracking projects due to uncertainties and unknowns. The unknowns are evident because designs will not be finalized until later in the process. The uncertainties are the increase of risks involved. Whether it is a communication problem, a human resources problem or a time problem, eventually resolving the problem will result in additional costs.

**Cost budgeting:** When allocating the overall cost estimate to individual work activities in a fast track project, special attention needs to be paid to possible savings as well. A ‘traditional’ budgeting can be used as basis, but will be adjusted to (possible) additional costs and saving due to the nature of fast tracking. A balance must be obtained.

**Cost control:** Changes will be very likely to occur. Cost control is an integrated part of all control processes. In fast tracking it will take some creative thinking to control the costs. A manager will have to seek solutions that do not influence the quality or the progress in a negative way.

### 6.5 PROJECT QUALITY MANAGEMENT

In order to deliver a high quality project, it is necessary to clearly define the objectives and scope. Quality is threatened in a fast tracking project. One of the reasons for this is the speed at which design and construction takes place. It is understandable that rushing into these processes can lead to flaws both in design and construction work. Architects often are reluctant to participate in fast-track design due to the opinion that
creative processes can’t be subject to acceleration if architectural quality has to prevail. Then there is the loss of quality through the complexity of the interfaces between the work packages. In many fast tracking cases designers are simply reacting to construction activities on site, constantly struggling to stay one step ahead of the construction work.

From a design point of view, quality is more likely to be obtained through usage of standard and easily available components in the design specification. A good design brief is the key to the success of most construction procurement techniques and fast tracking is no exception. It is essential that the client defines, in unambiguous terms, his requirements in terms of time, cost and quality. From the managers’ point of view, controlling the quality can be achieved through institution of appropriate procedures and policies for quality assurance.

The contractor will also expect that the contract time will be fairly adjusted to unforeseen occurrences and unbudgeted changes in conditions. This is an area rich in the probability of misunderstanding. A contract administrator or arbitrator will be likely to give the contractor the benefit in these situations. The only practical solution for resolving cost and time overruns at this point is to immediately reduce the scope or quality of the project.

Quality planning: The project deliverables stated in the project scope statement are essential to quality planning. Cost-benefit analyses are needed to provide information on which the quality planning is formed. It is also important to know how to satisfy the requirements.

Quality assurance: In order to keep the level of quality that is required, the overall project performance needs to be checked on a regular basis.

Quality control: During the project course it is important to check and control the quality. The project results need to comply with relevant quality standards and causes of unsatisfactory performance need to be terminated. Corrective and preventive actions might be necessary.

6.6 PROJECT HUMAN RESOURCE MANAGEMENT

The right project team is the foundation of a successful fast track project. It is absolutely necessary to use expertise from professionals who are familiar with this type of work method, or similar projects. One should select designers and contractors that are experienced in this approach to construction, therefore choose a pre-qualification process to evaluate a contractor’s experience. 63

A fast-track project requires clear, single point responsibility throughout the project hierarchy to minimize project confusion about who is in charge of each aspect of design or construction. This means that the project manager should be very capable of his job, and willing to go beyond the call of duty. The various functions of site identification, land assembly, appraisal, funding, design, construction and marketing are appointed to a project manager, rather than the architect as commonly done in traditional projects. Good practice requires that all project participants exercise care in communicating responsibility for project assignments. 64 It might be wise to provide team members some sort of training to enable them to fulfil their roles. Reward structures that recognise both individual and team achievements can be a much needed stimulus in fast tracking projects.

While selecting a fast track design team, a manager has to realize that creating an effective and efficient collaborating team will cost some time. Selecting parties, who have already collaborated before, will reduce a lot of time slack. Having more than one team working on a certain special design problem in a kind of design contest can increase speed substantially. Consequently the collaboration between the teams needs to be of a high level.

Organizational planning: identifying, documenting, and assigning project roles, responsibilities and reporting relationships.

Staff acquisition: As mentioned before, selecting the participants of a fast tracking project requires special attention. Having team members with experience in fast tracking will be beneficial. They will also need to be very flexible. In some cases this will rule out smaller companies. Another benefit can be experience in similar building types. If there are solid relations between the team members, from prior projects, this will save time in building trust and communication.

Team development: It might be wise to provide team members some sort of training to enable them to fulfil their roles. Experience has precedence over training, but developing individual and group skills to enhance project performance can only benefit the fast tracking project.

6.7 PROJECT COMMUNICATION MANAGEMENT

Proper communication is essential in fast tracking because prompt decisions are required. It is possible that the misunderstandings and erroneous inferences due to incomplete documents inherent in the fast track method will cause a loss of some or all of the overlapping advantages and thus yield a completion date on or after that of a normal time schedule.

The position of project manager should be established as soon as possible after the development decision is made in principle. All communication and control thereafter flow through him. The rest of the project team should be selected on the project manager’s recommendations.

Advancements in proven information and communication technology have been a huge assistance to fast tracking. For any sizable project, documents, including meeting notes and other records, are routinely put on the Internet for all team members to access and modify. Changes can be recorded in a matter of hours instead of days.65

Three-dimensional CAD models are intended to accelerate workflow through integrated data management and automated extraction of working drawings, schedules, bills of materials, and so forth. This can put better information into contractors’ hands earlier in the project, one of the hallmarks of fast tracking.66

Project websites can increase the design process speed up to 30% because of the improvement of information handling. Computer mediated communication is promising for a high performance team because time slacks, as well as distances can be lowered to almost zero. So working with a team at different locations, at different times might not influence the design process in a negative way but might increase the interaction in the team and challenge the team to a higher performance level.67

Another aspect to be taken into consideration is having the full team working together in a temporally facility on the building spot itself.

Communications planning: Defining which stakeholder needs what information is crucial in the process of fast tracking. An overkill of information will slow down the process, but inadequate flow of information can lead to miscommunication. Through determining who has what information at what time, and who will need what information at what time, a planning is forged. The planning starts in at the beginning of the project but will be revised during the project.

Information distribution: Information distribution includes implementing the communications management plan, as well as responding to unexpected requests for information. As mentioned before, the state of the art information and communication technology can support the distribution of information at the necessary speed to successfully implement fast tracking.

Performance reporting: Performance information is distributed to stakeholders and includes how resources are being used to achieve project objectives. Performance reporting should generally provide information on scope, schedule, cost, and quality. Fast tracking also requires information on risk and procurement.

Administrative closure: Phases in fast tracking need closure once their objective is reached. Administrative closure consists of documenting the project results to formalize acceptance of the product of the particular phase by the client. Closure of the phases prevents endless changes.

6.8 PROJECT RISK MANAGEMENT

The inherent risks of fast tracking projects include: (1) the loss of financial benefits due to the cost of changes and claims, (2) the loss of planned time savings due to schedule delays, and (3) the reduction of control over project costs due to the early elimination of design options normally encountered, incomplete tender specifications, and overlapping of the construction work. Several recommendations may be made in an effort to reduce these risks like spend more effort during the design phase, develop an effective design review system, increase information input from the field work and increase involvement of participants in all stages of the project.

Construction management: Depending on whether the client opts for a management contractor or a construction manager, the larger part of the risks is carried by the management contractor or the client. The management contractor will normally provide specified common user and service facilities but does not execute any of the permanent works, these being undertaken by works contractors under his direction. He enters into contracts with the works contractors and accepts the liability for non-completion. The construction manager is a consultant who contracts with the client for a purely professional managerial role. He does not accept any liability for non-completion etc unless resulting from professional negligence.

Designers: Contractors often get a penalty fee every day a project is delivered later as the date of agreement. This procedure also might be applied to a fast track design process. This would imply that only design firms could be selected who have enough volume to take such a risk.

Works contractors: The contractor will expect that the contract time will be fairly adjusted to unforeseen occurrences and unbudgeted changes in conditions. An arbitrator will be likely to give the contractor the benefit in these situations. The only practical solution for resolving cost and time overruns at that point is to immediately reduce the scope or quality of the project.

To correct errors or to change to more advantageous designs will require more change orders than would be common under normal construction scheduling. There is also the added risk of jobsite confusion and construction delay. It is also possible that the misunderstandings and erroneous inferences due to incomplete documents inherent in the fast track method will cause a loss of some or all of the overlapping advantages. Communication problems and scope changes are a large risk in fast tracking.

An overview of some of the possible risks to be carried by the client, manager and contractor is shown in Table 8

Risk management planning: In the risk management planning stage it is wise to acknowledge the added risk of fast tracking. Some of these risks can be avoided if acted on in an early stage.

Risk identification: the risks of fast tracking are mentioned in the prior chapter and some of them are show in Table 8. It is evident that all risks, carried by all participants are necessary to be identified when fast tracking. The over-the-wall method might still be applicable, but the impact of risk can affect everyone.

Qualitative risk analysis: By analyzing the risks of fast tracking, their probability of occurrence and their impact, risks can be prioritized. This will benefit the effectiveness of risk management.

Quantitative risk analysis: The prioritized risks from the qualitative risk analysis are used to see what their impact will be on the project.

Risk response planning: Some of the risks can be prevented by allocating them to the participant who has the most control over the specific risk. Every participant needs to provide a response to the risk that they carry.
Risk monitoring and control: Although many of the additional risks in fast tracking are known, there is always the possibility of new risks turning up. This is why it is essential to monitor the project during the whole life-cycle.

6.9 PROJECT PROCUREMENT MANAGEMENT

The position of project manager should be established as soon as possible after the development decision is made in principle. All communication and control thereafter flow through him. The rest of the project team should be selected on the project manager’s recommendations.

A management contract may be described as an arrangement in which the client appoints an external organisation (management contractor) to manage and co-ordinate the design and construction phases of a project. The management contractor will normally provide specified common user and service facilities but does not execute any of the permanent works, these being undertaken by works contractors under his direction.

Most works contractors are selected by competitive tender based on bills of quantities or a work schedule with preliminaries and specifications. A performance specification may be used. Price is not the only criterion for selection; the prospective works contractor should demonstrate the ability to provide the technical and managerial capabilities required for delivery on a tight programme, understand the design implications and coding with particular reference to interfacing and offer the requisite design input.

The most difficult aspect of any fast-track project is negotiating the contract between the owner and contractor and determining the method to price changes. A fixed-priced contract with changes to be paid by time and materials would likely cause the total cost of the project to exceed the client’s acceptable budget. On the other hand, a cost-plus contract with a maximum guaranteed price could create unnecessary hardship for the contractor. Therefore, the best avenue for sharing the risk may be a cost-plus contract that clearly defines what is reimbursable and what is not. In addition, the client may want to allow the contractor a contingency to accommodate smaller changes and to keep the project moving smoothly. A distinction should be made, by drafting a contract for the services provided in the advisory and costing phase, another contract for the services provided in the construction phase. This is also known as a Design-Build-Contract. The Construction Management method of project delivery is a similar method amenable to fast tracking.

In as much as the contractor must be brought in at a very early stage in fast track, it is difficult to obtain genuine general contractor price competition. If bidding competition is an absolute owner requirement, the contractor cannot be selected until after the drawings and specifications are available, at least to the level of 60 or 70 percent completion. This would effectively rule out any contractor input during the early design stages when the most significant cost affecting decisions are being made. Contractors bidding from incomplete documents will be at a distinct disadvantage. For these reasons, it would make better sense to select a contractor on the basis of comparative experience, reputation, recommendations, and interviews. The price competition at the level of subcontractors and suppliers will normally be quite sufficient to protect the owner’s interests. As a part of the selection process the contractor remuneration system or formula can be discussed, negotiated, and adopted.

In a fast track design team, design team members have to be carefully selected on their proven experience with the deliverance of the same type of designs as is in the concerning project.

Procurement planning: Based on the scope and the market conditions, a planning is drafted on what to procure, how to procure it, how much of it and when. This forms the starting point of procurement and is integrated in all other planning processes.

Solicitation planning: The requirements for the solicitation should unambiguous. Since the lowest price is not an adequate measure, a detailed list of requirements is needed. Experience, quality, leadership, commitment, are

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some of the requirements but they are hard to measure. Therefore these qualities need to be translated in measurable requirements.

**Solicitation:** During this process the quotations, bids, offers, or proposals are obtained

**Source selection:** Fast tracking requires a different approach to source selection than traditional projects. If the requirements were adequately formulated in the solicitation planning there should be no problem in selecting the right parties for the project. The proposals need to be ranked in order to establish a negotiation sequence.

**Contract administration:** Since many contractors are needed in a fast tracking project, there is a demand for administration and control of the execution of the procured services and products.

**Contract closeout:** A verification of completion and settlement of the contract is needed in order to close phase of the project.

### 6.10 THEORETICAL FRAMEWORK: RECAPITULATION

<table>
<thead>
<tr>
<th>Project Management Body of Knowledge</th>
<th>Fast Track Management</th>
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<td><strong>Project Integration Management</strong></td>
<td>Fast tracking is obtained though creation of work packages and overlapping these work packages. The fragmentations in fast tracking are a threat to successful implementation. Integration management in fast tracking is especially important in:</td>
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<tr>
<td>The processes required to ensure that the various elements of the project are properly coordinated.</td>
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<td>• Project plan development: integrating and coordinating all project plans to create a consistent, coherent document.</td>
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<td>• Project plan execution: carrying out the project plan by performing the activities included therein.</td>
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<tr>
<td>• Integrated change control: coordinating changes across the entire project.</td>
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<tr>
<td><strong>Project Scope Management</strong></td>
<td>Clearly defined work packages support fast tracking. Lack of information may complicate defining scope. Thorough scope management is essential in fast tracking because:</td>
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<tr>
<td>The processes required to ensure that the project includes all the work required, to complete the project successfully.</td>
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<tr>
<td>• Initiation: authorizing the project or phase</td>
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<td>• Scope planning: developing a written scope statement as the basis for future project decisions</td>
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<td>• Scope definition: subdividing the major project deliverables into smaller, more manageable decisions.</td>
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<td>• Scope verification: formalizing acceptance of the project scope.</td>
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<tr>
<td><strong>Project Time Management</strong></td>
<td>Time reduction is the primary objective of fast tracking. Time is saved through simultaneously executing work packages in which design and construction is overlapping.</td>
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<tr>
<td>The processes required to ensure timely completion of the project.</td>
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<td>• Activity definition: identifying the specific activities that must be performed to produce the various project deliverables.</td>
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<td>• Activity sequencing: identifying and documenting interactivity dependencies.</td>
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<td>• Penalize contractors and designers do keep their deadlines.</td>
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<td>• Stimulate the high speed project through incentives in the reimbursement system.</td>
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| • Make use of advanced information and communication technology to keep the duration of communication to a
## Project Cost Management
The processes required to ensure that the project is completed within the approved budget.
- Resource planning: determining what resources (people, equipment, materials) and what quantities of each should be used to perform project activities.
- Cost estimating: developing an approximation of the costs of the resources needed to complete project activities.
- Cost budgeting: allocating the overall cost estimate to individual work activities.
- Cost control: controlling changes to the project budget.

The many interfaces between the work packages and the speed at which a fast track project is going results risk of quality loss.
- Designers usually have more time to think things through. Fast tracking can lead to designer struggling to stay ahead of the contractors.
- Contractors usually have time to correct their work or run behind without jeopardizing the whole project.
- Use expert knowledge from different contractors or engineers to estimate the costs.
- Use cost-benefit analysis to create a quality plan.
- Continuously check and control the quality. Adjust the tasks where necessary, but understand the consequences.

## Project Quality Management
The processes required to ensure that the project will satisfy the needs for which it was undertaken.
- Quality planning: identifying which quality standards are relevant to the project and determining how to satisfy them.
- Quality assurance: evaluating overall project performance on a regular basis to provide confidence that the project will satisfy the relevant quality standards.
- Quality control: monitoring specific project results to determine if they comply with relevant quality standards and identifying ways to eliminate causes of unsatisfactory performance.

It is generally accepted that fast tracking has higher initial costs. This is because speeding up the project will affect the efficiency/productivity level. These additional costs should eventually be compensate through the benefits of fast tracking like early usage of the building, less inflation, etc.
- Use expert knowledge from different contractors or engineers to estimate the costs.
- Be careful in allocating risks. The more risk a contractor has to carry, the higher his bid will be.
- Both savings and costs as a result of fast tracking need to be incorporated into the budgeting.

## Project Human Resource Management
The processes required to make the most effective use of the people involved with the project.
- Organizational planning: identifying, documenting, and assigning project roles, responsibilities and reporting relationships.
- Staff acquisition: getting the needed human resources assigned to and working on the project.
- Team development: developing individual and group skills to enhance project performance.

The right project team is the foundation of a successful fast track project.
- Use designers and contractors that are experienced in fast tracking.
- Choose a pre-qualification process to evaluate a contractor’s experience.
- Provide team members with possible necessary training.
- Parties who have collaborated together before may have an advantage.
- The project manager should be selected as soon as possible. All other members of the project team should be handpicked by the project manager.
- Flexibility should be an important requirement in the selection process.

## Project Communication Management
The processes required to ensure timely and appropriate generation, collection, dissemination, storage, and ultimate disposition of project information.
- Communications planning: determining the information and communications needs of the stakeholders: who needs what

Proper communication is essential in fast tracking because prompt decisions are required.
- All communication and control flow through the project manager.
- Advancements in proven information and communication technology can be huge assistance to fast tracking.
### Project Risk Management

The systematic process of identifying, analyzing, and responding to project risk. It includes maximizing the probability and consequences of positive events and minimizing the probability and consequences of adverse events to project objectives.

- **Risk management planning:** deciding how to approach and plan the risk management activities for a project.
- **Risk identification:** determining which risks might affect the project and documenting their characteristics.
- **Qualitative risk analysis:** performing a qualitative analysis of risk and conditions to prioritize their effects on project’s objectives.
- **Quantitative risk analysis:** measuring the probability and consequences of risks and estimating their implications for project objectives.
- **Risk response planning:** developing procedures and techniques to enhance opportunities and reduce threats from risk to the project’s objectives.
- **Risk monitoring and control:** monitoring residual risks, identifying new risks, executing risk reduction plans, and evaluating their effectiveness throughout the project life cycle.

Changes can be recorded in a matter of hours instead of days.

- Another aspect to be taken into consideration is having the full team working together in a temporally facility on the building spot itself.
- An overkill of information will slow down the process, but inadequate flow of information can lead to miscommunication.
- Closure of the phases is needed to prevent endless changes in the design.

### Project Procurement Management

The processes required to acquire goods and services to attain project scope from outside the performing organization.

- **Procurement planning:** determining what to procure and when.
- **Solicitation planning:** documenting product requirements and identifying potential sources.
- **Solicitation:** obtaining quotations, bids, offers, or proposals, as appropriate.
- **Source selection:** choosing from among potential sellers.
- **Contract administration:** managing the relationship with the seller.
- **Contract closeout completion and settlement of the contract, including resolution of any open items.

Fast tracking is not bounded by one type of contracting form. Many contracts are possible, and even the standard over-the-wall method is used quite often.

- The position of project manager should be established. The rest of the project team should be selected on the project manager’s recommendations.
- A management contractor will arrange and co-ordinate all contracts with works contractors. Be aware that allocating risks comes at a price.
- Some risk can be avoided through penalty fees for every day a design plan or a construction task is delivered later as the date of agreement.
- Jobsite confusion and construction delays are more common in fast tracking projects.
- Scope changes and low quality communication are major risks in fast tracking.
- Table 8 shows some of the other risks involved in fast tracking.
- Just allocating risks is not enough. Proper response needs to be worked out by all who carry risk.

Choosing fast tracking management as a method to deliver a building comes with much greater risk than a traditional process. Not just the client, but all participants are burdened with this risk.

- Loss of financial benefits due to the cost of changes and claims.
- Loss of planned time savings due to schedule delays.
- The reduction of control over project costs due to the early elimination of design options normally encountered, incomplete tender specifications, and overlapping of the construction work.
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and adjustable, but fixed-price is very hazardous to the client, cost+ with a guaranteed maximum price can put a contractor on the spot since there is still much unknown. A cost-plus contract that clearly defines what is reimbursable and what is not is ideal.

- If a Design-Build contract is opted, a distinction should be made between services provided by the contractor as a consultant and as a works contractor.
CRISIS PROJECT MANAGEMENT
THE RELOCATION OF THE FACULTY OF ARCHITECTURE
David Caelers

Chapter: Theoretical Framework: fast tracking in relation to project management knowledge areas
EMPIRICAL RESEARCH

This chapter contains the results from the case study research. The selected case is the relocation of the Faculty of Architecture to Julianalaan 134-136, called BK City.

7.1 APPROACH TO DATA COLLECTION

The case study data collection has taken place from the beginning of September 2008 till October 2009. By joining the project organization the opportunity arrived to have full access to all aspects of the project. During this time data was collected in several ways:

Attending meetings. By attending many meetings during this project, a lot of data was collected. Each week I have attended a number of meetings with different parties involved in the project. In some cases I would prepare the agenda for the meeting, in some cases I have written the minutes. In most cases I attended the meeting and wrote down what happened. Some of the meetings I joined were with the construction project managers, some were with the (sub)contractors, some with the insurance company and some with the project group. At the end of each week I had heard most of what was going on that week from a number of different viewpoints.

Presence on the building site. I had a daily walk through the building site, observing the work in progress but also the work delivered. During these walks I would take some pictures. There was not a meeting that could show me the progress better than a walk through the building.

Access to all information. Due to my official task as project secretary I have had access to all the documents present at the office. These are schedules, budgets, minutes from all meetings and much more. This source of information is only used as back up since most of these documents are discussed during these meetings. Eventually I helped collect all these documents to form a dossier on the project.

Presence at the office. This is a very informal way of gathering information. By being present at the office of the project management team it is easy to overhear the people involved talking about subjects that might not be discussed during the meetings. This type of information can be quite shocking and always needs to be checked before adding to the collection of information. It certainly puts the factual information from minutes in a different light.

Interviews. A lot of the information gathered through above mentioned methods are subject to my personal view on situations and therefore too subjective to be the only source of information. The minutes and other documents provide a neutral point of view, but a third angle would make triangulation possible. Triangulation is a powerful technique that facilitates validation of data through cross verification from more than two sources. In particular, it refers to the application and combination of several research methodologies in the study of the same phenomenon.70

The result of this data collection is a vast dossier including all documents, drawings, calculations, correspondence, minutes and interviews. In order to make this information tangible, a selection had to be made. The primary sources of information and the only official moments of decision-making where located in the minutes that were often, but not always, kept. During these meetings, during conversations with participants, and during the site visits I would make more personal notes that include my point of view on the situation at hand. A summary of the minutes and my weekly notes are the foundation of the data collection and can be found in paragraph 5.2.1. The interviews are documented separately in paragraph 5.2.2. Another source I have used is the recently published "The Making of BK City" in which all parties involved are interviewed. Although I was not the interviewer, some of the results of these interviews are useful for this research. A list of quotes can be found in paragraph 5.2.3.

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7.2 RESULTS OF DATACOLLECTION

7.2.1 SUMMARY OF HISTORY AND NOTABLE EVENTS

In order to understand the summary of the minutes it is wise to elaborate on the organizational structure of the project. The organization chart relevant to this research is shown in Figure 19.

![Organization and data chart](image)

**Figure 19 Organization and data chart**

Only team members that attend more than 1 of these project teams are mentioned here. My presence in the teams and the blue balloon “Memoirs” are not part of the organizational structure, but mentioned in this chart to explain where my notes are based upon, amongst other resources. The colours correspond to the colours of the text in this paragraph. The brief team is not incorporated in this research.

_The Steering Committee_: Chaired by the chairman of the Executive Board of the university, the steering committee is the highest ruling team in the project organization. The dean of the faculty, who is chairman of the design team as well, the project manager, who is chairman of the project group are members of the steering committee as well to inform the committee on the progress. The secretary of the Executive Board is...
present as contact point for the insurance experts. The director of the Finance & Control department is present, however, he is not accountable for the budget.

**The Project Group:** Chaired by the leading project manager, the project group is the focal point of all teams. The team consist of all the chairmen from the "phase" teams (brief, design, construction, facility). Its main concern is to integrate all the interfaces between the different disciplines. The dean, chairman of the design team, is supported by the coordinating architect. When necessary, others can be temporarily added to the project group to clarify current business.

**The Design Team:** Chaired by the dean of the faculty, the design team is a collaboration between all architects. Representatives of all architecture bureaus take a seat in this team. The chairman of the brief team, the construction team, the facility team and the chief project manager attend this meeting as well.

**The Construction Team:** Chaired by the construction manager from the Facility Management & Real Estate department, the construction team is by far the largest team. Representatives of all works contractors attend this meeting and so do the project leaders who steer them on the construction site. All project leaders are, direct or indirect, part of the Facility Management & Real Estate department, just like the construction manager and the facility manager. A representative of the coordinating architecture bureau attends this meeting as well to assure the works discussed are designed properly and the designs are constructed properly.

The original summary of minutes was 35 pages long. It is added as Appendix A. That summary contained the exact dates of every meeting and divided all results in weeks. A summary of this data collection is used for this report. It divides the information in months and reduced the data to 20 pages. Appendix B is an overview of the data collection. It is a table with the teams on one axis and the months on the other. This overview will be used to analyze the data.

---

**AUGUST**

**STEERING COMMITTEE**

Construction of the First Phase seems to have no problems. At this time demolition of the Second Phase will commence.

The appeal for permits regarding the breakthrough for the glass houses and the restaurant will be handed in this week. A normal procedure will be followed.

A system to control the budget is being implemented. A first report is to be expected next week.

The parking area is finished

Schedule for the 2nd phase is complete, schedule for the 3rd phase in general.

Questions being raised concerning the motives not to opt for one of the alternatives. It is pointed out that the choice was well founded by arguments and the cost overruns were unexpected and unavoidable.

Cost overview for 1st and 2nd phase is finalized. Estimation for 3rd phase is critically judged

The municipality has received all drawings. Still have to wait for possible objections from local community.

The 1st phase is on schedule, so the freshman students will be able to move in on the 1st of September.

Project leader H. Wamelink is concerned about the feasibility of the general schedule.

**PROJECT GROUP**

All new passage ways inside the building need to be mapped and handed to the municipality for approval.

The university team needs to keep the budget under control, and not leave it up to the engineers or consultants.

The design for the Street has been approved.

Questions are raised regarding the 'special' European procurement procedure. Will the glass houses also be part of this accelerated process? How long can this continue?
Furniture will need to be stored, since the construction schedule is falling behind.

Concerns are brought up with regards to the safety of laptops when the building is operational.

The builders that are currently working on the First Phase will go on holiday the 1st of September. A second crew will start the Second Phase. This means the risk of making the same mistakes the Second Phase is very possible.

The (financial) project manager is displeased with the course of action during the First Phase. All was executed rather ad hoc, resulting in limited room for cost control. By pressing on information from engineers, designers and contractors he hopes to have better control in the Second Phase.

After a meeting with the committee for monuments, it has been decided that all breakthrough in the inner and outer walls are approved, aside from one in the restaurant and one at the west side.

There will be 258 parking spaces created.

Residents are now more concerned about the change in appearance of the building, after construction. They will be kept posted on design plans.

The electrical and mechanical systems have been checked by a second opinion, to save money. The electrical systems are not over priced and cannot be reduced.

The next deadline is fixed on the 1st of November.

Due to holidays in is safe to say that the designs and the glass houses are behind on schedule.

IT connections are up from 3000 to 4000. Miscalculation in the global estimate.

A proper archive needs to be composed. All design products, permits, minutes, revisions and consults should be in here.

The permits have reached the period in which outsiders can object to the plans. There is no indication thus far that someone will object.

Two of the breakthroughs lead through fire resistant walls. An alternative is yet to be found.

The current intention for the colour scheme regarding the window stills is that each window still will get a different colour to respond to (country) flags. A municipal committee has yet to approve this plan.

Some of the plans need some adjustment as the owner (Fortis) does not appreciate some of the proposed modifications.

There has been a lot of recovering of asbestos. Someone needs to assess how much is allocated to the budget, and how much is spent. At this time the budget has not been overrun

The programme used to control the costs/budget is not working as planned because it makes no distinction between planned costs (or budgeted costs) and real time costs (like invoices). Another programme keeps track of the actual expenditure.

A construction schedule has been drafted by acquiring schedules from all contractors and discussing these with all project leaders.

The Second Phase will be even more intense since all contractors will be working on all floors

The fire department wants all furniture to be bolted down. Lose furniture can be hazardous in case of an emergency.

The colour scheme of the window stills has been approved by the committee. The paint can commence soon.

The idea of a flexible work environment is nullified if there are only a few fixed access points to the internet. Looking into the options of a complete wireless environment.

Yet again the plan to dissolve the design team. Actions should be taken over by the project group or the designers themselves.

There has been no budget allocated for the development of the surrounding area.

There is a clear distinction between the flow of students and flow of builders. These flows should never cross each other. Students will be briefed on where they can or cannot go.
DESIGN TEAM

Surrounding areas:

- Front square: Bicycle Park for 400 bikes. Function of the square should be a meeting place. The statue will return. A car free zone.
- There should be designated smoking areas, with some form of shelter.
- Ample parking spaces. The entrances should be clearly visible from the parking lot. Bicycle spaces need to be located near the entrances or the y will lose function.
- Room will be created to have greenery in the landscape.
- Usage of existing bricks to pave the area.
- Other than smoking areas there will be need for areas to sit down.

The building:

- Colouring the window stills on the third floor in fluorescent colours is not allowed by the municipality. The idea comes from Koolhaas to imitate the flags of the world. Details need to be discussed with the municipality.
- The glass houses need to be defined further. The ‘boxes’ in the east glass house need to be ‘tables’. They are not allowed to be closed off. There should be more information on the degree of sunlight in the glass houses.
- The lecture halls need to be named. Either a letter or a name. Size of the letter should increase as you approach the room. No more than 4 directions should be named. Avoid directions like “south-west”.

Design is no longer “boxes”, but mid-level floors on both ends. There will be 6 meter gaps between the glass house and the building for fire safety. The dean will decide whether steel or cardboard will be used and which alternative for roof lighting will be used. The designer/contractor of the glass houses expects both glass houses to be finished at the start of December.

The window stills will be coloured in style of country flags.

The interior architect for the east glass house (MVRDV) will have a look at the options for the tower. Any adjustments will need a new permit. Options are limited by the structure.

The interior of the glass houses are separate volumes with own structure. Close collaboration is needed between the architects and the installation engineers.

CONSTRUCTION

Creating passages in the walls needs to pick up pace. It is falling behind schedule.

Sprinkler and IT services are being installed on schedule.

The Second Phase is considered as being harder than the First Phase. Deadline for the Second Phase is 01-11-2008. Possibly extra shift are necessary to maintain the deadline.

Invoices need to be handled swiftly. A massive pile of bids will be discussed this week.

A special lunch will organized, 13-08-2008, for all on site builders.

A new building site needs to be fitted out, for the Second Phase.

Paint work on the third floor will be finished 13-08-2008. Second floor is next.

The floors are not level, so no skirting will be placed.

Carpet on the second floor is behind schedule.

Ground floor is on schedule, except for asbestos sanitation.

The stairwells will not be coated because it is too labour-intensive.

Asbestos sanitation will clear the First Phase in week 33. Sanitation in Second Phase has started already.

The plans for the library will be finished on 13-08-2008. Therefore this section will be added to the Third Phase (instead of Second Phase).
The arrangement of the main entrance/lobby has been rejected by the architect. Hold plans till further notice.

Weather circumstances are causing delays in the suspension of the sprinkler tubes.

Chairman expresses his fear of possible delay in the schedule. Hardly any contractor is using the possibility that is given to work during the nights and/or on weekends. Delays in the First Phase will have repercussions for the Second Phase. If contractors do not use the opportunity to work nights and weekends, they have no cause to fail the 01-09-2008 deadline.

First Phase is asbestos free. Second Phase is in progress and will be cleared in week 34.

Contractor reports good being stolen (again!)
Sprinkler installation will be tested 26-08-2008
Project leaders will provide the schedule for the Second Phase and distribute it 21-08-2008
Fire department will check the building on 29-08-2008. Escape routes need to be open.

MEMOIRS

Contractors inform their project leaders that they will finished within the deadline, yet they do not realize that they are not just depending on a final deadline, but also the progress another contractor is having. For instance, a painter cannot start his work before the structural work and plaster work is finished.

The university is keeping the contractors to their promise that they will finish in time. If not, they threaten, other contractors might be called in for the Second Phase. This will obviously not happen, since most of the material is already ordered, but it is the only leverage the university has since no penalties were discussed.

Still a lot of issues regarding the process of payment. No one really knows where all the invoices or orders go to and how they get there. It is a very bureaucratic system that does not work in a high speed project.

The pressure on the project leaders is stacking up. Their contractors claim they will finish in time, but the progress of the work suggests they will not. The project leaders are criticized for lack of judgement of the work done, and simply just taking the word of the contractors.

Communication between the project leaders is deteriorating as well. The pressure and the miscommunication are creating a lot of frustration.

An argument during the construction team meeting leads to postponing the meeting and taking the contractors to the site to confront them with the lack of progress in the work.

The contractors are confronted with the schedule for the Second Phase. They object as their proposals for schedule have been used, but shortened in order to maintain the ultimatum. The project managers refer to the option of working 24/7. The contractors do not agree with this proposal as they do not have the manpower to work 24/7. Management suggests hiring more people, but this does not always improve the work rate. People start to hinder each other, and the floors cannot take the weight of many lifts and work force.

SEPTEMBER

STEERING COMMITTEE

Feasibility of the schedule seems plausible.

To improve communication with user (employees) a special team (Flex team) is implemented.

Costs allocated to asbestos sanitation appear to exceed the budget by 200,000 euro.

Independent engineering company thinks the bid for the glass houses is too high. Cost calculation will be reviewed and both companies will clarify their opinion.

Permission is granted to create a different budget/account for inventory needed in the new building.

Second deadline, 1st of November, will be maintained. Everything is on schedule.

Second opinion on the cost calculation of the glass houses differs from calculation by Octatube. Meeting planned on 15th of September.
PROJECT GROUP

Switching to double shifts has been proposed. The design needs to be ‘frozen’. Cleaning needs to be done more promptly. Someone needs to check what the financial consequences are to working in double shifts.

Asbestos sanitation is definitely over budget. Costs were initially estimated at 200,000 Euros, but will probably be 400,000 Euros.

For the costs of the glass houses a second opinion has been required. This second opinion is 400,000 lower than the initial bid. Both the contractor and the consultant need to face each other and come to an agreement.

The insurance company does not consider the glass houses to be simple and efficient. At the start of the project half of the insurance money should be spend on simple and efficient objectives.

The point is made that if we are to drill foundation for the glass houses, we will need to order the materials now.

A financial system is still not working. By next Monday a spreadsheet is needed to show the orders and invoices clearly to the steering committee.

Apparently there is 24/7 security on site. Still there are reports of goods stolen, so a watchdog is proposed.

The design team needs to be informed that the deadline for designing the Second Phase has passed.

The municipality is sending mixed signals regarding the colour of the gutters. To be on the safe side, the university will choose a neutral colour.

Foundation piles will be ordered as soon as the structural engineer is done calculating.

The cost control system is making progress. An overview is created.

The plan for the surrounding area is to asphalt most of it, create some parking spaces, trim the bushes, a recreational area, etc. A different budget will be used for lighting and furniture, by making it portable to the new faculty building.

The second floor of the First Phase is ready on the 30th of September. This means that Bachelor and Master students will be moving in on the 1st of November.

DESIGN TEAM

The structure of the glass houses is under debate. Keeping distance between the framework and the façade could lead to a strip of glass between the glass house roof and the old building. The number of columns needed is going to be calculated. The energy/daylight concept has not been worked out properly yet. Acoustics in the glass houses need to be sorted as well. Floors need to be defined as well. Bricks are the cheapest solution, but will hinder with wheeled furniture. Decisions need to be made regarding the electrical and data services. Is the network going to up in the ceiling, or down in the floor?

A choice needs to be made between having the structure of the glass houses supported by the façade of the building or by columns.

Acoustics are still a problem. Having absorbing materials in the roof might not be sufficient since the glass walls are. An external consultant company will look into it (Cauberg-Huijgen)

Although bricks would be a cheap solution for the floors, the ambition is still there to have the glass houses and the front square asphalted.

Regarding the mechanical engineering there are some issues concerning the ventilation, overheating and acoustics. A second opinion is gathered from an engineering company (ABT).

The climate needs to be sufficient in quality, yet everyone is fully aware that the services are only needed for 5 years. A large investment would be a waste.

Dazzle and overheating can be a direct result of flashes from the sun. The roof should be closed in some parts and blinds should be placed.

Options are discussed regarding a third floor in the east glass house. Unfortunately this would require a lot more fire safety issues to be met, like sprinklers and the fire resistance of the structure.

CONSTRUCTION
Every week during this weekend it is mentioned that hard hats and other safety clothing is mandatory. Many builders refuse to wear the regulated clothing and risk the consequence of being sent off the building site. Repercussions are responsibility of the contractor.

Schedules for Second Phase need to be adjusted to prevent the same mistakes being made in the First Phase.

New work schedule consists of 2 shifts (7 till 4 and 4 till 11, instead of 7 till 7)

Questions are raised concerning the instalments (terms of payment). The chairman will see to it that the term/time of payment is set at "0".

The new work schedule, consisting of two shifts is rejected.

If work is not properly done, and needs to be corrected, this will be done in the weekend to prevent any possible delays.

Third floor, Second Phase, should be demolished by week 40

Some of the painting jobs have been cancelled, to save money. The alternative is cleaning the walls thoroughly.

The demolition crew is leaving to much rubbish behind.

All bids for the First Phase are in, but not all have been accepted or paid out.

The demolition crew and painters are working in the same space creating an unsafe environment. The ‘finishing’ contractors (like carpeting and painting) are having difficulties because the demolition crew is falling behind on schedule. The only option is to do demolition work at night and make sure unsafe areas are marked.

Safety is a big issue. Hardly anyone respects the rules on wearing hardhats and boots. Also the site is not well lockable, which allows trespassers.

Contractors need to put on a list who is working on site. Contractors are responsible for their own equipment and materials. It becomes university property the moment it is bolted down, or in any way part of the building.

The library and the ‘street’ are taken out of the general schedule. There is not clear view on the schedule regarding these sub-projects.

As a result of conflicts between demolition work and other work, due to debris, the demolition work will be scheduled around regular working hours.

General rule of thumb is: when rounds are made, with contractors, and work is behind on schedule, the schedule will be adjusted, personnel will be added or extra shifts. Anything to catch up to the original schedule.

Asbestos sanitation in the basement should be finished in week 42.

MEMOIRS

Two problems will be solved with one solution. A number of rooms are in need of awning. Since this will be placed on the inside due to the monumental state of the façade, the awning can also be used to improve the acoustics. Areas that are subject to a lot of light exposure will have the outside awning repaired. Areas with little exposure will get curtains. In total 6 types of awning are used.

Some lecture halls will get curtains as well, for acoustic reasons.

Instead of placing blackboards in lecture rooms, movable whiteboards are used. This increases flexibility and can be bought from the budget for the new building.

The air vents and the lighting are interfering with each other as a result of separate designs.

The deliberate damages to the building cannot continue. Builders need to wear recognizable clothing to be able to spot people that are not allowed on the building site, and confront builders who damage work.

Still First Phase on the agenda. It seems that the last bits are the toughest to tackle.

The municipality does not seem to have 1 clear view on the colour scheme for the window stills. There are some in favour of the colours, some are opposed. In more than one occasion the municipality has shown inconsistency in its actions and consents.

The design for the glass houses is taking too long. Decisions need to be made and a bit more pressure on the designer would be preferable. Perhaps making him join the project group will help.

A big judgement error regarding the surrounding area. The idea was to have about 200.000 Euros to create a few parking spaces. The estimate right now is 1,2 million Euros.
Someone needs to make arrangements with the owner, Fortis bank, to put down in writing that they will cover certain expenses.

There is a discussion going on between the chairman of the project group (who is also chairman of the department real estate & housing) and the chairman of the design team (who is also the dean). Point of discussion is the monitoring of the project. Apparently the dean is not in favour of someone monitoring the process. I wonder why…

OCTOBER

STEERING COMMITTEE

An overview needs to be drafted concerning the different insurances and their pay out.

Costs allocated to the inventory, like furniture, need to be documented carefully. The 1st of November deadline will only be kept concerning the students. The employees will be housed later on. The aim is to have it sorted before the 1st of December.

A newsletter is proposed, to inform everyone regarding the housing moments.

The integration of the glass houses with the existing building poses problems (structure versus foundation).

A financial agreement has been reached concerning the glass houses

Schedule of the glass houses is aimed at the Dies Natalis, 09-01-2009.

Another asbestos contamination has occurred. The sanitation company has to be reviewed on their performance.

The budget of 44 million Euros, as agreed upon on 31-07-2008, will be maintained.

Accident has occurred. Electrician has made a judgement error, resulting in an electric shock. He seems to be in good shape. The pace of construction is not influenced.

Again a case of asbestos contamination. A new company has been signed on. This will have consequences for the budget. The adversity has used up all of the ‘unforeseen’ leeway.

Construction schedule of the glass houses is deemed unfeasible. Three options are brought forward:

1. Steel structure. Cheap, durable and fast construction
2. Cardboard structure. Agreed price, limited lifespan (5 years), longer construction time
3. Cardboard structure with glass fibre. More expensive, durable, longer construction time

The steering committee finds itself in a predicament. All options have different insights. The ease of usage is not yet compared in this proposal. A decision is yet to be made. In reviewing the options for the glass houses, the main items of interest are costs, durability and scheduling.

The budget is under great strain. The main reason is the adversity concerning the asbestos sanitation. The question arises whether or not the budget can still be maintained. The committee proposes to build the glass houses in stages. It might not be possible to maintain all functions without one of the glass houses. This needs further investigation.

The consequences of putting the second glass house on hold are:

- 128 less MSc workspaces
- 16 less employee workspaces
- 1 presentation room less
- 1 exposition room less

The design team has concluded that the second glass house is a necessity

Realizing all wishes would result in exceeding of the budget by 2,5 million Euros. Executing only the essentials would exceed the budget by 1,5 million Euros.

Both glass houses will be built. The structure will be made out of steel. Deadline is before the Dies Natalis, 09-01-2009. Costs regarding the interior of the east glass house will be reduced to its original budget. The construction of the ‘temple’ building will be put on hold.

The insurance company has proposed an alternative solution for the east glass house. This will be taken into consideration in next meeting.
Two factors may jeopardize the schedule for the construction of the glass houses, the floor and the roof. Both can only be constructed during dry weather.

Foundations work will commence this Monday. The official building permit has not been released yet, but the municipality has promised to arrange before the end of the week.

Discussions between the steering committee and the bar committee has lead to the bar committee to look for solutions themselves. Firstly, the temple building will be made ready for construction. The next stage is to determine how to proceed with the right parties.

Communication in the direction of the students and employees is going very well. A newsletter, a website and emails are used.

The front square of the building will not be asphalted, but paved with bricks.

At this time, the budget over-run is steady at 1.5 million Euros. The asbestos sanitation is independent from the budget since there is no alternative but to sanitize.

The choice for the glass houses needs to be documented properly.

PROJECT GROUP

The permit regarding the monument status will be received today. The other permits are underway and should not take more than 1-2 weeks.

The colours of the window stills have been verbally approved by the municipality.

The addition to the team by the municipality will cease, until the request comes from the team.

Asphalt in the glass house is not an option because the machinery will sink into it. A sturdy floor has not been calculated into the budget. Perhaps a combination in which the locations for machinery get a sturdy floor and the remainder is asphalt.

The managing/leading architect has been chosen to design the faculty bar. The specifics are yet to be decided upon. Not sure if the costs have been incorporated into the budget.

Permit regarding monumental status is in, the other permits are delayed.

The glass houses will not be ready by the end of the year, as was suggested before. February will be more likely. Therefore, the Dies will not take place in the glass house (later to be changed). The idea at first was: engineering in September, fabrication in October, and assembly in December. This is no longer feasible. With extra effort and using steel instead of cardboard the process could be speed up, but this is not preferable right now.

Budget under pressure due to asbestos sanitation.

The surrounding area has always been a balancing item in the budget. Other budget cuts need to be made in order to execute the proposed work for the area.

Accident on the site resulted in a builder getting a 500 volts shock. The accident is not caused by third parties or a result of the speed/crowdedness of the project. The builder is fine and released from hospital the same day.

There is still no permit for the pile foundation, yet the work will start next Monday.

The piling of the foundation will cause for a lot of noise. It is important to make sure everyone is aware of this. Discouraging people to come to the faculty during the foundation work. Some meetings and plans need to be relocated.

The steering committee has decided that the Dies is more important than the design of the glass houses. Cardboard is out, steel is in.

DESIGN TEAM

Decision is made to built the glass house out of cardboard, but put the east glass house on hold for now. This will have consequences for the budget as well as the programme, so this will need to be sorted. The street will have a break up to the espresso bar, Master students will need to be allocated somewhere else, another presentation room (120p) will be needed, some staff places need to be relocated, etc.

Since the budget is being over-run, all expenses need to be thoroughly noted. Paint work is starting to cost 70.000 Euros more than budgeted. The colour scheme of the window stills is met with hostility. Should we continue if the costs are rising as well?

Design changes of the library and the congress room will have negative consequences on the budget.
A list should be made with necessary and desirable items and there costs regard: the east glass house, the crow’s nest, the temple building, the basement, the I-web.

The interior of the east glass house has three floors, four wheeled staircases, a flexible wall and is 200.000 Euros under budget. The extra costs of installations due to the third floor are not calculated yet.

In order to start construction work on the glass houses, the design of the floors need to be ready, which they are not now. A contractor for the floor is yet to be decided upon as well.

Decisions by the steering committee:

- It has been decided that both glass houses are needed. Still, it is unacceptable that the south glass house will not be ready on the 9th of January. The cardboard has been replaced by steel, to speed up the construction.
- The temple building is on hold for now. The I-web will not be moved for now.
- The interior of the east glass house needs to be even cheaper.
- The colouring of the window stills will carry on. The colour scheme will be adjusted
- Research is needed to see what is possible regarding a secured bicycle park.

Glass houses:

- A new work schedule needs to be drafted. The designer/contractor suggests starting with the east glass house, instead of the (larger) south glass house.
- Awning is still a big issue. Not all facades will need awning, but from a design point of view all façades need to look alike. Rolls are need to cover 6 meters up and 6 meter down from the middle of the façade.
- If the calculations are in order and send to the municipality, within 14 days a permit will be issued. A permit prior to construction is preferred.
- Decision needed regarding the floors. Bricks are 80.000 Euros cheaper than concrete. Machinery would be situated on concrete slabs. This would prevent any flexibility in location of the machinery. Moving furniture would be difficult as well.

Planning has been handed to the contractors. Critical points in the planning: concrete floor, the roofing and coordination of the complete project.

Pile driving for the foundation will start on Monday. Needs to be communicated to students, employees and residents.

Fixed awning is out of the question since it would be against the whole concept of the glass house. Another meeting is needed to discuss the awning in detail.

An engineering company (ABT) can make a concept model for the air conditioning which could save 80.000 Euros eventually. The time schedule has room for this option.

The municipality has received no objections regarding the glass houses, so the permits should be issued this week. Some adjustments have been made after submitting the plans, but none are exceeding the margin for changes.

The fire department still needs to check the glass houses. The south glass house can be submitted, and for the east glass house some current drawings can be used.

The floor in the glass houses will be concrete. Due to the increase of costs, the front square will be paved instead of asphalted.

A new design is needed for the interior of the east glass house. Something less expensive and with regard to floor heights. The designer (MVRDV) the user (DSD) and the dean have different view on the design. All need to find an agreeable design.

In the budget, the south glass house has metal-stud walls. The design team would like the walls to be made out of hardened glass.

The I-web was still in consideration. Costs for moving it were reduced from 500.000 to 200.00 Euros. It would be located on the front square. One of the architects notices that a calculation error has been made in placing it
on the front square. The I-web is apparently 1.5 times as big and would take up too much space. The I-web will
not be moved.

Even though the colouring of the window stills is under a lot of pressure, the idea will carry on. The colours
might change.

The surrounding area near the espresso bar needs to be finished halfway through November. The entrance will
be of great importance. The budget for the surrounding area is getting out of control and so is the planning.
Design and construction need to come together. Costs could be diminished by asking for more offers/bids.

Design for the east glass house has been simplified. Climate and acoustics might still be a problem, but this
was also the case in all former designs and therefore accepted. The current design will cost between 200,000
and 300,000 Euros, which includes 128 student spaces and 16 employee spaces. Still some communication
issues regarding the design: the design team wants an open and transparent design, the user (DSD) wants a
closed design. It also needs to be flexible so other departments might use it at a later stage. The design is still
too expensive. The employees need to be located outside of the glass house due to the demands from the DSD.
Floors need to rest on the existing column structure because the pile foundation will need to carry the weight.
Extra costs for the concrete floor will be compensated by the choice for steel instead of cardboard. The glass
will be HR++ which is 10/m2 more expensive, but will pay itself back within the year due to insulated value. No
light calculations yet; so it is hard to decide how open the roof should be and how many lamps are needed. The
floor of the glass house will accidentally be 160mm lower than needed. Raising the floor is not an option so the
ramps are extended instead. Electricity will run inside the columns, so this should be communicated between
different contractors

The crow’s nest is part of the whole programme so it should be put out to tender.

CONSTRUCTION

Works are progressing to expectations.

Damages to radiators everywhere are reported. Also more and more damages to other people’s property. It is a
result of the crowdedness.

It is not certain yet if the tower needs to be installed with sprinklers. Costs will be 6000 Euros

Contractors demand to know what they need to do with the hours they are waiting due to unforeseen
circumstances.

Unforeseen uncovered asbestos is slowing down the pace of the project and interfering with other schedules.
The second floor is 7 weeks behind on schedule. The library, which is on the second floor, is ON schedule.
The final cost for the Second Phase needs to be calculated, so bids/invoices need to be handed in.

A wall is created with foil to separate the First and Second Phase, but builders keep barging through it. New
solution is needed. A fixed wall is no option because the fire department demands that it can be used as an
escape exit.

Construction work on the ground floor is taking too long. Paint work is behind on schedule. Asbestos sanitation
is slowing the process down. Schedule is under pressure.

All lifts (excluding one for unforeseen work) need to move out of the building. They are no longer necessary
and one of them has caused an accident by hitting the scaffolding.

Most of the asbestos should be gone by now. Just some places in the basement left.
The espresso bar is running a week behind.
Sprinkler system will be checked tomorrow.
On the 5th of November all works in the Second Phase should be done.

MEMOIRS

It looks like the milestone will not be met. Another two openings will be cut into the walls and a lot of small
points of delivery need to be finished.

The air vents and the sprinklers are in each other’s way, creating chaos.

Something went wrong in the communication regarding the trees. Cutting down trees that are not supposed to
be cut down is very bad.
The idea of asphalting the floor in the glass house is not going to work. The machinery will sink due to the weight.

The clutter around in the building is out of control. This cannot be solved with a weekly round by students. Builders need to clean up their own mess. To get things started, cleaning crews with 3 builders from each contractor are assigned to the task.

The asbestos sanitation team has lost its credibility. Therefore, another company has been selected to do the sanitation.

Budget cuts in the surrounding area have resulted in 450,000 Euros budget over-run instead of 600,000 Euros over-run.

The electrical and mechanical engineering on the first floor is very chaotic.

The interior architect (Fokkema) has made a design for the crow’s nest. It is still uncertain if the work will be executed due to budget problems versus the programme.

The basement, originally not part of the project, is becoming a bigger project by the day. The reason is the lack of storage room in the original plan.

There is quite some agitation amongst the contractors/builders about getting exposed to asbestos. Liability issues are raised and a general lack of trust is going around.

Some of the major contractors are being pressed by the fixed milestone planning. Yet smaller contractors seem to cause much of the stagnation. The problems caused by them are transferred to the others, which is not fair.

Miscommunication in the drawings is leading to problems in the execution. Data connections are missing because they were drawn on other drawings.

The contractors doubt the feasibility of the next deadline.

The stagnation in the planning is a fact. Yet all contractors seem to push the responsibility away from them.

The chaos on the site is getting worse due to a funnel effect. There is less and less space with the same amount of builders.

The second and third floor is a mess. There is a lot of debris and quite some damages.

One of the contractors has a project leader who is not handling the pressure very well. These problems need to be solved within the contractor’s organization, not the projects’.

The Street is not finished, so scheduling needs to be adjusted. Add workload in nights and weekends.

Some contractors just mention that they are falling behind on schedule but give no indication how to catch up.

Not all the asbestos will be sanitized. The asbestos in the window adhesive will only be removed if the window is broken.

Future user (department) of the east glass house and the design team do not see eye-to-eye on the design. A main issue is the option to close off the rooms inside the structure. A solution is to place the department inside the building and students in the glass house.

**NOVEMBER**

**STEERING COMMITTEE**

No problems regarding the construction schedule. Even the glass houses seem to be on schedule. The only risk is the weather.

The glass houses designed by Octatube and Neptunis are researched and compared. There is a great difference in visual quality between the two, the construction costs seem to be more or less the same. (The Neptunis was proposed by the insurance experts due to the high costs for the Octatube design). The conclusions/decisions will be discussed with the insurance experts next week.

The plans for the crow’s nest are put ‘on hold’ for now.

No action will be taken regarding the acoustic problems. Different rooms will be tested with different solutions to see which option works best. When the results are in, a decision will be made.

The costs for the surrounding area are very high. The steering committee will like to see some alternatives. These will be shown next meeting.

Asbestos has been spotted in the temple building.
A new colour scheme is designed regarding the window stills. The budget is over-run by 1.5 million at this time. This still excludes the crow’s nest, the acoustic problems, the surrounding area, extra personnel and the temple building.

The procurement department was not satisfied with the course the project team was taking. A meeting has cleared the problems.

The works are still more or less on schedule. Only the services department will be housed a week later than planned.

The architects cannot seem to find common ground on the matter of the colours in the east glass house. The chairman of the project group will put pressure on the situation.

The alternatives solutions for the surrounding areas are discussed. The whole plan is very basic, so there is not much room for cheaper alternatives. The plan is accepted and the budget over-run is stated at 2 million Euros. This includes the surrounding area, but excludes the acoustic problems.

The inventory of the old building was taxed in 2004. Everything that was saved from the burned down building was taxed as well. The insurance will reimburse the inventor to a limit of 35 million, minus the value of the saved inventory. The amount is estimated at 20 to 25 million Euros.

The building permit for the glass houses is submitted. The schedule is under a great deal of pressure. There is still a discussion going with the designer/contractor regarding planning.

The surrounding area will be fitted out, but as practical and simple as possible.

Still no decision on the colours of the east glass house. Discussion is ongoing.

The budgets are more or less depleted. No orders may be given without proper consent.

PROJECT GROUP

Building permits for the glass houses are in, but a pronouncement needs to be submitted due to the change of arrangement within the glass houses. A preliminary meeting with the fire department to make sure the changes will not lead to rejection of the change.

As a result of design changes inside the east glass house, a passageway will be created different from the one in the building permit. Since this is a breakthrough in the monumental façade, this will need to be discussed with the monumental building committee.

An audit of the building process is rejected, an audit of the flex-working-concept is proposed.

The project team should be dismantled around Christmas time together with this regular meeting. Tasks regarding the glass houses should be transferred upon the permanent organization. This transfer needs to be worked out.

The change in the location of the opening in the façade (to enter the glass house) has resulted in nullification of the monumental permit. A new submission will be entered as soon as the design is fixed.

The architect for the interior of the east glass house (MVRDV) shows a new design. Although the design is met with great enthusiasm, the change is very late and over budget. In all probability the old design will not be changed. The architect wants to see if some small changes might lower the cost of the design.

Architects are urged to stop designing. The costs are exceeding the budget more and more.

An audit of the flex-working-concept is started.

In contrast to the last meeting, the project team will not be dissolved after Christmas but diluted after the turn of the year.

DESIGN TEAM

Costs will be saved by only colouring the window stills and not the gutter as well.

Some standard options for a roofed bicycle park are discussed.

In the original design the mid floors in the south glass house had no overhang. Then it went to 1.35 meters and now it has turned to 2.70 meters. Even though the design team prefers a 1.35 overhang, the users want a 2.70 meter overhang which will be constructed.

Still no solution regarding the acoustic problem. Some suggestions in having banners throughout the glass house, but this will affect the design. A creative solution needs to be found. A special meeting for the acoustics is set.
Suggestions are raised to paint the glass house in colours. This would affect the idea that the glass houses should contrast the building, so a grey pattern is chosen and yet to be designed.

A lighting calculation is not possible, which makes it difficult to decide the amount of openings to be made in the roof.

A new design is made for the east glass house. This one is light enough to be placed on the floor. The costs are lowered to an estimate of 150.000, which is within the budget. Sprinklers still need to be sorted. The design is hardly flexible, so the furniture should be.

The crow’s nest is cut out of the programme due to budget cuts. For now it is on hold.

The colour scheme for the window stills is being executed. This needs close attention since the colours have changed. Bids made by the painter should be closely watched.

Drawings are needed of the surrounding area to inform contractors. There are still some financial problems to be solved in order to get this project going. The idea is to do everything as minimal as possible. The front square should still look appealing. The design should be flexible and the street furniture movable.

The glass houses are built on schedule. The structural consultant does not always agree with the plans made by the designer/contractor. This can lead to changes in the costs. The overhang has been determined at 2,70 meters. Due to the structural beams, there will only be a free height of 3 meters under the beams. Other shapes for the beams are suggested to increase the ceiling height.

Acoustic problems are split in main building and glass houses. A specialist needs to work closely with the architects to find appealing solutions.

The position of the structure in the east glass house has changed. The view from the courtyard and the entrances from the building into the glass house were the reason. The colour of the structure (red) is suggested for the colour of the furniture and the floors by the architect. The floors inside the building are red as well. But since they are carpet, the exact same colour cannot be obtained. Furthermore, the glass houses were considered contrasting elements. The idea is rejected.

The crow’s nest is put on hold for now due to the budget over-runs. The idea is that you should wait until there is money to do it right.

The window stills will be coloured for roughly 40.000 Euros.

A fire department meeting was missed due to lack of communication.

There are many concerns regarding the surrounding area. Therefore an extra meeting is called for. The steering committee is concerned that the costs for the surrounding area will exceed the budget. Creativeness with resources is needed. Street furniture needs to be mobile, so it can be deducted from the insurance money. Anything that is not absolutely necessary to develop (for instance the square/courtyard near the Michiel de Ruyterweg) will be left aside. Perhaps some of the universities money that was intended to develop the Mekelweg near the old building can be used around this building. The budget only contains lighting, bricks and a dam-wall. The insurance experts still need give permission for the intended mobile street furniture.

The glass houses will be discussed more thoroughly in a separate meeting. Some samples are watched for the awning. Since the awning will need to roll up 3 meters, only few materials can be used. The colours are not met with any enthusiasm. The idea is to pick something with an industrial look. Rushing into things. Is this the system we want to implement? Are there alternatives? What are the costs? What are the consequences for the climate? Lockers are considered for inside the glass house, but because they are fixed, the design would become less flexible. The idea is rejected. The design for the interior of the east glass house has changed (again). Instead of a ‘mountain’ it has become a stand/tribune. If daylight, costs, space, programme are all in order, the new design will be accepted. The idea for combining acoustic material with awning is rejected because it would jeopardize the view from the building into the glass house. The colour has changed from red to orange. The floor will not be coloured.

Architects need to hand in the hours they have worked on a weekly base, to insure the costs do not get out of control.

The fire department is concerned with the safety of the glass houses. Specifically the wish of the organization to remove everything from the south glass house for big events, because the space could accommodate for more people than the exits would allow. Regarding the east glass house there are concerns in the amount of people that can use the tribune.
CONSTRUCTION

The Street, first floor, central part, will be finished in 2 weeks (19-11-2008)
The colours in the façade should be determined this week.
The basement, Fourth Phase, is set up in schedule. This will be send to all contractors this week.
All contractors should be gone by the end of the week. The ‘special’ sub projects are excluded
Classes will start next Monday.
Due to fire regulations it is not permitted to have furniture in the hallways which is not fixed to the floor. This has not been done yet.
The colour scheme of the façade has been determined and the paint work can be scheduled
For weeks on end no decision has been made concerning the floor of the congress hall. At first the plan was to have a wooden floor, but this was impossible regarding the budget. Decision has been made to put in a special type of carpet, but still not certain which.
There are still some bids for the basement lacking. These should be handed in immediately.
There was asbestos found in the tower, which needs to be sanitized.
Many of the air vents have been damaged. The contractor will draft another bid, to restore and repair said vents.
The basement is progressing on schedule.
Still no decision on the carpet in the congress hall
Asbestos sanitation is FINISHED
The contractor for the mechanical engineering will hold a meeting for the buildings facility managers on how to operate and handle the building
It is still taking too long for bids to be awarded and invoices to be paid.
It has come to the attention that the restaurant only has one exit...
This is the final Construction Team meeting

MEMOIRS

Fire safety keeps popping up as a problem.
Many of the wall sockets are inoperable. When a phase is delivered this is not checked. Some students should be used to try out all sockets.
Damages are not always reported, so they are not always fixed either.
Halfway through December the management team will be half the size. This means everyone should check everything very well before that time, or few people will have a big mess to clean up.
The refurbishment of the temple building to serve the faculty pub is not allocated in the budget. The pub organization will need to create its own resources. Yet the faculty wants to have a say in the design and its expression. Quite the contradiction.
As mentioned before, the insurance experts have divided the budget in a ‘temporary solution’ side, which is the Julianalaan, and a ‘new building’, which is everything bought now, but will also be used in the new building (like furniture). Since there is nothing left in the first budget, the design for the surroundings needs to be adjusted to products that can be shipped to a new location.
One contractor to build a lift, another to place the doors in the lift, yet another contractor to install the electrical network… Will need some extra attention from the managers.
It is quite odd that agreements are made that if a contractor falls behind on schedule, he will catch up during nights and weekends. It has been made clear that the deadlines are leading. Yet most of the contractors do not report when they fall behind, nor do they work the nights or weekends

DECEMBER

STEERING COMMITTEE
The steering committee will keep meeting in the new year, at least till February.

The settlement with the insurance company is worrisome.

The frequency of the meeting will be once every two weeks from now on.

The estimate at this time is 46.5 million Euros. This still excludes the surrounding area, the temple building and the acoustic problems.

The acoustics in the south glass house will be problematic. A solution can be to add isolation in the structure of the roof. This would result in schedule delays and extra costs. This might jeopardize the possibility of the Dies in the glass house. The project team will make a decision in this, but the aim will still be to have the Dies in the glass house.

The east glass house would be finished by the 15th of March, but this delivery date has been pushed back to April 2009.

PROJECT GROUP

The south glass house is on schedule. Its framework is expected to be ready in 3 days. The roofing will be done during the Christmas holidays. The glass house should be airtight on the 8th of January.

The dilatation in the floor has changed. Instead of one dilatation in longitudinal direction, two dilatations were made crosswise. This could have catastrophic repercussions for the floor heating.

South glass house will be ready on the day of the Dies. Will be tight to arrange the necessities regarding the Dies. The finishing works will be done after the Dies up to March.

Production of the truss elements is done for 95%. Assembly will take place first week of January. Main structure will be done in week 7. If all goes as planned, both glass houses will be finished halfway through March.

Discussion brought up regarding additional work. It is stated that the risks of changes due to the speed and the pressure on the project was incorporated in the price, so additional work should be regarded as none existing. If a contractor disagrees, he should show proof of the contrary.

In contrary to earlier statements, the project team will not continue in a diluted version, but the same composition. The frequency will be tuned down to once every two weeks.

The deadline for both glass houses is once more stated: 15th of March. The facility manager is convinced this is not possible for interior of the east glass house.

Issues regarding the floors in the south glass house: resting the mid-level floors on pillars will increase local pressure in the concrete ground floor, which would be costly. A wooden floor is suggested. The disadvantage of this option is the noise a wooden floor creates. The original design is no longer available because the foundation is too weak for that design. A concrete floor is chosen, disregarding the extra costs.

The library should be finished halfway through January. It should be celebrated, but without extra costs.

The minimal design for the faculty pub is still quite costly and asbestos sanitation is not even included yet. Possibilities need to be discussed in steering committee.

It looks like the budget is going to be over-run with another 500.000 Euros. Up to now, 35 million Euros has been billed (invoiced)

Invoices need to be submitted before the 6th of January on account of the closing year.

Many students do not know how to find their teachers. This is why special telephones will be placed for internal calls.

MEMOIRS

No distinct delivery date can be set for the glass houses as their design has not been finished completely. Still, 15th of March is the aim at this point.

Even though additional work is included in the uniform price, contractors still try to submit additional work.

The milestone was 1st of November. Most of it was done at that time, yet the small stuff is still ongoing this week, a month later.

Contractors are damaging each other’s work. They should arrange amongst themselves how to work out the repairs.

The carpet contractor has ‘lost’ rolls of linoleum. He will need to order again and wants to claim the costs. Why?
Somehow the detectors for the lighting do not work properly. They do not turn lighting on when there’s movement and they keep on during the night.

Someone will make rounds to judge the comfort level in all rooms.

The lighting in the glass houses is topic surrounded by miscommunication.

The columns have been placed without pulling the necessary cables through them. Now they will be very hard to pull through. Less efficient due to miscommunication.

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**JANUARY STEERING COMMITTEE**

Another small budget over-run has summed the total budget up to 46,8 million Euros, including the paving of the surrounding area. Extra budget cuts have lead to only partly paved surroundings. Furthermore, costs have been spared regarding the temple building, the glass houses and the infrastructure around the building.

The interior architect has made a report regarding the acoustic problems, stating that the situation is problematic. The solution should be practical and financially attractive.

Due to works in the south glass house, the deadline for both glass houses is pushed back 1 month; 15th of April.

The project team needs to be dismantled. The meeting frequency has been lowered to once every three weeks. A permanent faculty needs to take over from here.

The design for the interior of the east glass house, by Winy Maas, will costs more or less 185.000 Euros, which is above budget. There are alternatives that stay within the budget, but they are of far less quality and have far less possibilities.

The residents from the building across the street (Oxford and Cambridge) are objecting to the colour scheme for the window stills. Since the residents have been very cooperative during the project, a compromise needs to be formulated. The architect will come with 3 alternatives to discuss with the residents.

A point of attention is made that the discussions with the insurance have never been noted down. Arrangements are therefore not always in writing.

There is a gap between what is invoiced and what is spent regarding the estimates; 36 versus 46 million Euros. This has happened because the system that is used to register the orders does not check the invoices which are gathered in a different system. There might be invoices missing or orders double paid.

The project team has decided that the 15th of April is the ultimate deadline for both glass houses.

The progress in the east glass house is in trouble because the contractor has gone bankrupt. The assumption is made that after the “re-start” the company will continue working.

The contractor for the glass houses gave such a high price for the finishing works that the organization has put out a tender for the work. Another contractor offered a much lower price, so they will finish the work.

Electricity and lighting is estimated 200.000 Euros above the rough estimate. An analysis is yet to be made.

As a result from the protest by the residents, one side of the building will get the designed colour scheme; the other side will be painted in a neutral grey.

The east glass house will be furnished with designs made by Richard Hutte. The major condition is that the furniture is portable and reusable in the new building (for insurance budget purposes).

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**PROJECT GROUP**

The colours have been communicated with the municipality (welstand) but not officially and not with the residents who are opposed to the colours. The architect is asked to consider not colouring the south side of the building.

The new permit for the glass houses has not been submitted yet. The municipality wants all designs to be final and not everything in separate packages. The permit needs to be obtained prior to the start of the construction of the interior.

Discussions regarding the colour of the floor in the east glass house are still ongoing. Decisions regarding the acoustic problems need to be dealt with quickly, because insulating the roof needs to be arranged before the roof is lifted.
Meetings are being arranged for sponsors of the faculty pub. Some of the contractors have already given their consent.

Last week a feeling was expressed that the budget was over-run with another 500,000 Euros. This was incorrect. It seems it is closer to 150,000 Euros. The exact number is still unknown.

Some of the contractors want to dispute the additional work arrangement. Others have dropped the claim for additional work.

The window-still-colour-plan will be adjusted as a result of the objection made by residents in the surrounding area.

A strategy is drafted for the pilots regarding acoustics. Mainly use of drapes. Some rooms will get panels with a photo.

The design team has been dissolved. Some of the members have formed a ‘glass houses’ team to continue on the specific tasks at hand.

Management wants the architects to stop designing. The project design is finished.

The design for the interior of the east glass house is problematic. The discussion arises whether or not the rooms should be lockable.

The mid-level floors in the south glass house will be built by another contractor due to discussions regarding the price set by the designer/contractor.

Bids concerning the electrical services in the east glass house seem to come out 200,000 over the budget. Instead of accepting this over-run, creative solutions need to be sought to make up the difference.

The mechanical engineering and some of the woodwork is coming out under budget. A change of paintwork contractor should save costs as well.

Both glass houses have different floors. One of them has gutters for cables in them, changing its functionality. It also gives it the option to change the colour of the top layer.

DESIGN TEAM

There are concerns regarding the idea to leave the passage between the south glass house and the street completely open. Glass sliding doors are suggested, but their functionality is doubted due to the fact that the sensors would go off constantly due to traffic in the street. Construction in the south glass house is right on schedule. Glass will be set today, tomorrow all will be sealed off. The suggestions made by the acoustics expert are disregarded. Another meeting will be planned with expert to look for alternatives. The awning will start at 12 meters high, the ceiling, and run to 6 meters in height. The first mid-floor will be behind on schedule, according to the designer/contractor. It is suggested to start construction of the second mid-floor before the first is finished, to make up for lost time and still finish both floors before the milestone. Designer of the east glass house wants the ‘tribune’ to be orange on the outside, white on the inside, and the floors and furniture white as well. This will be debated at another stage.

MEMOIRS

To fit all installations in the glass houses, lifts are needed or scaffolding. From aesthetic point of view lifts would be preferable, but construction management is certain the scaffolding will be more practical and cheaper.

Still no solution regarding the acoustic problems in the glass house. The designer/contractor is urging since there is not much time left to implement solutions in the structure.

The mechanical installations in the east glass house were not built with the notion that there would be a structure right underneath it. You might be blow of the structure by the air pressure.

The coordinating architect and designer of the interior of the east glass house still cannot agree on the colour scheme.

The idea of fixing the awning to the roof structure does not work. There is still a small opening for light to come in, and the heights differ due to conflicts with the steel structure.

FEBRUARI

STEERING COMMITTEE
Acoustic research has shown that the cheapest solution is the best way to begin. This only costs 180.000 Euros, whilst 600.000 Euros was estimated. The remainder will be kept available in case additional operations are required.

The faculty bar will have a budget of 35.000 Euros, which will barely cover the asbestos sanitation and prepping the structure. Students are working on a low budget design.

The fire department has ordered the furniture in the hall ways to be fixed to the floor or removed. These adjustments will cost an additional 14.000 Euros.

Other additional work that has been approved: presentation facilities (104.000), a shower (16.000) and awning (23.000).

PROJECT GROUP

The bankrupt contractor has made a re-start and is back in business.

It is essential that the designer/contractor for the south glass house, the structural engineering company and the actual contractor work closely together.

Both glass houses are air tight today.

The interior of the glass houses needs to be movable due to insurance pay out.

A light plan has been drafted by a designer (Hutten). The design will be more costly than the basic lighting that was agreed upon. The budget cuts do not allow this new lighting plan.

The floor colouring can be realised in 3 different ways. Linoleum costs 65.000, coating costs 57.500 and added colour to the concrete costs 75.000. The floor will just be painted, like the floor in the south glass house (which had cost 37.000). Still no choice in the colour of the floor. Pressure is building up.

MEMOIRS

Johan Hogervorst: “Alleen omdat je hier een beslissing neemt wil niet zeggen dat je ook echt daadwerkelijk een BESLISSING neemt!” (Just because you make a decision does not necessarily mean that you are making a DECISION)

The designer of the interior of the east glass house insists on a new lighting design. The managers indulge. Result is more delays and extra costs. The contractor for the glass houses is falling behind on schedule. He is not happy with his payments. The scaffolding will not stay that much longer. For a while it seems that these two project members are forcing their hand in everything. They get special treatment by the steering committee who indulges their every whim. As a result more pressure will build up for the project leaders and contractors.

MARCH

STEERING COMMITTEE

A model for the faculty bar is presented. The total costs will be 150.000 Euros, including the 35.000 contribution by the university. The remainder will be provided by sponsored work and sponsored finances. Demands and conditions for usage of the bar will be drafted as soon as possible.

The paving of the surrounding area is going to cost 100.000 Euros more.

The project team is being dissolved.

A necessary budget over-run for the glass houses of 121.000 has been approved.

To conclude the final budget estimation there are 3 processes that need to match: the overview of orders, the registration system and the Finance & Control system

PROJECT GROUP

The deadline of 15th of April will not be met. It will more likely be around the end of April. The east glass house will be used for a seminar halfway through April, so adjustments must be made in the schedule.
The carbon fibre design made for the furniture in the east glass house comes with consequences: it will take 6 months to fabricate it. Options: 1) wait; 2) use another material to create the design; 3) use original polyester furniture from China. Eventually polyester was used to create the design.

The plans for the pub are still on hold. Funds have been raised, but the organization is not adequately structured.

South glass house is on schedule. The colour of the floor in the east glass house is determined.

APRIL

STEERING COMMITTEE

The exact total of the extra costs for the surrounding area is 107,567 Euros.

Construction work is still in progress. There is much doubt as to the feasibility of the deadline.

The total costs are still uncertain. The reality is that the total costs will probably exceed the current estimation. Electrical services are more expensive than anticipated. These are necessary expenditures.

The glass houses are almost finished.

The project team has its last meeting today. All tasks have been delegated to appropriate departments within the faculty.

The financial systems have been matched.

The budget over-run is substantial. The position that the steering committee takes is: It is what it is. Let us finish it properly.

PROJECT GROUP

Budget/expenditure systems are not synchronized. There is a system based on bids, one based on orders and one based on invoices. Differences are in the millions of Euros.

Fire department is not sure if the materials used in the glass houses are fire proof.

After the 1st of June the expedited situation is ended. Works after that period will need to be entered in a European Procurement procedure. This means all orders need to be given before May.

Project group will be dissolved on the 24th of April.

Current situation suggests that the budget is over-run with more or less 4 million Euros. The steering committee demands an explanation.

No word yet from the municipality regarding the dues/fees concerning the whole project.

Fire department is satisfied with the materials in the glass houses.

7.2.2 SUMMARY OF INTERVIEWS

The original interviews were held in Dutch. The original notes from these meetings are included in Appendix C.

MECHANICAL ENGINEERING

An interview with project leader Marco Djuricic, in charge of mechanical engineering, on 07-24-2009.

SPRINKLER SYSTEM

The choice to go for a sprinkler system was made before Marco joined the project. Although he never had a say in the decision, he knows that the primary reasons to go for a sprinkler system were the lack of sufficient escape routes and the poor fire resistant features of the building structure. It would not hold an hour in case of a fire.
The design of the sprinkler system called for a combination of dry and wet. A dry sprinkler system has the pipes filled with dry air instead of water. This system is used in the attic due to the risk of freeze. The rest of the building has a wet sprinkler system which is connected to the water supply system. The permission granted by the water industry was very convenient since it reduced the costs of a water storage tank.

CENTRAL HEATING

In the initial stages of the project the decision was made to maintain the old central heating system of the building. The reason for this was that not so long ago this building was still operational and the current system provided ample heat for the users. One part of the building was not equipped with heating, so pipes were installed there. Additionally, some of the pipes contained asbestos and needed replacement. Other than that there were some pipes with minor defects that were either replaced or fixed.

AIR CONDITIONING

The Facility Management & Real Estate department of the university always executes projects using their manual. The manual provides a certain quality level that the university wants to guarantee. The manual is therefore quite a bit more rigorous than the official Building Regulations. The air conditioning plan proposed by the department turned out to be a lot more expensive than calculated in the budget. Eventually the steering committee decided to drop the manual for once and execute the air conditioning plan low budget and efficient. The exact installation plan was co-designed by an external engineering company. These decisions took place around June 2008.

ELECTRICAL ENGINEERING

The designs for the electrical engineering were based on the survey of the current state by an external engineering company (the same company who did the engineering of the air conditioning):

During a survey of the main building at the Julianalaan 134 the electrical systems of the building were checked in some of the areas. Based on this survey an enumeration of findings was noted:

- The existing wiring has aged quite badly and does not hold up against current fire safety regulations.
- Most of the wiring has already been removed.
- The existing electro-technical installations attached to the ceiling needs to be removed in order to create room for the sprinkler system.
- The electro-technical distributors have amply exceeded the life span of 35 years.

The general impression is that the existing 45 year old electro-technical installation, both wiring and distributors, do not qualify for reuse. It is however possible that some of the areas in the building have had a renewal of wiring and distributors in the last 15 years. An installation specialist will need to analyze the situation. The functionality and usefulness of these installations in light of the new plans for the building are highly doubtful. Usually, in building projects of this size, the reuse of existing electrical installations is economically not viable. Disassembly, storage and re-assembly will cost quite some additional time and the savings are usually not very interesting. In most cases it will eventually be more cost efficient to lay down a completely new electrical plan. A second opinion by another engineering company suggests that the recently renewed distributors can be reused. The installations contractor needs to create an overview of which distributors are reusable and which need to be removed. Based on this overview, the contractor can estimate the costs for the entire electrical plan.

FIRE SAFETY

Fire safety meeting June 9th, 2008:
On May 22nd, shortly after the fire in the faculty building, a fire safety expert drafted a report, on request by the dean of the faculty, about the current state of the fire safety in the main building on the Julianalaan 134. The report also included a recommendation in order to meet the requirements of the current fire safety regulation regarding educational buildings.

The structure of the floors, beams and columns is not fireproof enough to pass regulations. Most of the construction parts are less than 15 minutes fireproof. The official Building Regulations state that a structure needs to be at least 30 minutes fireproof. A sprinkler installation would prevent the structure from catching fire within the first 30 minutes. This will give all occupants enough time to flee the building and the fire department enough time to search. Furthermore, the fire detector connected to the sprinkler system will alert the fire department immediately the moment the sprinkler system jumps on. Still, with the use of a sprinkler system, the beams in the building have insufficient concrete casting. Additional fireproof plating will be necessary. Another fire safety expert is called upon, who indicates that a sprinkler system will be necessary.

An interview with project leader Nico Prenen, in charge of fire safety installations, on 08-03-2009.

Choosing a sprinkler system was done quite fast. More important than any advice, the mindset was that under no circumstances this (the fire) would ever happen again. The executive board of the university did not want to take any chances and therefore opted for the sprinkler system. Furthermore, installing a sprinkler system would, according to estimates, not be much more expensive than plating the entire structure with fireproof material.

The fire department was involved in the project from the start. Furthermore, an independent fire safety expert was brought in to provide additional counsel throughout the duration of the project. A fire safety team was created which worked independently from the design team. Traditionally communication regarding fire safety passes through the municipality before it ends up with the fire department. Considering the speed at which the project was undertaken, the project team was allowed to have a direct line with both municipality and the fire department.

During the first phase of the construction work (east side of the main building) the pace was incredible. Every single sketch that came from the design team needed to be checked immediately in order to be executed promptly. The sprinkler system and fire safety installation needed to be implemented in an equally fast pace.

The second phase (west side of the main building) elapse smoothly since a lot of the work that was executed in the first phase could be copied in the second phase.

In the third phase (the glass houses) there were some things that needed to be sorted out, especially for the east glass house. The ‘mountain’ that was planned there brought up quite a stir. The main concern was the escape route, yet there were a number of issues regarding the ‘mountain’ that needed to be checked. The coordinating architect was responsible for this design, which came from another architecture bureau. The coordinating architect called in assistance from another fire safety expert. Eventually there were a number of fire safety experts brought onto this project. Another problem with the east glass house was the smoke partitioning. In the initial plans, this smoke separation line was drawn alongside the facade of the main building. Usually this would seem a good idea, but in this case it would mean that all the glass work in the facade would need replacement by fireproof glass. The municipality would object to this due to the monumental nature of the facade and the project team would object because the additional costs of these new windows were never calculated into the budget. Instead, the interior wall, adjacent to hallway along the facade, was used as partitioning border. To accomplish this, the only adjustment needed were door-springs on the doors in this wall.

Initially, the three phases of the project were treated separately with regard to fire safety. Because all three areas are linked to one and other some integrating measures need to be taken. The main issues for integration of the three phases were the evacuation routes.
Another external engineering company was consulted in regard to the fireproofing of the construction of the building. They suggested that the exposed steel beams were coated in fireproofing foam. Additionally, all changes to the main structure of the building were discussed with this agency.

A final point of attention concerning fire safety is the placement of furniture in the hallways. The width of the hallways is quite vast, yet the capacity of the escape routes is measured by the doorways, which are relatively small. Therefore, some furniture is allowed in the hallways. This concept is however limited since only a small amount of furniture is allowed, the furniture needs to be fixed to the floor and the material of the furniture should not be able to stimulate or develop fire or smoke.

SECURITY SYSTEMS

An interview with project leader Erwin Faber, in charge of mechanical engineering, on 08-17-2009.

The new faculty of Architecture, BK City, is fitted out with two types of door security systems: Salto and Keyprocessor.

Salto is a system that has been implemented in more locations throughout the university campus. The objective is to ultimately have the whole university campus fitted out with Salto system. This would result in only needing one personal pass that would give you access to all the locations you need access to, throughout the campus.

The Keyprocessor system is applied in BK City as well. The major difference between Salto and Keyprocessor is that Salto works locally, as in every door is a subsystem itself. Keyprocessor is central system that is operated digitally. This system requires additional facilities.

Every door that needs to be locked is fitted out with a Salto system. Exceptions are made for a few locations that are provided with Keyprocessor. These locations have special needs and are only accessible at certain hours or with special privileges. The elevators, the entrance doors of the different departments and the outer shell of the building (the access points of the whole building) are fitted out with Keyprocessor.

ACOUSTICS

Based on email correspondence with (facility) project leader Yvette Brijs, in charge of acoustics, on 08-05-2009.

An engineering consultancy was brought in by the interior architecture bureau to hold a survey together to determine which rooms would need acoustic measures. The educational rooms and lecture halls had priority due to the speed of the project and the budget available at that time. Another facility project leader calculated a global estimate of the costs. Subsequently, a number of rooms were used as pilot rooms for mock ups. The same engineering consultancy measured the impact of the operations on the acoustics and documented it in a report. Based on this report, the chairman of the project group decided to fit out the remaining rooms with a basic solution for the problems. This basic solution, acoustic panels between the beams in the ceiling, had the best result-cost ratio. Additional solutions were used where necessary, the type depending on the characteristics of the room. For example, some rooms were fitted out with curtain because these would also benefit the overexposure of the room. The departments were provided with acoustic measures at a later moment. Another engineering company was brought in to examine the glass houses on acoustics. The proposed solution, applying absorbing material to the roofing, was not executed by the contractor/designer of the glass houses. The reasons are not completely clear to me (Yvette Brijs), but apparently it had something to do with the delivery of the materials.

ASBESTOS SANITATION

An interview with project leader Jan van der Pol, in charge of asbestos sanitation, on 07-24-2009.
The speed at which tasks needed to be executed rebuilding the faculty was very distinctive. Design and construction were running simultaneously. Consequently, demolition work started the moment the old main building was chosen as new location. The unavoidable result was that asbestos sanitation needed to be done during demolition and construction work. From the National Working Conditions (ARBO) point of view this is very unorthodox.

Inspection was executed through the type-A measure. This means that only visual inspection of asbestos is done. This is a much milder inspection, compared to destructive inspection, which searches for asbestos beneath the surface.

In traditional refurbishment projects asbestos sanitation is executed as followed: A design is made. Based on the details of the drawings, an inspection is started. The drawing indicate which parts will be demolished and based on this knowledge a destructive inspection is executed. If inspection turns up with asbestos contamination, the area will be sanitized. Demolition will take place after sanitation is completed. A traditional approach was not possible during this project. This resulted in additional risks regarding sanitation. Some minor incidents occurred, but no one was injured in any way. However, there was a lot of concern amongst the works contractors causing some disturbance on the construction site. The contractors were not properly informed on the activity surrounding the asbestos sanitation. This was the result of some miscommunication on the site and lack of knowledge regarding contamination. For instance, not all asbestos has similar consequences to contamination. Luting paste, containing asbestos, is hardly contagious. The loose asbestos which can be found in some of the pipe isolation is very contagious.

Since it was not evident from the start which parts of the building would be demolished, it was not clear where the asbestos was located. The pace at which demolition took place was very high, so at times there were parts demolished before inspection had taken place. This resulted in a few incidents that lead to the cancellation of the contract with the asbestos sanitation company. The actual main reason was the loss of trust between the company and the construction workers on the site. It did not help that they changed contacts regularly which led to communication errors which was a sign to others that the company was not committed to the project.

7.2.3 QUOTES FROM “THE MAKING OF BK CITY”

The actual names of the interviewees and the original (Dutch) quotes are located in Appendix C. The quotes are italic

(Dean) “Our management was focussed on quality in terms of functionality, shape and time.”

(Dean) “… Some decisions were made so promptly that cost calculation could only be done after the work was done”

(Dean) “This might be a temporary solution, but we should realize that a whole generation of architects will be educated here. So keep in mind: I want ambition!”

(Insurance expert) “Due to the complex and vast administration and the imminent speed of requesting, judging and approving of tenders, we were offered office space at the faculty of civil engineering at the finance and control department. We were able to meet employees of the university on a daily base. The proximity has strongly contributed to quick decision making and the creation of trust.”

The major designers brought in for this project all have had a strong relation with the faculty in the past and have relevant view on what the faculty would need or what would be possible to create in the new building:

- Coordinating architect: Chief teacher of one of the departments of the faculty. Contracted architect for the transformation of the Julianalaan building to apartment complex, the initial plan of the owner.
- Interior architect: Researcher of the current plans for restructuring the old faculty. Completely up to date on the demands and wishes of the faculty.
• East glass house interior architect: Chief teacher of one of the departments of the faculty. Already worked with the faculty on changes on the 13th floor of the former building.
• Restaurant and Street architect: Designed the public areas of the former faculty building.
• Glass houses architect: Chief teacher of one of the departments of the faculty. Designed the glass houses in the former building.
• Espresso bar architect: Designed the espresso bar in the former building.

The chairmen of the brief team, design team and facilities team had already worked closely together on a number of projects in the former building. Some of the concepts could immediately be transferred to the new building. Most of the architects had also worked with each other or the chairmen. A research had already been executed to improve the faculty of architecture. This was obviously done with the idea to improve the burned down building, not the building at the Julianalaan. Still, there were a lot of communication aspects to control regarding all functions and departments. Biggest challenge: moving from a building which was getting too small to a building which was 25% smaller. Advantage: No one wanted to be the weakest link. The whole building industry was following the process.

The electro-technical contractor and mechanical engineering contractor did not have the capacity within the company required for this task, so subcontractors were signed from abroad, including Portugal, Poland and Germany.

(Chairman brief team) “I have amazing memories from the time that the project organization was located in the adjacent ‘temple’ building. Being located together contributed greatly to the excellent communication and results of which we are so proud. Physical contact still preserves above telephone and email contact.”

(Chief project leader) “The initial plan was to transfer the management procedure to the Facility Management & Real Estate department after the project start up, but we ended up working together throughout the whole project.”

(Chief project leader) “We have encountered days with over 450 construction workers on the site.”

(Chief project leader) “During the contractors meeting we would discuss with all relevant contractors what was planned for the next 2 days and who needed to be aware of who’s presence during the execution of the works”

The loss of revenue and all extra costs were covered by the insurance. This meant that the insurance companies had a lot of influence in the decision making. Every expense for demolition work of the ruins or relocation of the faculty needed to be approved by an expert appointed by the insurance companies in order to be included in the insurance payout.

(Secretary of the Executive Board) “The professionalism with which the insurance experts and contra-experts worked together was admirable.”

(Chief university facilities) “We have invested time in communication with parties like the residents of the area and the municipality. That was a very wise decision. Obtaining permits from the municipality went smoothly and the residents were very sympathetic.

(Team Monuments and Building Quality, municipality Delft) “The transformation of the monumental building into an apartment complex was at odds. Refurbishing the old university building into a faculty building was less of an issue. Therefore it was not very hard to approve the building permits.”

The Delft University of Technology is restricted to European legislation with regards to procurement. A traditional procurement procedure requires a lot of preparation and has, depending on the situation, a turnaround of at least four to five months. In some cases there is an exception to the rule: compelling urgency. This was the situation in creating BK City. Compelling urgency is a particular procurement procedure. It is important that the urgency is not blameworthy to the party applying for the procedure, in this case the university. A second condition is the nature of the situation has to be accidental and unforeseeable, like a fire.
(Financial project manager) "This was a very particular project of which none of the participants had any prior experience."

(Architect interior east glass house) "A lesson to be learned from this project is that the combination of (forced) urgency and mutual respect for each other is a key factor to success."

(Architect restaurant) "The success of this project is due to the mutual trust and management. There was no choice: everyone had to work together properly."

(Works contractor) "Changes were ongoing and so were the meetings. Sometimes an architect was designing something on the spot, at which time a carpenter would assist him. Everyone had a little bit more understanding for each other’s discipline compared to traditional situations. This work attitude provided the client with the best result possible."

(Chairman construction team) "As soon as we were concentrating on the refurbishment of the old main building at the Julianalaan, the number one priority was to find suitable partners to get the job done. During the procurement procedure we were looking for companies with whom we had a history with or who knew the building. This relieves some of the tension and facilitates communication." "It is in situations like these that you can see how important it is to have the right people for the job. You need people who think in solutions and are willing to go the distance."

(Installations contractor) "No one objected to lending their tools to another company. Normally you would have to call the office and have them sent over the tools."

(Works contractor) "At one point we decided to work in two shifts: 07:00 till 16:00 and 13:00 till 22:00."

(Glass contractor) "The thing that stood out for me was the solidarity between the regular contractors of the university."
This chapter contains the analysis of the case study data collection. The framework, created by the literature survey, is used in the data analysis as a strainer to capture the process of the case study in terms of project management. It also gives the opportunity to compare traditional project management, fast track project management and the specific project management aspects in this case study.

### 8.1 ANÁLYSIS METHOD

An overview of the analysis shows traditional project management, fast track management and the organizational structure (the elements from the data collection) on one axis, and the knowledge areas of project management on the other axis. The interviewees from the data collection, both from my interviews and the books’, will be added to the organizational structure. This overview will show, per aspect of project management, the differences between traditional project management, fast track project management and the specific project management in this case study.

A clear matrix is provided in Appendix E. In this chapter of the research all information from the former chapter is matched up with one or more knowledge areas. Many situations are applicable to multiple knowledge areas. The knowledge areas are not fully independent from each other, and therefore neither is the data from the case. Elaboration on the relationship between the data and the knowledge area can be found in the conclusions, in the next chapter.

### 8.2 PROJECT INTEGRATION MANAGEMENT

**STEWING COMMITTEE**

- Global planning: end of June design plans ready, 1st of September First Phase finished, 1st of November rest entire building finished. Additional new structures to be discussed.
- To conclude the final budget estimation there are 3 processes that need to match: the overview of orders, the registration system and the Finance & Control system

**PROJECT GROUP**

- Establishing scope and dividing workload amongst teams
- Send in demolition crew with architects to start demolition work.
- Demarcation of the architects’ work is needed
- Design plans are discussed and practical consequences
- Brief is finished, programme team dissolved
- The relations between design, installations and construction work are not properly tuned. New meeting is proposed, prior to the meeting with contractors, to improve team work
- An archive of designs, permits, minutes, revisions etc needs to be composed.
- Take precaution because Second Phase will have even more builders at the same time on site
- Work during exploitation. Keep builders and students separated at all times
- Municipal representative in PG is no longer needed, unless asked for
- The piling will cause for a lot of noise. It is important to make sure everyone is aware of this. Discouraging people to come to the faculty during the foundation work. Some meetings and plans need to be relocated.
- Decisions regarding the acoustic problems need to be dealt with quickly, because insulating the roof needs to be arranged before the roof is lifted.
- New permit for the glass houses has not been submitted yet. The municipality wants all designs to be final and not in packages. The permit needs to be obtained prior to the start of the construction of the interior.

**DESIGN TEAM**
Permits are an issue. Building is listed. Obtain permits in sub-projects due to fast tracking
Fast inventory of scope, then decide phasing, then work out design and details
Regarding glass houses; box-in-box: close collaboration is needed between the architects and the engineers
In order to start construction work on the glass houses, the design of the floors needs to be ready, which they are not now. A contractor for the floor is yet to be decided upon as well.
The budget for the surrounding area is getting out of control and so is the planning. Design and construction need to come together. Costs could be diminished by asking for more offers/bids
It is suggested to start construction of the second mid-floor before the first is finished, to make up for lost time and still finish both floors before the milestone

CONSTRUCTION TEAM

Asbestos sanitation will enlist more people to speed up the project. The sanitation planning presides the planning for all the other contractors
Lifts will be organized centrally. All contractors will be able to use these lifts
The idea of implementing a sprinkler system is being proposed to the design team
One of the contractors will leave the scaffolding so other contractors can use it as well
Schedules for 2nd Phase need to be adjusted to prevent the same mistakes being made in the 1st Phase
If work is not properly done, and needs to be corrected, this will be done in the weekend to prevent any possible delays
Demolition work is falling behind on schedule and conflicting with other disciplines. Demolition will be done at night
Damages to radiators everywhere are reported. Also more and more damages to other people’s property. It is a result of the crowdedness.
Contractors demand to know what they need to do with the hours they are waiting due to unforeseen circumstances.
Many of the air vents have been damaged. The contractor will draft another bid, to restore and repair said vents.
The contractor for the mechanical engineering will hold a meeting for the facility managers on how to operate and handle the building.

MEMOIRS

At this point, bids are being checked by: a cost-expert, an insurance expert, the dean and procurement. This does not help the speed of the project.
Contractors are pressed to work hard, even though it is not certain what they need to do. The architects are still too busy discussing the brief/programme.
There are many issues between the contractors, damaging each other’s work, interrupting each other’s work, etc. A main contractor is clearly missed.
Contractors only account for their own schedule without regard for dependence of other contractors, the order of construction.
The air vents and the lighting are interfering with each other as a result of separate designs
Inviting the designer of the glass houses to the project group should expedite the design phase
The clutter everywhere in the building is out of control. Builders need to clean up their own mess. To get things started, cleaning crews with 3 builders from each contractor are assigned to the task.
Major contractors are being pressed by the milestone planning. Yet smaller contractors seem to cause much of the stagnation. The problems caused by them are transferred to the others, which is not fair
To fit all installations in the glass houses, lifts are needed or scaffolding. From aesthetic point of view lifts would be preferable, but construction management is certain the scaffolding will be more practical and cheaper.

INTERVIEWS & QUOTES

During the first phase of the construction work (east side of the main building) the pace was incredible. Every single sketch that came from the design team needed to be checked immediately in order to be
executed promptly. The sprinkler system and fire safety installation needed to be implemented in an equally fast pace.

- Initially, the three phases of the project were treated separately with regard to fire safety. Because all three areas are linked to one and other some integrating measures need to be taken.
- Design and construction were running simultaneously. The unavoidable result was that asbestos sanitation needed to be done during demolition and construction work. This resulted in additional risks regarding sanitation. The contractors were not properly informed on the activity surrounding the asbestos sanitation.

### 8.3 PROJECT SCOPE MANAGEMENT

#### STEERING COMMITTEE

- Cost calculation is 50M, excl VAT.>> not acceptable. Change design, subtract glass houses, or use alternative location instead of glass houses. Options calculated and chosen for 1 glass house less, and some design changes: <35M
- Validation of the project (2 glass houses). Choice was well founded and cost overruns declared unexpected/unavoidable
- Permission is granted to create a different budget/account for inventory needed in the new building
- The 1st of November deadline will only be kept concerning the students. The employees will be housed later on. The aim is to have it sorted before the 1st of December.
- As result of budget over-runs, glass houses are proposed over longer time span. The design team decides after reviewing the brief that both glass houses are necessary
- The construction of the ‘temple’ building will be put on hold
- No action will be taken regarding the acoustic problems. Rooms will be tested with different solutions to see which option works best.
- The costs for the surrounding area are very high. The steering committee would like to see some alternatives. These will be shown next meeting.
- The alternatives for surrounding areas are discussed. Plan is very basic, so not much room for cheaper alternatives. Plan is accepted and over-run is 2 million €
- The acoustics in the south glass house will be problematic. A solution can be to add isolation in the structure of the roof. This would result in schedule delays and extra costs. This might jeopardize the possibility of the Dies in the glass house. The project team will make a decision in this, but the aim will still be to have the Dies in the glass house
- An architect has made an acoustic problems report, stating that the situation is problematic. The solution should be practical and financially attractive.
- Extra budget cuts have lead to only partly paved surroundings. Furthermore, costs have been spared regarding the temple building, the glass houses and the infrastructure around the building.
- The design for the interior of the east glass house is above budget. There are alternatives that stay within the budget, but they are of far less quality and have far less possibilities.
- The faculty bar will have a budget of 35,000 Euros, which will barely cover the asbestos sanitation and prepping the structure. Students are working on a low budget design.
- Acoustic research has shown that the cheapest solution is the best way to begin. This only costs 180,000 Euros, whilst 600,000 Euros was estimated. The remainder will be kept available in case additional operations are required.
- The fire department has ordered the furniture in the hall ways to be fixed to the floor or removed. These adjustments will cost an additional 14,000 Euros

#### PROJECT GROUP

- Establishing scope and dividing workload amongst teams
- Brief team is pushed to clarify floor scheme
- Surrounding was not included in the overall plan or budget
- Insurance company objects to the proposed glass houses. Decision was made to keep it simple and cheap
- Design team is ordered to cease designing the second phase
- The schedule for the glass houses is unfeasible. Delivery date will be around February. Changing materials (cardboard>steel) is not considered an option
• The surrounding area is balancing it em in the budget. Other budget cuts need to be made to execute the work
• The steering committee says the Dies is more important than the design of the glass houses. Cardboard is out, steel is in
• A new breakthrough in the façade will need to be discussed with the monumental building committee
• Architects are urged to stop designing. The costs are exceeding the budget more and more.
• Issues regarding the floors in the south glass house: resting the mid-level floors on pillars will increase local pressure in the concrete ground floor, which would be costly. A wooden floor is suggested. The disadvantage of this option is the noise a wooden floor creates. The original design is longer available because the foundation is too weak for that design. A concrete floor is chosen, disregarding the extra costs.
• Many students do not know how to find their teachers. This is why special telephones will be placed for internal calls
• A light plan has been drafted by a designer (Hutten). The design will be more costly than the basic lighting that was agreed upon. The budget cuts do not allow this new lighting plan.

DESIGN TEAM

• Budget is discussed: 20.000.000 for the project. Construction 10M and furniture 10M
• Fast inventory of scope, then decide phasing, then work out design and details
• The Dean makes promise to steering committee that ideas will be final next week and a Final Design will be ready by the end of the month.
• A design with 6 glass houses is still discussed even though the steering committee and project group have decided there will only be 2 glass houses
• Architects are thinking about glass structures on the roof, in the future
• Functional aspects of the model making department in the south glass house needs to be determined
• Coloured window stills are not approved by municipality. Design will be slightly altered to obtain approval.
• A third floor in the glass house?
• The climate needs to be sufficient in quality, yet everyone is fully aware that the services are only needed for 5 years. A large investment would be a waste
• Paint work is starting to cost 70.000 Euros more than budgeted. The colour scheme of the window stills is met with hostility. Should we continue if the costs are rising as well?
• Design changes of the library and the congress room will have negative consequences on the budget
• Costs will be saved by only colouring the window stills and not the gutter as well.
• Suggestions to colour the window stills of the glass houses is rejected because the initial idea was to have them contrast with the building
• The glass houses will be discussed in a separate meeting. The design for the east glass house has changed (again). Instead of a ‘mountain’ it will be a tribune. If daylight, costs, space, programme are all in order, the new design will be accepted. Combining acoustic material with awning is rejected because it would jeopardize the view from the building into the glass house.
• The crow’s nest is cut out of the programme due to budget cuts. For now it is on hold.

CONSTRUCTION TEAM

• Library is taking more time to design. Will be transferred from phase 2 to phase 3
• Some of the painting jobs have been cancelled, to save money. The alternative is cleaning the walls thoroughly
• It is not certain yet if the tower needs to be installed with sprinklers. Costs will be 6000 Euros
• No decision has been made concerning the floor of the congress hall. At first the plan was to have a wooden floor, but this was impossible regarding the budget
• It has come to the attention that the restaurant only has one exit.

MEMOIRS

• The budget is estimated at 35 million Euros. Yet there are hardly any fixed designs available. This means that all sub-estimates are very loosely calculated. The functionality of the estimate is questionable.
• The First Phase will not be delivered on time. Instead, the First Phase is changed into preparing the work spaces for first year students.
• During a coordinating meeting amongst the people within the organization it is stated that time is leading in respect to costs. A study place is required by the 1st of September
• Instead of placing blackboards in lecture rooms, movable whiteboards are used. This increases flexibility and can be bought from the budget for the new building
• The idea was to have about 200,000€ to create a few parking spaces. The estimate for surroundings is 1,2 million €.
• It looks like the milestone will not be met. Another two openings will be cut into the walls and a lot of small points of delivery need to be finished.
• Budget cuts in the surrounding area have resulted in 450,000 Euros budget over-run instead of 600,000 Euros over-run.
• The interior architect (Fokkema) has made a design for the crow’s nest. It is still uncertain if the work will be executed due to budget problems versus the programme.
• The basement, originally not part of the project, is becoming a bigger project by the day. The reason is the lack of storage room in the original plan.
• Future user (department) of the east glass house and the design team do not see eye-to-eye on the design. A main issue is the option to close off the rooms inside the structure. A solution is to place the department inside the building and students in the glass house.
• No distinct delivery date can be set for the glass houses as their design has not been finished completely. Still, 15th of March is the aim at this point.
• The mechanical installations in the east glass house were not built with the notion that there would be a structure right underneath it. You might be blown of the structure by the air pressure.

INTERVIEWS & QUOTES

• (Dean) “This might be a temporary solution, but we should realize that a whole generation of architects will be educated here. So keep in mind: I want ambition!”

• The major designers brought in for this project all have had a strong relation with the faculty in the past and have relevant view on what the faculty would need or what would be possible to create in the new building:
  o Coordinating architect: Chief teacher of one of the departments of the faculty. Contracted architect for the transformation of the Julianalaan building to apartment complex, the initial plan of the owner.
  o Interior architect: Researcher of the current plans for restructuring the old faculty. Completely up to date on the demands and wishes of the faculty.
  o East glass house interior architect: Chief teacher of one of the departments of the faculty. Already worked with the faculty on changes on the 13th floor of the former building.
  o Restaurant and Street architect: Designed the public areas of the former faculty building.
  o Glass houses architect: Chief teacher of one of the departments of the faculty. Designed the glass houses in the former building.
  o Espresso bar architect: Designed the espresso bar in the former building.

• The chairmen of the brief team, design team and facilities team had already worked closely together on a number of projects in the former building. Some of the concepts could immediately be transferred to the new building. Most of the architects had also worked with each other or the chairmen. A research had already been executed to improve the faculty of architecture. This obviously done with the idea to improve the burned down building, not the building at the Julianalaan. Still, there were a lot of communication aspects to control regarding all functions and departments

8.4 PROJECT TIME MANAGEMENT

STEERING COMMITTEE

• Global planning: end of June design plans ready, 1st of September First Phase finished, 1st of November rest entire building finished. Additional new structures to be discussed
• Instead of delivering a final design at the end of June, the deadline is moved to the end of November
• Expressing concerns regarding feasibility of general schedule
The 1st of November deadline will only be kept concerning the students. The employees will be housed later on. The aim is to have it sorted before the 1st of December. Time delay in glass houses leads to 3 options. All differ in design, price, lifespan, construction time, etc. The acoustics in the south glass house will be problematic. A solution can be to add isolation in the structure of the roof. This would result in schedule delays and extra costs. This might jeopardize the possibility of the Dies in the glass house. The project team will make a decision in this, but the aim will still be to have the Dies in the glass house.

The east glass house would be finished by the 15th of March, but this delivery date has been pushed back to April 2009. Due to works in the south glass house, the deadline for both glass houses is pushed back 1 month; 15th of April. Construction work is still in progress. There is much doubt as to the feasibility of the deadline.

PROJECT GROUP

Send in demolition crew with architects to start demolition work. Proposition made to incorporate a fine – bonus stipulation in the contracts. Communication issues with municipality need to be resolved in order to keep the speed up. The orders for contractors contain: delivery date for the works is fixed. Contact between all designers needs to be closer to speed up the process.
The third floor of the First Phase will be finished by 01-09. First and second floor will take more time to finalize.

Furniture will need to be stored, since the construction schedule is falling behind. Schedule has been drafted by acquiring schedules from contractors and discussing these with all project leaders. Checking the financial consequences of working in double shifts to make the deadline.

Design team is ordered to cease designing the second phase. The schedule for the glass houses is unfeasible. Delivery date will be around February. Changing materials (cardboard>steel) is not considered an option.

There is still no permit for the pile foundation, yet the work will start next Monday. The steering committee says the Dies is more important than the design of the glass houses. Cardboard is out, steel is in. Architects are urged to stop designing. The costs are exceeding the budget more and more.

The south glass house is on schedule. Its framework is expected to be ready in 3 days. The roofing will be done during the Christmas holidays. The deadline for both glass houses is once more stated: 15th of March. The facility manager is convinced this is not possible for interior of the east glass house.

The deadline of 15th of April will not be met. It will more likely be around the end of April. The east glass house will be used for a seminar halfway through April, so adjustments must be made in the schedule.

The carbon fibre design made for the furniture in the east glass house comes with consequences: it will take 6 months to fabricate it. Options: 1) wait; 2) use another material to create the design; 3) use original polyester furniture from China. Eventually polyester was used to create the design.

DESIGN TEAM

Permits are an issue. Building is listed. Obtain permits in sub-projects due to fast tracking. Architects are thinking about glass structures on the roof, in the future. Structure of glass houses; steel or cardboard? The Dean will make a choice. In order to start construction work on the glass houses, the design of the floors needs to be ready, which they are not now. A contractor for the floor is yet to be decided upon as well.

The budget for the surrounding area is getting out of control and so is the planning. Design and construction need to come together. Costs could be diminished by asking for more offers/bids.

It is suggested to start construction of the second mid-floor before the first is finished, to make up for lost time and still finish both floors before the milestone.

CONSTRUCTION TEAM
CRISIS PROJECT MANAGEMENT
THE RELOCATION OF THE FACULTY OF ARCHITECTURE
David Caelers

- All contractors will provide their schedule of works
- Lifts will be organized centrally. All contractors will be able to use these lifts
- Still no decision on colour scheme. Urgency is now required
- One of the contractors will leave the scaffolding so other contractors can use it as well
- The schedule will be discussed in another meeting, dedicated to just the schedule
- Due to the unforeseen amounts of asbestos found in the building, another meeting is planned to discuss sanitation during nights, to avoid further delay
- Phase 2 even busier. Extra shifts needed
- Architect has disapproved design for main entrance so work is on hold
- Opportunity to work nights/weekends is not used by contractors, so if deadline is failed it will have consequences for tender in 2nd phase
- Schedules for 2nd Phase need to be adjusted to prevent the same mistakes being made in the 1st Phase
- If work is not properly done, and needs to be corrected, this will be done in the weekend to prevent any possible delays
- Demolition work is falling behind on schedule and conflicting with other disciplines. Demolition will be done at night
- When rounds are made, with contractors, and work is behind on schedule, steps will be taken to catch up: schedule adjustments, adding personnel, extra shifts, etc
- It is not certain yet if the tower needs to be installed with sprinklers. Costs will be 6000 Euros
- Construction work is taking too long. Paint work is behind schedule. Asbestos sanitation slowing the process down. Schedule under pressure.
- Phase 2 even busier. Extra shifts needed
- Architect has disapproved design for main entrance so work is on hold
- Opportunity to work nights/weekends is not used by contractors, so if deadline is failed it will have consequences for tender in 2nd phase
- Schedules for 2nd Phase need to be adjusted to prevent the same mistakes being made in the 1st Phase
- If work is not properly done, and needs to be corrected, this will be done in the weekend to prevent any possible delays
- Demolition work is falling behind on schedule and conflicting with other disciplines. Demolition will be done at night
- When rounds are made, with contractors, and work is behind on schedule, steps will be taken to catch up: schedule adjustments, adding personnel, extra shifts, etc
- It is not certain yet if the tower needs to be installed with sprinklers. Costs will be 6000 Euros
- Construction work is taking too long. Paint work is behind schedule. Asbestos sanitation slowing the process down. Schedule under pressure.

MEMOIRS

- At this point, bids are being checked by: a cost-expert, an insurance expert, the dean and procurement. This does not help the speed of the project.
- The First Phase will not be delivered on time. Instead, the First Phase is changed into preparing the work spaces for first year students.
- The main reasons for delay is the constant editing of drawings by the architects and the under estimated time needed to engineer all installations.
- During a coordinating meeting amongst the people within the organization it is stated that time is leading in respect to costs. A study place is required by the 1st of September
- Contractors only account for their own schedule without regard for dependence of other contractors, the order of construction.
- Project leaders are confronted with the difference between the promises a contractor makes and the work completed.
- Contractors object to new schedule as their proposals for schedule have been shortened in order to maintain the ultimatum. Project leaders refer to the option of working 24/7. Contractors refuse, as they do not have the manpower to work 24/7. Management suggests hiring more people, but this does not always improve the work rate. People start to hinder each other, and the floors cannot take the weight of many lifts and work force
- It looks like the milestone will not be met. Another two openings will be cut into the walls and a lot of small points of delivery need to be finished.
- The stagnation in the planning is a fact. Yet all contractors seem to push the responsibility away from them
- The Street is not finished, so scheduling needs to be adjusted. Add workload in nights and weekends.
- Some contractors just mention that they are falling behind on schedule but give no indication how to catch up.
- It is quite odd that agreements are made that if a contractor falls behind on schedule, he will catch up during nights and weekends. Yet most of the contractors do not report when they fall behind, nor do they work the nights or weekends.
- No distinct delivery date can be set for the glass houses as their design has not been finished completely. Still, 15th of March is the aim at this point.
- The milestone was 1st of November. Most of it was done at that time, yet the small stuff is still ongoing this week, a month later.
- The designer of the interior of the east glass house insists on a new lighting design. The managers indulge. Result is more delays and extra costs. Similar things happening with contractor of glass houses.
INTERVIEWS & QUOTES

• In building projects of this size, the reuse of existing electrical installations is economically not viable. Disassembly, storage and re-assembly will cost quite some additional time and the savings are usually not very interesting. Only the distributors will be reused. The wiring will be replaced.

• The fire department was involved in the project from the start. Furthermore, an independent fire safety expert was brought in to provide additional counsel throughout the duration of the project. A fire safety team was created which worked independently from the design team. Traditionally communication regarding fire safety passes through the municipality before it ends up with the fire department. Considering the speed at which the project was undertaken, the project team was allowed to have a direct line with both municipality and the fire department.

• During the first phase of the construction work (east side of the main building) the pace was incredible. Every single sketch that came from the design team needed to be checked immediately in order to be executed promptly. The sprinkler system and fire safety installation needed to be implemented in an equally fast pace.

• Since it was not evident from the start which parts of the building would be demolished, it was not clear where the asbestos was located. The pace at which demolition took place was very high, so at times there were parts demolished before inspection had taken place.

• (Dean) “Our management was focussed on quality in terms of functionality, shape and time.”

• (Dean) “... Some decisions were made so promptly that cost calculation could only be done after the work was done”

• (Insurance expert) “Due to the complex and vast administration and the imminent speed of requesting, judging and approving of tenders, we were offered office space at the faculty of civil engineering at the finance and control department. We were able to meet employees of the university on a daily base. The proximity has strongly contributed to quick decision making and the creation of trust.”

• The chairmen of the brief team, design team and facilities team had already worked closely together on a number of projects in the former building. Some of the concepts could immediately be transferred to the new building. Most of the architects had also worked with each other or the chairmen. A research had already been executed to improve the faculty of architecture. This obviously done with the idea to improve the burned down building, not the building at the Julianalaan. Still, there were a lot of communication aspects to control regarding all functions and departments

• (Chief project leader) “During the contractors meeting we would discuss with all relevant contractors what was planned for the next 2 days and who needed to be aware of who’s presence during the execution of the works”

• The Delft University of Technology is restricted to European legislation with regards to procurement. A traditional procurement procedure requires a lot of preparation and has, depending on the situation, a turnaround of at least four to five months. In some cases there is an exception to the rule: compelling urgency

• (Installations contractor) “No one objected to lending their tools to another company. Normally you would have to call the office and have them send over the tools.”

• (Works contractor) “At one point we decided to work in two shifts: 07:00 till 16:00 and 13:00 till 22:00.”

8.5 PROJECT COST MANAGEMENT

STEERING COMMITTEE
• Cost estimation 25.000.000, including furniture and new structures.
• Cost calculation is 50M, excl VAT.>> not acceptable. Change design, subtract glass houses, or use alternative location instead of glass houses. Options calculated and chosen for 1 glass house less, and some design changes: <35M
• De costs are estimated at 34,8M incl. VAT. If the deadline on the 1st of September is missed, these costs will go up
• Another cost calculation: 35 million, taxes and furniture excluded. This budget is fixed and cannot be deviated from.
• The total budget is adjusted to 44 million Euros. Another exceeding of the budget will not be accepted.
• Budget control system is being developed. Results will be discussed next week
• Cost estimation regarding 3rd phase critically judged
• Independent engineering company thinks the bid for the glass houses is too high. Cost calculation will be reviewed and both companies will clarify their opinion
• Permission is granted to create a different budget/account for inventory needed in the new building
• An overview needs to be drafted concerning the different insurances and their pay out.
• Costs allocated to the inventory, like furniture, need to be documented carefully.
• Again asbestos contamination. A new company has been signed on. This will have consequences for the budget. The adversity has used up all of the ‘unforeseen’ leeway.
• Time delay in glass houses leads to 3 options. All differ in design, price, lifespan, construction time, etc.
• As result of budget over-runs, glass houses are proposed over longer time span. The design team decides after reviewing the brief that both glass houses are necessary
• The construction of the ‘temple’ building will be put on hold
• The insurance company has proposed an alternative solution for the east glass house.
• The glass houses designed by Octatube and Neptunis are compared. There is a great difference in visual quality between the two, the construction costs seem to be more or less the same. The conclusions/decisions will be discussed with the insurance experts next week.
• The costs for the surrounding area are very high. The steering committee will like to see some alternatives. These will be shown next meeting.
• The budgets are more or less depleted. No orders may be given without proper consent.
• The acoustics in the south glass house will be problematic. A solution can be to add isolation in the structure of the roof. This would result in schedule delays and extra costs. This might jeopardize the possibility of the Dies in the glass house. The project team will make a decision in this, but the aim will still be to have the Dies in the glass house
• The estimate at this time is 46,5 million Euros. This still excludes the surrounding area, the temple building and the acoustic problems.
• An architect has made an acoustic problems report, stating that the situation is problematic. The solution should be practical and financially attractive.
• Extra budget cuts have lead to only partly paved surroundings. Furthermore, costs have been spared regarding the temple building, the glass houses and the infrastructure around the building.
• The design for the interior of the east glass house is above budget. There are alternatives that stay within the budget, but they are of far less quality and have far less possibilities.
• There is a gap between what is invoiced and what is spent regarding the estimates; 36 versus 46 million Euros. This has happened because the system that is used to register the orders does not check the invoices which are gathered in a different system
• Electricity and lighting is estimated 200.000 Euros above the rough estimate. An analysis is yet to be made
• The faculty bar will have a budget of 35.000 Euros, which will barely cover the asbestos sanitation and prepping the structure. Students are working on a low budget design.
• Acoustic research has shown that the cheapest solution is the best way to begin. This only costs 180.000 Euros, whilst 600.000 Euros was estimated. The remainder will be kept available in case additional operations are required.
• The fire department has ordered the furniture in the hall ways to be fixed to the floor or removed. These adjustments will cost an additional 14.000 Euros
• A necessary budget over-run for the glass houses of 121.000 has been approved
• Faculty bar design is presented. The costs will be 150.000 E, including the 35.000 contribution by the university. The remainder will be provided by sponsored work and sponsored finances. Demands and conditions for usage of the bar will be drafted as soon as possible
• Main financial worries are the installations. These are suspected to be under estimated
• The latest estimation for the mechanical installations is 30% higher than the first rough estimation
• Reminder to take control of the budget not let the engineers and consultants control.
• Requiring information from engineers/designers/contractors to have gain control in budget
• Find the difference between budget for asbestos sanitation and costs so far
• Cost control system does not work due to difference between planned costs and real time costs
• Surrounding was not included in the overall plan or budget
• Checking the financial consequences of working in double shifts to make the deadline
• Insurance company objects to the proposed glass houses. Decision was made to keep it simple and cheap
• Still resolving the different budget systems
• The surrounding area is balancing item in the budget. Other budget cuts need to be made to execute the work
• Architects are urged to stop designing. The costs are exceeding the budget more and more.
• Issues regarding the floors in the south glass house: resting the mid-level floors on pillars will increase local pressure in the concrete ground floor, which would be costly. A wooden floor is suggested. The disadvantage of this option is the noise a wooden floor creates. The original design is longer available because the foundation is too weak for that design. A concrete floor is chosen, disregarding the extra costs.
• The minimal design for the faculty pub is still quite costly and asbestos sanitation is not even included yet. Possibilities need to be discussed in steering committee.
• Last week a feeling was expressed that the budget was over-run with another 500,000 Euros. This was incorrect. It seems it is closer to 150,000 Euros. The exact number is still unknown.
• Some of the contractors want to dispute the additional work arrangement. Others have dropped the claim for additional work
• The mechanical engineering and some of the woodwork is coming out under budget. A change of paintwork contractor should save costs as well
• Bids concerning electrical services in the east glass house are 200,000 E over the budget. Instead of accepting this over-run, creative solutions are needed to make up the difference.
• The floor colouring can be realised in 3 different ways. Linoleum, coating and added colour to the concrete. The floor will just be painted, like the floor in the south glass house (which half price compared to these options). Still no choice in the colour of the floor.
• A light plan has been drafted by a designer (Hutten). The design will be more costly than the basic lighting that was agreed upon. The budget cuts do not allow this new lighting plan.
• Current situation suggests that the budget is over-run with more or less 4 million Euros. The steering committee demands an explanation
• No word yet from the municipality regarding the dues/fees concerning the whole project.

DESIGN TEAM

• Budget is discussed: 20.000.000 for the project. Construction 10M and furniture 10M
• Surrounding area is being designed, without allocated budget.
• Structure of glass houses; steel or cardboard? The Dean will make a choice.
• Decision to be made about the structure of the glass houses. Use facade or columns?
• Choice to be made between brick floors or asphalt
• A third floor in the glass house?
• The climate needs to be sufficient in quality, yet everyone is fully aware that the services are only needed for 5 years. A large investment would be a waste
• Paint work is starting to cost 70.000 Euros more than budgeted. The colour scheme of the window stills is met with hostility. Should we continue if the costs are rising as well?
• Design changes of the library and the congress room will have negative consequences on the budget
• Decision needed regarding the floors. Bricks are 80.000 Euros cheaper than concrete. Machinery would be situated on concrete slabs. This would prevent any flexibility in location of the machinery. Moving furniture would be difficult as well
• An engineering company (ABT) can make a concept model for the air conditioning which could save 80.000 Euros eventually. The time schedule has room for this option
• The budget for the surrounding area is getting out of control and so is the planning. Design and construction need to come together. Costs could be diminished by asking for more offers/bids
• Costs will be saved by only colouring the window stills and not the gutter as well.
• The steering committee is concerned that the costs for the surrounding area will exceed the budget. Creativeness with resources is needed. Street furniture needs to be mobile, so it can be deducted from the insurance money.
• The glass houses will be discussed in a separate meeting. The design for the east glass house has changed (again). Instead of a ‘mountain’ it will be a tribune. If daylight, costs, space, programme are all in order, the new design will be accepted. Combining acoustic material with awning is rejected because it would jeopardize the view from the building into the glass house.
• The structural consultant does not always agree with the plans made by the designer/contractor. This can lead to changes in the costs.
• The crow’s nest is cut out of the programme due to budget cuts. For now it is on hold.

CONSTRUCTION TEAM

• Some of the painting jobs have been cancelled, to save money. The alternative is cleaning the walls thoroughly
• Many of the air vents have been damaged. The contractor will draft another bid, to restore and repair said vents.

MEMOIRS

• Only some parts of the project are open for tendering and checked. In many cases the cost-expert will see the bid when the work has already started. This complicates controlling the costs.
• The budget is estimated at 35 million Euros. Yet there are hardly any fixed designs available. This means that all sub-estimates are very loosely calculated. The functionality of the estimate is questionable.
• Two risks are jeopardizing the costs of the project. The costs for electrical engineering have been estimated very roughly, giving way to a lot of uncertainties. At the same time, the aspect ‘unforeseen’ in the budget has been reduced, to make the budget look better.
• The new cost estimate is 42 million instead the former 35 million Euros.
• Awning will be used to improve acoustics as well to save money
• Instead of placing blackboards in lecture rooms, movable whiteboards are used. This increases flexibility and can be bought from the budget for the new building
• The idea was to have about 200.000€ to create a few parking spaces. The estimate for surroundings is 1,2 million €.
• Budget cuts in the surrounding area have resulted in 450.000 Euros budget over-run instead of 600.000 Euros over-run.
• The interior architect (Fokkema) has made a design for the crow’s nest. It is still uncertain if the work will be executed due to budget problems versus the programme.
• The Street is not finished, so scheduling needs to be adjusted. Add workload in nights and weekends.
• The refurbishment of the temple building to serve the faculty pub is not allocated in the budget. The pub organization will need to create its own resources. Yet the faculty wants to have a say in the design and its expression.
• The design for the surroundings needs to be adjusted to products that can be shipped to a new location, since there is nothing left in the ‘temporary’ budget.
• To fit all installations in the glass houses, lifts are needed or scaffolding. From aesthetic point of view lifts would be preferable, but construction management is certain the scaffolding will be more practical and cheaper.
• The designer of the interior of the east glass house insists on a new lighting design. The managers indulge. Result is more delays and extra costs. Similar things happening with contractor of glass houses.

INTERVIEWS & QUOTES

• The decision was made to maintain and renovate the old central heating system of the building to save costs and because the quality of the heating was sufficient for the former users of the building.
• The Facility Management & Real Estate department of the university always executes projects using their manual. The manual provides a certain quality level that the university wants to guarantee. The air conditioning plan proposed by the department turned out to be a lot more expensive than calculated in the
budget. Eventually the steering committee decided to drop the manual for once and execute the air conditioning plan low budget and efficient.

- In building projects of this size, the reuse of existing electrical installations is economically not viable. Disassembly, storage and re-assembly will cost quite some additional time and the savings are usually not very interesting. Only the distributors will be reused. The wiring will be replaced.
- An engineering consultancy was brought in by the interior architecture bureau to hold a survey together to determine which rooms would need acoustic measures. The educational rooms and lecture halls had priority due to the speed of the project and the budget available at that time.
- Based on the acoustic report, the chairman of the project group decided to fit out the remaining rooms with a basic solution for the problems. This basic solution, acoustic panels between the beams in the ceiling, had the best result-cost ratio.

- (Dean) "... Some decisions were made so promptly that cost calculation could only be done after the work was done"

8.6 PROJECT QUALITY MANAGEMENT

STEERING COMMITTEE

- Cost calculation is 50M, excl VAT.>> not acceptable. Change design, subtract glass houses, or use alternative location instead of glass houses. Options calculated and chosen for 1 glass house less, and some design changes: <35M
- Again asbestos contamination. A new company has been signed on. This will have consequences for the budget. The adversity has used up all of the ‘unforeseen’ leeway.
- Time delay in glass houses leads to 3 options. All differ in design, price, lifespan, construction time, etc.
- The insurance company has proposed an alternative solution for the east glass house.
- The glass houses designed by Octatube and Neptunis are compared. There is a great difference in visual quality between the two, the construction costs seem to be more or less the same. The conclusions/decisions will be discussed with the insurance experts next week.
- The acoustics in the south glass house will be problematic. A solution can be to add isolation in the structure of the roof. This would result in schedule delays and extra costs. This might jeopardize the possibility of the Dies in the glass house. The project team will make a decision in this, but the aim will still be to have the Dies in the glass house.
- The design for the interior of the east glass house is above budget. There are alternatives that stay within the budget, but they are of far less quality and have far less possibilities.
- Acoustic research has shown that the cheapest solution is the best way to begin. This only costs 180.000 Euros, whilst 600.000 Euros was estimated. The remainder will be kept available in case additional operations are required.
- The fire department has ordered the furniture in the hall ways to be fixed to the floor or removed. These adjustments will cost an additional 14.000 Euros
- The budget over-run is substantial. The position that the steering committee takes is: It is what it is. Let us finish it properly.

PROJECT GROUP

- Inventory of users wishes is drafted
- Climate comfort levels are discussed. University level is much higher than necessary
- The design for the Street has been approved.
- Insurance company objects to the proposed glass houses. Decision was made to keep it simple and cheap
- Design team is ordered to cease designing the second phase
- The schedule for the glass houses is unfeasible. Delivery date will be around February. Changing materials (cardboard>steel) is not considered an option
- The steering committee says the Dies is more important than the design of the glass houses. Cardboard is out, steel is in
- Issues regarding the floors in the south glass house: resting the mid-level floors on pillars will increase local pressure in the concrete ground floor, which would be costly. A wooden floor is suggested. The
disadvantage of this option is the noise a wooden floor creates. The original design is longer available because the foundation is too weak for that design. A concrete floor is chosen, disregarding the extra costs.

- Decisions regarding the acoustic problems need to be dealt with quickly, because insulating the roof needs to be arranged before the roof is lifted.
- The colours have been communicated with the municipality (welstand) but not officially and not with the residents who are opposed to the colours. The architect has to consider not colouring the south side of the building.
- Bids concerning electrical services in the east glass house are 200,000 € over the budget. Instead of accepting this over-run, creative solutions are needed to make up the difference.
- The floor colouring can be realised in 3 different ways. Linoleum, coating and added colour to the concrete. The floor will just be painted, like the floor in the south glass house (which half price compared to these options). Still no choice in the colour of the floor.
- A light plan has been drafted by a designer (Hutten). The design will be more costly than the basic lighting that was agreed upon. The budget cuts do not allow this new lighting plan.
- The carbon fibre design made for the furniture in the east glass house comes with consequences: it will take 6 months to fabricate it. Options: 1) wait; 2) use another material to create the design; 3) use original polyester furniture from China. Eventually polyester was used to create the design.

**DESIGN TEAM**

- Budget is discussed: 20,000,000 for the project. Construction 10M and furniture 10M.
- Functional aspects of the model making department in the south glass house needs to be determined.
- Surrounding area is being designed, without allocated budget.
- Coloured window stills are not approved by municipality. Design will be slightly altered to obtain approval.
- Structure of glass houses; steel or cardboard? The Dean will make a choice.
- Architect has disapproved design for main entrance so work is on hold.
- Decision to be made about the structure of the glass houses. Use facade or columns?
- Choice to be made between brick floors or asphalt.
- A third floor in the glass house?
- The climate needs to be sufficient in quality, yet everyone is fully aware that the services are only needed for 5 years. A large investment would be a waste.
- Paint work is starting to cost 70,000 Euros more than budgeted. The colour scheme of the window stills is met with hostility. Should we continue if the costs are rising as well?
- Decision needed regarding the floors. Bricks are 80,000 Euros cheaper than concrete. Machinery would be situated on concrete slabs. This would prevent any flexibility in location of the machinery. Moving furniture would be difficult as well.
- A creative solution needs to be found for the acoustic problems in the glass houses. A special meeting for the acoustics is set do brainstorm possibilities.
- The steering committee is concerned that the costs for the surrounding area will exceed the budget. Creativeness with resources is needed. Street furniture needs to be mobile, so it can be deducted from the insurance money.
- The glass houses will be discussed in a separate meeting. The design for the east glass house has changed (again). Instead of a ‘mountain’ it will be a tribune. If daylight, costs, space, programme are all in order, the new design will be accepted. Combining acoustic material with awning is rejected because it would jeopardize the view from the building into the glass house.

**CONSTRUCTION TEAM**

- Still no decision on colour scheme. Urgency is now required.
- If work is not properly done, and needs to be corrected, this will be done in the weekend to prevent any possible delays.
- Some of the painting jobs have been cancelled, to save money. The alternative is cleaning the walls thoroughly.
- Damages to radiators everywhere are reported. Also more and more damages to other people’s property. It is a result of the crowdedness.
- Contractors are pressed to work hard, even though it is not certain what they need to do. The architects are still too busy discussing the brief/programme.
MEMOIRS

- The design for the surroundings needs to be adjusted to products that can be shipped to a new location, since there is nothing left in the 'temporary' budget.
- Somehow the detectors for the lighting do not work properly. They do not turn lighting on when there’s movement and they keep on during the night.
- Someone will make rounds to judge the comfort level in all rooms.
- To fit all installations in the glass houses, lifts are needed or scaffolding. From aesthetic point of view lifts would be preferable, but construction management is certain the scaffolding will be more practical and cheaper.
- The mechanical installations in the east glass house were not built with the notion that there would be a structure right underneath it. You might be blown of the structure by the air pressure.

INTERVIEWS & QUOTES

- The decision was made to maintain and renovate the old central heating system of the building to save costs and because the quality of the heating was sufficient for the former users of the building.
- The Facility Management & Real Estate department of the university always executes projects using their manual. The manual provides a certain quality level that the university wants to guarantee. The air conditioning plan proposed by the department turned out to be a lot more expensive than calculated in the budget. Eventually the steering committee decided to drop the manual for once and execute the air conditioning plan low budget and efficient.
- In building projects of this size, the reuse of existing electrical installations is economically not viable. Disassembly, storage and re-assembly will cost quite some additional time and the savings are usually not very interesting. Only the distributors will be reused. The wiring will be replaced.
- Based on the acoustic report, the chairman of the project group decided to fit out the remaining rooms with a basic solution for the problems. This basic solution, acoustic panels between the beams in the ceiling, had the best result-cost ratio.

- (Dean) "Our management was focussed on quality in terms of functionality, shape and time."

- (Dean) "This might be a temporary solution, but we should realize that a whole generation of architects will be educated here. So keep in mind: I want ambition!"

- (Works contractor) "Changes were ongoing and so were the meetings. Sometimes an architect was designing something on the spot, at which time a carpenter would assist him. Everyone had a little bit more understanding for each other’s discipline compared to traditional situations. This work attitude provided the client with the best result possible."

8.7 PROJECT HUMAN RESOURCE MANAGEMENT

STEERING COMMITTEE

- Municipality requires permit procedure for glass houses, and might object. Legal advice is necessary.
- To improve communication with user (employees) a special team (Flex team) is implemented.
- The architects cannot seem to find common ground on the matter of the colours in the east glass house. The chairman of the project group will put pressure on the situation.
- An architect has made an acoustic problems report, stating that the situation is problematic. The solution should be practical and financially attractive.
- The project team needs to be dismantled. The meeting frequency has been lowered to once every three weeks. A permanent faculty needs to take over from here.
- The project team is being dissolved.
- The design team is “officially” dissolved. 1 bureau has the lead. Others have sub plans in master scheme.
- Dissolvement of project team called back.
PROJECT GROUP

- Brief is finished, programme team dissolved
- Builders that are working on the First Phase will go on holiday the 1st of September. A second crew will start the Second Phase. This means the risk of making the same mistakes
- Design team should be cancelled. Project team will take over tasks left. Design period is finalized
- Municipal representative in PG is no longer needed, unless asked for
- Project team should be dismantled around Christmas time with this regular meeting. Tasks should be transferred upon the permanent organization.
- The design team has been dissolved. Some of the members have formed a ‘glass houses’ team to continue on the specific tasks at hand.

DESIGN TEAM

- Need to find someone to calculate acoustics to see if it poses a threat
- Concerns about ventilation and overheating regarding the mechanical engineering. A consultant is hired
- Architects need to hand in the hours they have worked on a weekly base, to insure the costs do not get out of control.
- The suggestions made by the acoustics expert are disregarded. Another meeting will be planned with expert to look for alternatives.

CONSTRUCTION TEAM

- Asbestos sanitation will enlist more people to speed up the project. The sanitation planning presides the planning for all the other contractors
- A lot of meetings lack decisions. The meeting is filled with discussions, but it is not clear what the final conclusions/decisions are.

MEMOIRS

- The supervisor is coming up short in his work. He comes in late, leaves early, hardly works on the site and generally contradicts decisions made by the organization.
- The architects are constantly behind on the contractors. When a solution is needed by the contractors, the architect on the site has to confer with the main office before giving an answer
- There are many issues between the contractors, damaging each other’s work, interrupting each other’s work, etc. A main contractor is clearly missed.
- No one seems to know how the process of payment works; only that it is always late. Contractors threaten to stop work, if not reimbursed
- Project leaders are confronted with the difference between the promises a contractor makes and the work completed.
- The asbestos sanitation team has lost its credibility. Therefore, another company has been selected to do the sanitation.
- The chaos on the site is getting worse due to a funnel effect. There is less and less space with the same amount of builders.
- Halfway through December the management team will be half the size. This means everyone should check everything very well before that time, or few people will have a big mess to clean up.
- One contractor to build a lift, another to place the doors in the lift, yet another contractor to install the electrical network...
- The designer of the interior of the east glass house insists on a new lighting design. The managers indulge. Result is more delays and extra costs. Similar things happening with contractor of glass houses.

INTERVIEWS & QUOTES

- The asbestos sanitation company regularly changed contacts which led to communication errors which was a sign to others that the company was not committed to the project. They eventually had to be replaced
The major designers brought in for this project all have had a strong relation with the faculty in the past and have relevant view on what the faculty would need or what would be possible to create in the new building:

- Coordinating architect: Chief teacher of one of the departments of the faculty. Contracted architect for the transformation of the Julianalaan building to apartment complex, the initial plan of the owner.
- Interior architect: Researcher of the current plans for restructuring the old faculty. Completely up to date on the demands and wishes of the faculty.
- East glass house interior architect: Chief teacher of one of the departments of the faculty. Already worked with the faculty on changes on the 13th floor of the former building.
- Restaurant and Street architect: Designed the public areas of the former faculty building.
- Glass houses architect: Chief teacher of one of the departments of the faculty. Designed the glass houses in the former building.
- Espresso bar architect: Designed the espresso bar in the former building.

The electro-technical contractor and mechanical engineering contractor did not have the capacity within the company required for this task, so subcontractors were signed from abroad, including Portugal, Poland and Germany.

(Chief project leader) "The initial plan was to transfer the management procedure to the Facility Management & Real Estate department after the project start up, but we ended up working together throughout the whole project."

(Financial project manager) "This was a very particular project of which none of the participants had any prior experience."

(Chairman construction team) "As soon as we were concentrating on the refurbishment of the old main building at the Julianalaan, the number one priority was to find suitable partners to get the job done. During the procurement procedure we were looking for companies with whom we had a history with or who knew the building. This reliefs some of the tension and facilitates communication. "It is in situations like these that you can see how important it is to have the right people for the job. You need people who think in solutions and are willing to go the distance."

(Glass contractor) "The thing that stood out for me was the solidarity between the regular contractors of the university."

8.8 PROJECT COMMUNICATION MANAGEMENT

STEERING COMMITTEE

To improve communication with user (employees) a special team (Flex team) is implemented. A newsletter is proposed, to inform everyone regarding the housing moments. Communication towards the students and employees is good. A newsletter, a website and emails are used. The steering committee will keep meeting in the new year, at least till February. The residents from the building across the street (Oxford and Cambridge) are objecting to the colour scheme for the window stills. Since the residents have been very cooperative during the project, a compromise needs to be formulated. The architect will come with 3 alternatives to discuss with the residents.

There is a gap between what is invoiced and what is spent regarding the estimates; 36 versus 46 million Euros. This has happened because the system that is used to register the orders does not check the invoices which are gathered in a different system. A point of attention is made that the discussions with the insurance have never been noted down.

As a result from the protest by the residents, one side of the building will get the designed colour scheme; the other side will be painted in a neutral grey.

The project team is being dissolved

To conclude the final budget estimation there are 3 processes that need to match: the overview of orders, the registration system and the Finance & Control system.
• The project team has its last meeting today. All tasks have been delegated to appropriate departments within the faculty.

PROJECT GROUP

• Communication issues with municipality need to be resolved in order to keep the speed up
• Frequency of meetings is discussed
• Keeping residents informed through meeting and website
• Contact between all designers needs to be closer to speed up the process
• Residents will be able to contact managers directly when confronted with nuisance
• None of the prior minutes have been checked by the project group
• The municipality presses that they will need to see final documents, plans and drawings as soon as possible to give advice timely
• Requiring information from engineers/designers/contractors to have gain control in budget
• Residents are concerned about the change in appearance of the building. They will be kept informed
• Work during exploitation. Keep builders and students separated at all times
• The piling will cause for a lot of noise. It is important to make sure everyone is aware of this. Discouraging people to come to the faculty during the foundation work. Some meetings and plans need to be relocated.
• The project team will not be dismantled before Christmas, but in the new year not to rush transition
• The dilatation in the floor has changed. Instead of one dilatation in longitudinal direction, two dilatations were made crosswise.
• The project team will not continue in a diluted version, but the same composition. The frequency will be tuned down to once every two weeks
• Discussion brought up regarding additional work. It is stated that the risks of changes due to the speed and the pressure on the project was incorporated in the price, so additional work should be regarded as none existing.
• Many students do not know how to find their teachers. This is why special telephones will be placed for internal calls
• Last week a feeling was expressed that the budget was over-run with another 500.000 Euros. This was incorrect. It seems it is closer to 150.000 Euros. The exact number is still unknown.
• The colours have been communicated with the municipality (welstand) but not officially and not with the residents who are opposed to the colours. The architect has to consider not colouring the south side of the building
• The design team has been dissolved. Some of the members have formed a 'glass houses' team to continue on the specific tasks at hand.
• Management wants the architects to stop designing. The project design is finished

DESIGN TEAM

• The brief has been formulated and can be used in meetings with departments
• Surrounding area is being designed, without allocated budget.
• Regarding glass houses; box-in-box: close collaboration is needed between the architects and the engineers
• In order to start construction work on the glass houses, the design of the floors needs to be ready, which they are not now. A contractor for the floor is yet to be decided upon as well.
• A creative solution needs to be found for the acoustic problems in the glass houses. A special meeting for the acoustics is set do brainstorm possibilities.
• The structural consultant does not always agree with the plans made by the designer/contractor. This can lead to changes in the costs.
• The suggestions made by the acoustics expert are disregarded. Another meeting will be planned with expert to look for alternatives.

CONSTRUCTION TEAM

• All contractors will provide their schedule of works
• The schedule will be discussed in another meeting, dedicated to just the schedule
• Due to the unforeseen amounts of asbestos found in the building, another meeting is planned to discuss sanitation during nights, to avoid further delay
• Construction drawings and master drawing do not correspond
• Contractors demand to know what they need to do with the hours they are waiting due to unforeseen circumstances.
• A wall is created with foil, but builders keep barging through it. A fixed wall is no option because the fire department demands that it can be used as an escape exit.
• Due to fire regulations it is not permitted to have furniture in the hallways which is not fixed to the floor
• The contractor for the mechanical engineering will hold a meeting for the facility managers on how to operate and handle the building.
• It is still taking too long for bids to be awarded and invoices to be paid

MEMOIRS

• Multiple contact people from the municipality and the project organization lead to miscommunication
• The architects are too scattered to be efficient. Since it is impossible to have all architects in the same physical location, it would be wise to file all drawings, minutes and other relevant information at one central point (on the internet)
• At this point, bids are being checked by: a cost-expert, an insurance expert, the dean and procurement. This does not help the speed of the project.
• Contractors are pressed to work hard, even though it is not certain what they need to do. The architects are still too busy discussing the brief/programme.
• The main reasons for delay is the constant editing of drawings by the architects and the under estimated time needed to engineer all installations.
• At his time everyone is assuming that European Procurement can only be avoided till the 1st of September.
• There are few cost overviews circulating. Some have approved costs; others have all bids, etc.
• The design team is behind schedule in regard to the construction team. Some decisions are made without discussion or drawings. There is no way to trace back the origin of the design.
• Neither municipality nor fire department allow minutes to be kept during the meetings
• The architects are constantly behind on the contractors. When a solution is needed by the contractors, the architect on the site has to confer with the main office before giving an answer
• Contractors only account for their own schedule without regard for dependence of other contractors, the order of construction.
• Project leaders are confronted with the difference between the promises a contractor makes and the work completed.
• Communication between project leaders is deteriorating. Pressure and miscommunication is creating a lot of frustration.
• The air vents and the lighting are interfering with each other as a result of separate designs
• Contact with municipality is hard. They do not allow minutes to be kept, making it impossible to be certain to cover all angles.
• Inviting the designer of the glass houses to the project group should expedite the design phase
• Something went wrong in the communication regarding the trees. Cutting down trees that are not supposed to be cut down is very bad.
• Miscommunication in the drawings is leading to problems in the execution. Data connections are missing because they were drawn on other drawings.
• Damages are not always reported, so they are not always fixed either.
• The lighting in the glass houses is topic surrounded by miscommunication.
• The columns have been placed without pulling the necessary cables through them. Now they will be very hard to pull through.
• Still no solution regarding acoustic problems in glass house. The designer/contractor is urging since there is not much time left to implement solutions in the structure.
• Construction manager: “Alleen omdat je hier een beslissing neemt wil niet zeggen dat je ook echt daadwerkelijk een BESLISSING neemt!” (just because you make a decision does not necessarily mean that you are making a DECISION)
The fire department was involved in the project from the start. Furthermore, an independent fire safety expert was brought in to provide additional counsel throughout the duration of the project. A fire safety team was created which worked independently from the design team. Traditionally communication regarding fire safety passes through the municipality before it ends up with the fire department. Considering the speed at which the project was undertaken, the project team was allowed to have a direct line with both municipality and the fire department.

The coordinating architect was responsible for the design of the east glass house, which came from another architecture bureau. The coordinating architect called in assistance from another fire safety expert than the one being used by the organization. Eventually there were a number of fire safety experts brought onto this project.

Design and construction were running simultaneously. The unavoidable result was that asbestos sanitation needed to be done during demolition and construction work. This resulted in additional risks regarding sanitation. The contractors were not properly informed on the activity surrounding the asbestos sanitation.

Since it was not evident from the start which parts of the building would be demolished, it was not clear where the asbestos was located. The pace at which demolition took place was very high, so at times there were parts demolished before inspection had taken place.

The asbestos sanitation company regularly changed contacts which led to communication errors which was a sign to others that the company was not committed to the project. They eventually had to be replaced.

(Insurance expert) “Due to the complex and vast administration and the imminent speed of requesting, judging and approving of tenders, we were offered office space at the faculty of civil engineering at the finance and control department. We were able to meet employees of the university on a daily base. The proximity has strongly contributed to quick decision making and the creation of trust.”

The major designers brought in for this project all have had a strong relation with the faculty in the past and have relevant view on what the faculty would need or what would be possible to create in the new building:

- Coordinating architect: Chief teacher of one of the departments of the faculty. Contracted architect for the transformation of the Julianalaan building to apartment complex, the initial plan of the owner.
- Interior architect: Researcher of the current plans for restructuring the old faculty. Completely up to date on the demands and wishes of the faculty.
- East glass house interior architect: Chief teacher of one of the departments of the faculty. Already worked with the faculty on changes on the 13th floor of the former building.
- Restaurant and Street architect: Designed the public areas of the former faculty building.
- Glass houses architect: Chief teacher of one of the departments of the faculty. Designed the glass houses in the former building.
- Espresso bar architect: Designed the espresso bar in the former building.

The chairmen of the brief team, design team and facilities team had already worked closely together on a number of projects in the former building. Some of the concepts could immediately be transferred to the new building. Most of the architects had also worked with each other or the chairmen. A research had already been executed to improve the faculty of architecture. This obviously done with the idea to improve the burned down building, not the building at the Julianalaan. Still, there were a lot of communication aspects to control regarding all functions and departments.

The electro-technical contractor and mechanical engineering contractor did not have the capacity within the company required for this task, so subcontractors were signed from abroad, including Portugal, Poland and Germany.

(Chairman brief team) “I have amazing memories from the time that the project organization was located in the adjacent ‘temple’ building. Being located together contributed greatly to the excellent communication and results of which we are so proud. Physical contact still preserves above telephone and email contact.”

(Chief project leader) “During the contractors meeting we would discuss with all relevant contractors what was planned for the next 2 days and who needed to be aware of who’s presence during the execution of the works”
• (Chief university facilities) "We have invested time in communication with parties like the residents of the area and the municipality. That was a very wise decision. Obtaining permits from the municipality went smoothly and the residents were very sympathetic.

• (Works contractor) "Changes were ongoing and so were the meetings. Sometimes an architect was designing something on the spot, at which time a carpenter would assist him. Everyone had a little bit more understanding for each other's discipline compared to traditional situations. This work attitude provided the client with the best result possible."

• (Chairman construction team) "As soon as we were concentrating on the refurbishment of the old main building at the Julianalaan, the number one priority was to find suitable partners to get the job done. During the procurement procedure we were looking for companies with whom we had a history with or who knew the building. This relieved some of the tension and facilitates communication. "It is in situations like these that you can see how important it is to have the right people for the job. You need people who think in solutions and are willing to go the distance."

8.9 PROJECT RISK MANAGEMENT

STEERING COMMITTEE

• Costs allocated to the inventory, like furniture, need to be documented carefully.
• Again asbestos contamination. A new company has been signed on. This will have consequences for the budget. The adversity has used up all of the 'unforeseen' leeway.
• The choice for the glass houses needs to be documented properly
• The residents from the building across the street (Oxford and Cambridge) are objecting to the colour scheme for the window stills. Since the residents have been very cooperative during the project, a compromise needs to be formulated. The architect will come with 3 alternatives to discuss with the residents.
• A point of attention is made that the discussions with the insurance have never been noted down.
• As a result from the protest by the residents, one side of the building will get the designed colour scheme; the other side will be painted in a neutral grey.

PROJECT GROUP

• Possible issues with external parties, like municipality, insurance company, etc are addressed.
• Proposition made to incorporate a fine – bonus stipulation in the contracts
• Residents will be able to contact managers directly when confronted with nuisance
• None of the prior minutes have been checked by the project group
• The municipality presses that they will need to see final documents, plans and drawings as soon as possible to give advice timely
• Residents are concerned about the change in appearance of the building. They will be kept informed
• Some design plans need alternation due to objections by the owner
• Work during exploitation. Keep builders and students separated at all times
• The colours of the window stills have been verbally approved by the municipality.
• There is still no permit for the pile foundation, yet the work will start next Monday
• Fire department is not sure if the materials used in the glass houses are fire proof.

DESIGN TEAM

• Surrounding area is being designed, without allocated budget.
• Coloured window stills are not approved by municipality. Design will be slightly altered to obtain approval.
• The steering committee is concerned that the costs for the surrounding area will exceed the budget. Creativeness with resources is needed. Street furniture needs to be mobile, so it can be deducted from the insurance money.
CONSTRUCTION TEAM

- Safety inspection took place. No satisfaction. Main problem is too much debris lying around.
- Many builders refuse to wear the regulated clothing and risk the consequence of being sent off the building site.
- Instalments are late. Chairman will see to it that the process will be as fast as possible.
- Demolition work is falling behind on schedule and conflicting with other disciplines. Demolition will be done at night.
- Contractors are responsible for own equipment/materials. It becomes university property the moment it is part of the building.
- Damages to radiators everywhere are reported. Also more and more damages to other people’s property. It is a result of the crowdedness.
- A wall is created with foil, but builders keep barging through it. A fixed wall is no option because the fire department demands that it can be used as an escape exit.
- All lifts need to move out of the building. They are no longer necessary and one of them has caused an accident by hitting the scaffolding.
- Many of the air vents have been damaged. The contractor will draft another bid, to restore and repair said vents.

MEMOIRS

- Multiple contact people from the municipality and the project organization lead to miscommunication.
- The architects are too scattered to be efficient. Since it is impossible to have all architects in the same physical location, it would be wise to file all drawings, minutes and other relevant information at one central point (on the internet).
- The architects are not allowed to own their designs. All designs will be signed by “BK City” to prevent complex lawsuits at a later stage.
- The decision is made to have 1 standard hourly rate for anyone from the architecture firms. This includes the head architect as well as an intern. The risks are quite high and it will be hard to estimate the total costs of design work.
- The design team is behind schedule in regard to the construction team. Some decisions are made without discussion or drawings. There is no way to trace back the origin of the design.
- Two risks are jeopardizing the costs of the project. The costs for electrical engineering have been estimated very roughly, giving way to a lot of uncertainties. At the same time, the aspect ‘unforeseen’ in the budget has been reduced, to make the budget look better.
- Neither municipality nor fire department allow minutes to be kept during the meetings.
- The threat to use other contractors for phase 2 if works are not finished in time is void. Materials are already ordered. Yet this hollow threat is the only leverage they have.
- No one seems to know how the process of payment works; only that it is always late. Contractors threaten to stop work, if not reimbursed.
- Contractors object to new schedule as their proposals for schedule have been shortened in order to maintain the ultimatum. Project leaders refer to the option of working 24/7. Contractors refuse, as they do not have the manpower to work 24/7. Management suggests hiring more people, but this does not always improve the work rate. People start to hinder each other, and the floors cannot take the weight of many lifts and work force.
- Contact with municipality is hard. They do not allow minutes to be kept, making it impossible to be certain to cover all angles.
- Someone needs to make arrangements with the owner, Fortis bank, to put down in writing that they will cover certain expenses.
- Should this project be monitored?
- Something went wrong in the communication regarding the trees. Cutting down trees that are not supposed to be cut down is very bad.
- There is quite some agitation amongst the contractors/builders about getting exposed to asbestos. Liability issues are raised and a general lack of trust is going around.
- Fire safety keeps popping up as a problem.
- Damages are not always reported, so they are not always fixed either.
- The design for the surroundings needs to be adjusted to products that can be shipped to a new location, since there is nothing left in the ‘temporary’ budget.
- Even though additional work is included in the uniform price, contractors still try to submit additional work.
• Contractors are damaging each other’s work. They should arrange amongst themselves how to work out the repairs.

INTERVIEWS & QUOTES

• Design and construction were running simultaneously. The unavoidable result was that asbestos sanitation needed to be done during demolition and construction work. This resulted in additional risks regarding sanitation. The contractors were not properly informed on the activity surrounding the asbestos sanitation.
• Since it was not evident from the start which parts of the building would be demolished, it was not clear where the asbestos was located. The pace at which demolition took place was very high, so at times there were parts demolished before inspection had taken place.
• (Chief university facilities) “We have invested time in communication with parties like the residents of the area and the municipality. That was a very wise decision. Obtaining permits from the municipality went smoothly and the residents were very sympathetic.”

8.10 PROJECT PROCUREMENT MANAGEMENT

STEERING COMMITTEE

• Skip European Procurement by using “exceptional urgency”
• In order to settle the matter of reimbursement as swiftly as execution of works is being demanded, an urgency procedure is being formulated
• Independent engineering company thinks the bid for the glass houses is too high. Cost calculation will be reviewed and both companies will clarify their opinion
• The contractor for the glass houses gave a bid that was too high; another contractor offered a much lower price, so they will finish the work.
• Faculty bar design is presented. The costs will be 150,000 E, including the 35,000 contribution by the university. The remainder will be provided by sponsored work and sponsored finances. Demands and conditions for usage of the bar will be drafted as soon as possible

PROJECT GROUP

• Discussing ways of procurement, tender process, contractor selection
• Proposition made to incorporate a fine – bonus stipulation in the contracts
• The orders for contractors contain: delivery date for the works is fixed
• Questions are raised regarding the ‘special’ European procurement procedure. Will the glass houses also be part of this accelerated process? How long can this continue?
• Checking the financial consequences of working in double shifts to make the deadline
• Discussion brought up regarding additional work. It is stated that the risks of changes due to the speed and the pressure on the project was incorporated in the price, so additional work should be regarded as none existing.
• Some of the contractors want to dispute the additional work arrangement. Others have dropped the claim for additional work
• After the 1st of June the expedited situation is ended. Works after that period will need to be entered in a European Procurement procedure. This means all orders need to be given before May.

DESIGN TEAM

• Need to find someone to calculate acoustics to see if it poses a threat
• Concerns about ventilation and overheating regarding the mechanical engineering. A consultant is hired
• Architects need to hand in the hours they have worked on a weekly base, to insure the costs do not get out of control.
CONSTRUCTION TEAM

- No orders without bids
- Invoices are not processed fast enough
- Phase 2 even busier. Extra shifts needed
- Opportunity to work nights/weekends is not used by contractors, so if deadline is failed it will have consequences for tender in 2nd phase.
- Instalments are late. Chairman will see to it that the process will be as fast as possible.
- All bids for the First Phase are in, but not all have been accepted or paid out
- When rounds are made, with contractors, and work is behind on schedule, steps will be taken to catch up: schedule adjustments, adding personnel, extra shifts, etc
- There are still some bids for the basement lacking. These should be handed in immediately.
- It is still taking too long for bids to be awarded and invoices to be paid
- The decision is made to have 1 standard hourly rate for anyone from the architecture firms. This includes the head architect as well as an intern. The risks are quite high and it will be hard to estimate the total costs of design work.

MEMOIRS

- Only some parts of the project are open for tendering and checked. In many cases the cost-expert will see the bid when the work has already started. This complicates controlling the costs.
- At his time everyone is assuming that European Procurement can only be avoided till the 1st of September.
- The threat to use other contractors for phase 2 if works are not finished in time is void. Materials are already ordered. Yet this hollow threat is the only leverage they have
- Contractors object to new schedule as their proposals for schedule have been shortened in order to maintain the ultimatum. Project leaders refer to the option of working 24/7. Contractors refuse, as they do not have the manpower to work 24/7. Management suggests hiring more people, but this does not always improve the work rate. People start to hinder each other, and the floors cannot take the weight of many lifts and work force
- The asbestos sanitation team has lost its credibility. Therefore, another company has been selected to do the sanitation.
- It is quite odd that agreements are made that if a contractor falls behind on schedule, he will catch up during nights and weekends. Yet most of the contractors do not report when they fall behind, nor do they work the nights or weekends.
- Contractors are damaging each other’s work. They should arrange amongst themselves how to work out the repairs.
- The carpet contractor has ‘lost’ rolls of linoleum. He will need to order again and wants to claim the costs. Why?

INTERVIEWS & QUOTES

- The loss of revenue and all extra costs were covered by the insurance. This meant that the insurance companies had a lot of influence in the decision making. Every expense for demolition work of the ruins or relocation of the faculty needed to be approved by an expert appointed by the insurance companies in order to be included in the insurance payout.
- The Delft University of Technology is restricted to European legislation with regards to procurement. A traditional procurement procedure requires a lot of preparation and has, depending on the situation, a turnaround of at least four to five months. In some cases there is an exception to the rule: compelling urgency
9 CONCLUSIONS

9.1 INTRODUCTION

In this chapter, the findings from the research come together. Each paragraph represents one of the knowledge areas and reflects on the findings in the literature about project management and fast tracking. This is mentioned in the sub paragraph 'Theory'. The sub paragraph 'Case study' summarizes the actions taken in the case study regarding the subject of the paragraph. A paragraph is finalized with an overview of the events, regarding the subject of the paragraph, which either positively or negatively influenced the process. This judgment is based on the knowledge gained from project management and fast tracking in reflection to what happened in the case study. This chapter ends with an answer to the research question mentioned at the beginning of this report.

9.2 PROJECT INTEGRATION MANAGEMENT

9.2.1 THEORY

Project integration management is described as the sum of all processes needed to ensure that all aspects of the project are coordinated. Some of the processes are the development of a preliminary scope statement, executing a project management plan and controlling all change requests.

Fast tracking elaborates on splitting up the project in work packages. Having more work packages creates more interfaces to coordinate, thus integration management in fast tracking projects is more complicated compared to traditional projects. Management of these interfaces is one of the characteristics of fast tracking. Literature suggests appointing a managing contractor at an early stage that is in charge of integrating the design and construction elements and provides project information for all parties.

9.2.2 CASE STUDY

The data collection reveals some interesting points on the matter of integration management during the realization of BK City:

The steering committee is not really involved in the integration of the different aspects of the project. It discusses the main phasing of the project, and the integration of the systems used to track the expenditures, but not so much in regard to the aspects of fast tracking.

The project group is primarily focussed on the integration of the whole project. This is exactly why all areas of the project come together in this team. Brief, design, construction, facilities, implementation, communication, all these aspects are represented by their chair. Most of the decision making takes place in the project group meetings. The details are worked out in the represented teams. Having a part of the building operational while construction work is going on in another part of the building requires the attention from the project group as this is an example of an interface between the construction team and the facilities/operations team. Some integration management aspects from specific teams might be discussed as well, if it requires special attention. The site organization regarding all contractors during the second phase, which contained even more workers than the first phase, is a typical integration aspect from the construction team, important enough to be discussed at these meetings. Integrating the whole project with outside parties, like the residents or municipality, is another task carried by the project team. For instance, obtaining building permits is specifically discussed in the project team meetings.

The design phase of the project has specific elements of the project that need proper integration. Having five prominent architecture bureaus working on one project, and in one team, requires much more integration management compared to a traditional project, which usually has only one architect. Most of the information needed by the project team for building permits (drawings, specs, etc) come from the design team, who needs
to ‘translate’ the scope of the project in a design plan, divide it amongst the architects and then combine it again to complete the building permit documents. This separation and merging of plans usually is not required in traditional project management. Another aspect, typical with fast tracking projects, is the overlap situation with construction work. Summarized, there are three levels of integration management in the design team: firstly within the team itself, dividing the plan amongst each other and collaborating, secondly between the design team and the other teams, coordinating the concurrent work with the construction team, and thirdly with external parties, like obtaining permits from the municipality.

The construction team has by far the most elements to integrate. The number of disciplines and companies working on the construction site each day is shocking. Not only do the work packages need to be integrated, as is fully explained in the fast tracking theoretical chapter, also practical solutions are necessary to make things work. For example, mobile lifts will be needed by most contractors. Yet, if everyone would bring their own lifts in, it would be complete chaos, and half the time these lifts would not be used. The same goes for the scaffolding; there is no point in tearing the scaffolding down if another contractor will need set it up the next day/week. The integration of the work packages can be planned as satisfactorily as possible; changes are still likely to occur. These changes cannot influence the pace of the work. So if delivered work is not in order, or a discipline (demolition or asbestos sanitation for instance) is falling behind and slowing everyone down, this will need to be settled in weekends and nights. At some point the work packages are not fully integrated. When this happens some contractors will have to wait. That is a loss of efficiency and will result in additional costs. Then there is the integration with other teams, primarily the design team. Literature has shown how design and construction are integrated in fast tracking (Figure 12), and this project is exactly like that. This means short communication lines and respect for each other is necessary to make it work. Another form of integration is connecting all the phases. By dividing the whole project in sections it is important to realize that all sections need to be connected in the end. This is primarily the electrical and mechanical contractors’ issue.

### Positive influences on the process

- Quick definition of scope and dividing the project in phases.
- Direct line between architects and demolition crew.
- Additional meeting for project leaders to strengthen cohesion and provide clarity to contractors.
- Temporarily adding municipality to the project group to expedite the process.
- Temporarily adding the glass house designer to the project group to expedite the process.
- Adjusting use of the building to the noise disturbance from pile driving.
- Starting on construction of the second floor, before the first is finished (mini-fast-track).
- Contractors sharing their equipment.
- Working weekends and nights to make up for losses.
- Integrated cleaning crew, set up by the contractors, to clear the debris.
- Transferring operational knowledge from contractor to facility manager.
- The slack from small contractors is picked up by the bigger contractors (good for project, not team spirit).
- Fire safety crew keeping up with the pace of design and construction work.
- Integration of the different parts of the building.

### Negative influences on the process

- Too many different finance systems that are not compatible.
- Architects function not clearly defined.
- Combination of an operational part of the building and another under construction. No clear separation.
- Bad integration management of acoustic material into the roofing of the glass houses.
- Design and construction on the surrounding area not properly integrated; over budget, too late.
- Too many people checking bids before they get sanctioned.
- Architects running behind with regards to the construction work.
- The controlling umbrella function of a general manager is missed (damages, theft, etc).
- Air vents and lighting are not integrated in one drawing, therefore interfering each other.
- Asbestos sanitation and demolition not properly integrated. Unsafe situation.
- Air vents and lighting are not integrated in one drawing, therefore interfering each other.
- Asbestos sanitation and demolition not properly integrated. Unsafe situation.

### Table 9 Integration Management summary of conclusions
9.3 PROJECT SCOPE MANAGEMENT

9.3.1 THEORY

Project scope management is needed to ensure that all work required to complete the project successfully is included. Nothing more, nothing less. It is therefore necessary to translate the clients’ demands into project deliverables. Reacting to changes in the scope of the project is also part of scope management.

Defining the scope at an early stage is very important in fast tracking. The work packages that need to be carried out simultaneously can only be defined properly once it is clear what the project deliverables are. An incomplete scope can result in constant design changes. Changes in scope have a greater impact on the process compared to traditional projects since all work packages are closely linked to one and other. Scope definition is part of the preparations at the start of the project. A fast track project is usually quite rushed, but these preparations can save a lot of time and money during the course of the project. By simplifying the scope, a lot of problems can be avoided. Designing for buildability and speed is suggested in literature.\(^\text{71}\)

9.3.2 CASE STUDY

The data collection reveals some interesting points on the matter of scope management during the realization of BK City:

Scope has played a major part in the development of BK City. Although the rough plans and general ideas were broadly studied and documented in research undertaken prior to the fire, many changes in the execution of these ideas occurred.

The steering committee needed to approve changes to the scope, since these usually implicated a rise of costs. The architects were basically shooting for the stars after which cut backs brought the design to an acceptable cost. Getting the required space was one of these situations. The architects came up with a bold design, attaching 6 glass houses to the facade and even the roof of the building. The costs were not accepted by the steering committee and more options were required. The cheapest solution would have been to use available space in other university buildings to supplement the required floor space. Since having all students and teachers under one roof was one of the primary points of the initial brief and scope, an option of two large glass houses was chosen as a compromise. Another clever act of scope management was the splitting of the scope (and budget) into a renovation part for the changes made to the building, and inventory part, which would be a long term investment. The steering committee is also pressed with making decisions regarding the change of scope due to unforeseen circumstances, like delays or budget over-runs. Delays may cause changes in the plans of housing different departments or students. Budget over-runs may cause certain sub projects to be eliminated from the scope, like the faculty pub. Sometimes an acknowledged task is knowingly left out of the scope, like the acoustics. The surrounding area is a part of the project that was not properly picked up in the scope. It was not an important part of the project, so there was hardly any budget allocated to this work. However, even using the cheapest solutions possible, the space of the surrounding area is so immense that the costs are quite high. Because it was never picked up in the scope, the development of the surrounding area led to a large budget over-run. A point of controversy regarding scope management by the steering committee is the celebration of the Dies in the south glass house. This celebration, an annual university event, was never initially planned in the glass house. The steering committee thought it would be a good idea to hold the event in the glass house. The consequences for the project scope were fierce. The structure of the glass house needed to be simplified and the acoustic measures suggested after thorough research were rejected in order to finish the glass house in time for this event. Scope and budget were determined for the east glass house interior but the architect suggested a design which was above budget. The alternatives under budget were of inferior quality, according to the steering committee. The budget over-run was approved based on the decision that it had the best cost-quality ratio.

The project group is concerned with the overall scope of the project as it is the team where all aspects of the project are represented in. A conflict occurred when the glass houses were proposed. An agreement was made

with the insurance experts that all works would be sober and efficient due to the temporary nature of the relocation. The costs for the proposed glass houses were a lot higher than a standardized glass house system. Eventually a full cost estimate was made closing the gap between the glass house proposed by the project group and the one proposed by the insurance experts. Based on best cost-quality ratio, the insurance experts accepted the proposal. A difficult scope management task was to keep the design team in the scope of the project. The closing of each package was not always enforced properly, which resulted in the design team making changes in plans that were already executed. This was frustrating for many project leaders and contractors. The leeway given to the architects was a combination of persistence by the architects and the point of view of their chairman, the dean, who is an architect himself, and resided in almost every team. Design changes (and therefore scope changes) were usually to benefit the quality of the project, but often came at a price (affecting both budget changes and schedule). It has to be said that the first rough cost estimate was based on nothing and almost got tripled in the end. When a budget is not clearly defined, it makes it even harder to maintain scope.

(Dean) “This might be a temporary solution, but we should realize that a whole generation of architects will be educated here. So keep in mind: I want ambition!”

One of the major decisions the design team had to make was pressing on the construction of the second glass house during the project, and not at a later point, as was suggested. The implications for the operations of the faculty would have been intense. Another particular aspect of the project was the colours of the window stills. There was quite some controversy regarding these colours. The design team eventually pressed on and executed the design, disregarding the opinions of many students and employees. However, when the residents started complaining, the design team decided not to colour that side of the building. The situation is disputable since taking the opinions of residents into account eliminates threats of them turning to the municipality and interfering with the pace of the project. Disregarding the opinions of some of the students and employees is understandable as well, since it is impossible to satisfy everyone’s opinion and takes too much time. Just in this particular situation it sends out mixed signals. The fact that the costs for the paint work would over-run the budget was neglected as well. Because the hallways are quite wide, the design team decided to place furniture in the hallways to use it as informal meeting area. The fire department did not approve this because it would hinder the evacuation route. The furniture was bolted down to meet the fire regulations. If the furniture in the hallways was part of the scope, this would have been discussed with the fire department in advance. The design was unstoppable in their work, which in many ways is very admirable. Yet the whole idea of defining scope is to prevent additional work, not contributing to the initial objectives. In some cases the design changes only led to re-work on the site, but in other cases it influenced the whole project through new permits and other changes through dependency of work packages.

Scope management is not a primary task of the construction team. Although all scope changes affect their work, they have hardly any say in the scope. It is the task of the construction team to solve problems that occur due to scope and scope changes. A practical example is a paint contractor who suggested to clean walls that were taken out of the paint work due to budget cuts. A good rinse can make a wall look almost as good as new. A good rinse can make a wall look almost as good as new. Maintaining the plan to have the glass houses was clearly based on problems during use. Eliminating the crow’s nest from the scope to save costs. It is not essential to acquire the objective. Leaking cells can make a wall look almost as good as new.

<table>
<thead>
<tr>
<th>Positive influences on the process</th>
<th>Negative influences on the process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Validating scope changes. Choice for two glass houses is well discussed and argued.</td>
<td>Forgetting to assimilate the surrounding area in the scope</td>
</tr>
<tr>
<td>Splitting budget and scope for renovation and inventory</td>
<td>Changes in scope regarding the window stills. Eventually user has no influence, residents do</td>
</tr>
<tr>
<td>Maintain scope (2 glass houses) when budget over-runs bring up ideas of postponement of 1.</td>
<td>Skipping acoustic measures in the glass houses in order to finish construction before the Dies</td>
</tr>
<tr>
<td>Removing faculty pub from scope to compensate for budget over-runs on necessary work</td>
<td>Not checking if furniture is allowed in hallways</td>
</tr>
<tr>
<td>Leaving acoustics out of the scope until measures were clearly based on problems during use</td>
<td>Letting the design team push forward in designing outside the scope of the project</td>
</tr>
<tr>
<td>Making contact with teachers more accessible by placing temporary phone booths for internal calls</td>
<td>Changing the material for the structure of the glass houses to finish construction before the Dies</td>
</tr>
<tr>
<td>Maintaining the plan to have the glass houses contrast the building. No coloured window stills.</td>
<td>Scope changes in the floor of the glass house resulting in additional costs</td>
</tr>
<tr>
<td>Eliminating the crow’s nest from the scope to save costs. It is not essential to acquire the objective</td>
<td>Scope had basic lighting in the glass house. Changing to special light design was not included in</td>
</tr>
</tbody>
</table>
Chapter: Conclusions

Cleaning instead of painting walls to save money | Paint work is far above budget and the colours of the window stills are met with hostility. No scope change?
---|---
Adjusting scope (completing half the building before September to 2nd floor) instead of claiming failure | Design changes in library and congress hall, resulting in additional costs
Using mobile whiteboards instead of fixed blackboards | Allowing constant design changes in the east glass house interior
Reducing costs of development of surroundings by eliminating all unnecessary items | Cost estimates are based on a lower quality level than the level used by the architects.
The ideas for the building (scope) were already worked out by the same people before the fire | Storage room was not properly incorporated in the scope. Development of the basement is unforeseen

Table 10 Scope Management summary of conclusions

9.4 PROJECT TIME MANAGEMENT

9.4.1 THEORY

Project time management is considered making sure the project is delivered on time. This is done by defining what needs to be done, determining the sequence in which it is done and how long it will take. This is all combined in a schedule. This, more or less, sums up the theory provided by the Project Management Body of Knowledge.

Fast tracking is the art of trying to reduce the schedule to its ultimate minimum. Although activities will be minimized to only the necessities and the pace in which it is done maximized, it is essentially the sequencing in which the most time is saved. Some of the ways to ensure fast project delivery are penalties and/or incentives for both contractors and designers, implementing advanced information and communication technology and as, a last resort, adding workforce and longer working days.

9.4.2 CASE STUDY

The data collection reveals some interesting points on the matter of time management during the realization of BK City:

The limited amount of time has been the number one reason to implement fast tracking on the project BK City. Nothing was more important than being able to provide the new students a faculty building at the start of the academic year, 1st of September.

The steering committee was involved in time management from an observing point of view and mainly on the global planning. Schedules were monitored weekly, and every now and then concerns were expressed. It did not take too long before everyone realized that the initial objective to have the east wing ready by September first was impossible, so focus was pointed towards getting the third floor ready for the first-year students. The others would be placed a little later during the year. Time management became a more pressing issue for the steering committee after they decided to celebrate the Dies there. A big time saver was the request for ‘compelling urgency’ which allowed the project to negate European Procurement Legislation. A traditional procurement procedure requires a lot of preparation and has, depending on the situation, a turnaround of at least four to five months. Through compelling urgency, this was no longer necessary.

The project group needed to find practical solutions in the interfaces between the different phases and disciplines at work. In many cases this meant shortening the communication lines between different disciplines. An example is the survey the demolition crew had with the architects. Just by spray painting walls, a quick start was made for the demolition crew. Normally this would take some time, needed to be approved, documented in drawings and writing, planned and eventually executed. Another example is the relationship with the fire department. Normally these connections take long because they go through the municipality, but in this case
the project team had direct contact with the fire department, saving a lot of time. The chairmen of the brief team, design team and facilities team had already worked closely together on a number of projects in the former building. Some of the concepts could immediately be transferred to the new building. Most of the architects had also worked with each other or the chairmen. Some control on the time management was done through implementation of incentives and fines regarding the delivery date of projects. Municipal agencies can become a retardant in building processes. In order to prevent that from happening, a good relation with the municipality was essential. The speed of the design process was another concern of the project group. It suggested on multiple occasions to keep the contact between the architects close and constant at all times. Setting up the chief schedule is one of the main tasks of the project group. This was done by requesting the schedules from all contractors involved and fitting them into one schedule. Oddly enough, this meant that the contractors decided the pace of the project. As soon as the project group reduced schedules from contractors, they would object immediately. One can only assume that a contractor was not willing to accept the risk of getting a fine for being late. A good call was to make an assessment of the additional costs of making up for lost time by working double shifts. Adjusting the schedule was a daily routine. Any time gained in one project was almost immediately lost in another project that was running late. When delays would reach unacceptable sizes, weekends and nights were used to catch up. Even Christmas time was used to catch up the lost time. Only few sub projects that were not essential and would result in budget over-runs anyway were excluded at some point. The use of cardboard as material for the glass houses was more important to the project group than the Dies, but the steering committee overruled them in this. Another time consuming aspect was the cost control, which was done through three different systems that were non-compatible. Also, the bids coming in were checked by a lot of people which resulted in delays as well. The dean, the cost expert, the insurance expert and the procurement department were involved in this process. As a semi-governmental institute there is not much you can do to prevent this type of paper trail, but since everyone else is going beyond the call of duty it is a pity that often procurement was falling behind. Time was saved by placing the project team on the construction site, in the adjacent building. Even the insurance experts had a temporary office in one of the faculty buildings.

(Insurance expert) "Due to the complex and vast administration and the imminent speed of requesting, judging and approving of tenders, we were offered office space at the faculty of civil engineering at the finance and control department. We were able to meet employees of the university on a daily base. The proximity has strongly contributed to quick decision making and the creation of trust."

(Chairman brief team) "I have amazing memories from the time that the project organization was located in the adjacent ‘temple’ building. Being located together contributed greatly to the excellent communication and results of which we are so proud. Physical contact still preserves above telephone and email contact."

The design team is mainly concerned with the level of quality the project will have. They do realize that time is essential, but they prioritize quality over time. Obtaining permits was part of the design teams’ tasks. This was not an easy task since the building is a protected monument. Filing for building permits is also quite hard when the design is not finished yet. This is why permits were obtained in packages as much as possible. This saved some time. It is incredible that even though the whole project was under an enormous amount of time pressure, still design choices were made that would not be very time efficient, like custom made carbon fibre furniture. A substantial amount of time was lost by the designers in unnecessary designs. Long after the decision was made to have two glass houses, there were still designs produced with additional glass houses on the roof and such.

The construction team, being at the bottom of the organizational structure, was burdened with the responsibility of getting the job done in record breaking time. Collaboration between the contractors was generally very good. Many of them borrowed each other’s equipment and items like lifts, and scaffolding was used by everyone.

(Installations contractor) "No one objected to lending their tools to another company. Normally you would have to call the office and have them sent over the tools."

Meeting deadlines was a struggle at all times. Especially the asbestos sanitation threw the schedule completely off course. The combination of the risk of contamination and slowing down the entire process led to the sanitation crew to be scheduled-in during the nights and weekends, which worked brilliantly. The demolition crew did the same thing. Still, other contractors hardly ever used the possibility provided by the organization to
work during nights and weekends. Contractors would wait until they would be reprimanded by project leaders for falling behind, and only when forced would they work additional shifts or extra hours. This was eventually taken up by the management team. Contractors that would fall behind would have to make up for the time lost during the nights or weekends to prevent other contractors having to wait for them. Engineering of installations, both electrical and mechanical, was highly underestimated both in time and money. Many contractors were unaware or refused to see the interdependencies between each others’ work. General project deadlines were discussed, when actually some contractors would have to finish their work long before that deadline, in order to allow other contractors to do the finishing. A problematic situation occurred when the schedules of many contractors were shortened to maintain the general schedule. When the management team suggested to work during nights and weekends the contractors claimed to be at maximum capacity. Adding new personnel was not preferred because the construction site was getting overcrowded and it would therefore lead to unsafe and unproductive situations. They say the last bits are always the hardest and this was surely the case in this project. Although deadlines were generally realized, the small corrections would still take weeks or even months to get finished. Daily meetings with contractors ensured that the project leaders were always up to speed on the situation.

(Chief project leader) “During the contractors meeting we would discuss with all relevant contractors what was planned for the next 2 days and who needed to be aware of who’s presence during the execution of the works”

<table>
<thead>
<tr>
<th>Positive influences on the process</th>
<th>Negative influences on the process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct decision making between architects and demolition crew on site</td>
<td>Pressing time even further by celebrating Dies in the glass house</td>
</tr>
<tr>
<td>Having incentives incorporated in the contracts, as well as fines</td>
<td>Giving the contractors control over the schedule</td>
</tr>
<tr>
<td>Keeping good relations with the municipality agencies</td>
<td>Adopting time consuming designs, like carbon fibre furniture</td>
</tr>
<tr>
<td>Monitoring the schedule on a daily basis, and reacting to changes that occur</td>
<td>Continuing designing on items that have been decided upon, like additional glass houses</td>
</tr>
<tr>
<td>Collective use of lifts and scaffolding and lending each other equipment when needed</td>
<td>Contractors not using the possibility to work during the nights and weekends</td>
</tr>
<tr>
<td>Asbestos sanitation is slowing everyone down so it is scheduled during the nights.</td>
<td>Allowing design changes in library, east glass house and congress hall that would cost extra time</td>
</tr>
<tr>
<td>Project leaders forcing contractors to catch up lost time during nights and weekends</td>
<td>Having three different cost control systems that are non-compatible</td>
</tr>
<tr>
<td>Quick connections between fire department and project team</td>
<td>Having bids checked by a too many people; dean, cost-expert, insurance, procurement department</td>
</tr>
<tr>
<td>Having the insurance experts situated on campus for quick contact</td>
<td>Underestimating the time needed to engineer and install mechanical and electrical services</td>
</tr>
<tr>
<td>Many of the designers and contractors had often worked together with the faculty before</td>
<td>Contractors only account for their own schedule without regard for dependence of other contractors</td>
</tr>
<tr>
<td>Contractors do not have the capacity to work extra shifts.</td>
<td>Contractors not mentioning their delays or not coming with suggestions to catch up</td>
</tr>
</tbody>
</table>

Table 11 Time Management summary of conclusions

9.5 PROJECT COST MANAGEMENT

9.5.1 THEORY

Project cost management is all about making sure that the project costs do not exceed the appointed budget. In order to control the costs, all work packages need to be estimated as thoroughly as possible. The budget needs to be monitored constantly during the project in order to take in any changes that occur to the budget and react on those changes promptly.

In fast tracking it is generally accepted that costs will be initially higher than compared to a traditional project. The main reason is the loss of efficiency and productivity due to the extreme pace of the process. However, the rapid delivery time should provide substantial benefits that should cover the additional costs. This cost and
savings system should be taken into account when making the budget. Literature shows that costs can be saved by bringing in the contractor at an early stage to help making the design as efficient as possible. The structure of fast tracking is quite different which usually results in a different division of risks. Extra attention should be paid to the allocation of risk because contractors will charge extra for carrying risk.

9.5.2 CASE STUDY

The data collection reveals some interesting points on the matter of cost management during the realization of BK City:

(Dean) “..Some decisions were made so promptly that cost calculation could only be done after the work was done”

Costs were always broadly discussed by the steering committee. A dozen estimates passed during the project. A summation of these estimates and the changes of the budget give a crooked view of the situation. It is in the nature of fast tracking to not know exactly what the project will entail. As long as the scope and the quality level are not fixed it is impossible to calculate a correct estimate. Although the steering committee sometimes threatened to not accept any more budget over-runs, there was hardly anything they could do. Eventually all excess sub projects that did not affect the primary objectives were taken out of the project. The crow’s nest and the faculty pub are an example. A great call was to split all costs in temporary expenditures for the renovation of the building and investments into new inventory for long term use. This provided some breathing room to work with. The proposal from the insurance experts for a cheaper glass house pushed the whole organization to re-evaluate the choices they were making. Although the design was still used, at least they now had formulated proper reasoning to choose this design. There were a few sub projects that affected the budget negatively in a serious way. Mainly asbestos sanitation, the surrounding area, the mechanical and electrical engineering where either underestimated or not included in the budget altogether. At some point the budgets were so far depleted that proper approval by the steering committee was necessary before awarding a contract. Although the final design for the interior of the east glass house was well above budget, it was still chosen. It is difficult to decide when to allow budget over-runs because of the increase in quality and when to eliminate choices to reduce the budget over-runs. In some cases it was the cost-quality ratio that made it decisive, not just simply accepting the cheapest option.

Early in the project there were doubts in the project group whether the budget reserved for the installation would be sufficient. A budget system was implemented later in the project. This system was implemented late and moreover, there were three different systems at one point with three different outcomes. Money was saved every now and then by obtaining a second opinion on a tender. The glass houses are an example of that. In traditional projects you would have a competitive tender on all aspects of the project, but in this case there was not enough time to acquire different bids and compare them. Costs were saved by waiting with acoustic solutions till after completion of the project to see which areas needed what kind of measures. Controlling costs was more difficult with three different cost calculating systems that were incompatible. By bringing in an engineering company to design a concept for the air conditioning, a large amount of money was saved. Unfortunately these second opinions were scarce. In most cases work was executed without any formal contract whatsoever.

The design team had no budget left to develop the surrounding area. The budget for the temporary building was depleted. Yet the budget for inventory was not depleted. By designing mobile street furniture, the development of the surroundings could partly be allocated to the inventory budget. Additional costs were incurred by appointing a lighting designer to redo the design for the east glass house. Basic lighting was initially agreed upon. Another disputable cost item were the window stills. Although the costs for the different colours exceeded the budget and the design was met with dissatisfaction by many student and employees, still the design was executed. Whether or not you like the design, this sub project could have been eliminated from the project and save more money. Design changes in the library and congress hall resulted in additional costs.

Contractors had lost faith in the asbestos sanitation company which meant they had to be replaced. The replacement of such a contractor during the project created additional costs. It came as a surprise that some of the contractors filed for additional work. It was agreed upon on beforehand that due to the uncertainty of the project scope, no additional work would be filed. This would be incorporated in the hourly rate. Most contractors
dropped the additional work after this reminder, but some still pursued additional reimbursement. A nice gesture by the contractors was the sponsoring of the faculty bar. Although the additional offered work was little in comparison to the work they were offered through the project, it was still a thoughtful gift and showed how much everyone was committed to the project. Costs were saved by having the paint contractor only clean walls instead of re-painting them.

<table>
<thead>
<tr>
<th>Positive influences on the process</th>
<th>Negative influences on the process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remove all non-affecting sub projects to reduce budget over-runs</td>
<td>Making costs a dependant of scope and quality</td>
</tr>
<tr>
<td>Dividing costs in temporary relocation and inventory investment</td>
<td>Bringing in a new asbestos sanitation company created additional costs, but was necessary</td>
</tr>
<tr>
<td>No competitive tendering but still a traditional ‘over-the-wall’ approach</td>
<td>Faculty bar is developed through sponsoring from participating companies from the project</td>
</tr>
<tr>
<td>Waiting for acoustic interventions until the building was used and problems were evident</td>
<td>Ambiguity in budget due to different systems that are not compatible</td>
</tr>
<tr>
<td>Designing mobile street furniture to tap out of the inventory budget</td>
<td>Accepting additional costs for the light design in the east glass house, which exceeds the scope</td>
</tr>
<tr>
<td>Making choices based on cost quality ration and not just the cheapest option</td>
<td>Executing work without checking the tender and awarding the contract</td>
</tr>
<tr>
<td>Using information provided by contractors or engineers to determine the budget.</td>
<td>Underestimating the electrical and mechanical engineering</td>
</tr>
<tr>
<td>Using awning for acoustic purposes as well as sun screening</td>
<td>Reducing the post ‘unforeseen’ in order to polish up the budget over-runs</td>
</tr>
<tr>
<td>Saving costs by using (unattractive, but practical) scaffolding instead of expensive lifts</td>
<td></td>
</tr>
<tr>
<td>Renovating and reusing the old central heating system</td>
<td></td>
</tr>
<tr>
<td>Leaving the quality standards from the university for practical sober quality standards</td>
<td></td>
</tr>
</tbody>
</table>

Table 12 Cost Management summary of conclusions

9.6 PROJECT QUALITY MANAGEMENT

9.6.1 THEORY

Project quality management is needed to ensure that the project satisfies the needs of the client. A quality system is built and the performance of the project is measured constantly. This is done through quality planning, quality assurance and quality control.

Loss of quality is very common in badly managed fast track projects. The interfaces between the many work packages and the pace of the project can result in sloppy work. Designers usually have more time to eliminate errors in their drawings and contractors usually have more leeway to correct their work without influencing the pace of the project. Quality can be maintained better by adopting standard and easily available elements, applying a cost-benefit analysis and quality assurance through continuous quality checks.

9.6.2 CASE STUDY

The data collection reveals some interesting points on the matter of quality management during the realization of BK City:

Quality has been a shifting element in this project. Although at first the quality level was set to sober and efficient, eventually a higher standard of quality was demanded, mainly by the dean. The insurance experts did check all procurement and expenditures to make sure that no unnecessary contracts were awarded.

(Dean) "This might be a temporary solution, but we should realize that a whole generation of architects will be educated here. So keep in mind: I want ambition!"
The steering committee is the only project team with representatives from the insurance companies. The
insurance experts can be seen as the counterpart of the design team. As much as the design team wanted to
invest in the highest quality possible, the insurance experts were keen to keep the costs at a minimum. The
project team however was responsible for the objectives of the project which included timely and efficient
delivery of the building, making it a neutral party in this. In many cases design options were discussed with the
insurance experts without any consequences. Only in few cases did they have objections, like the design for the
glass houses. Eventually a survey showed that the differences between alternatives were minimal in costs
compared to the differences in quality. In more situations did the cost-quality ratio preside instead of the
minimal costs. The interior design of the east glass house is another example. Although costs were more
important to the steering committee rather than quality, there is no way of avoiding discussions on quality
when costs exceeded the budget. With regards to the quality of the glass houses it is clear that the steering
committee decided that the timely completion of the glass house, for the celebration of the Dies, was more
important than the visual quality (the cardboard structure) or functional quality (acoustic material in the
ceiling). Another important decision made regarding the quality was to drop the university manual on building
quality and stick to the (lower) quality level of the Building Regulations.

The project team was burdened with the responsibility to balance the demand for quality with the other
objectives like short delivery and minimal costs. They ordered a survey to plot the wishes from the users. The
quality was controlled by the project team by ordering the design team to stop the design process of areas that
had already been decided upon. Quality was expressed in both functional quality, like proper acoustics, and
visual quality, like the interior of the east glass house. Both were subject to ‘give’ and ‘take’ as there is always
a need for balance between the quality level desired and the financial consequences. In functional quality, some
creativity was necessary. Climate installations were needed, but to invest in a high quality air conditioning
system for only the duration of 5 years would be a waste. A mid-way was found by adopting the Building
Regulations instead of the universities’ manual. To make sure the lowered quality level was still acceptable, a
survey was undertaken to judge the climate in the different rooms. Flexibility was another strong point of
functional quality. Decision making with regards to the floor of the glass house was based on having the
flexibility to move the equipment to other areas, meaning that the floor should be able to hold the weight of the
machinery everywhere, not just where the machinery is placed. The liberties offered to the design team were at
times quite generous. Bringing in a lighting designer to redo the light plan for the east glass house can be seen
as unnecessary expenses but was approved anyway. The project team sometimes needed to struggle with
other teams to maintain the right course. The project team did not agree with the steering committee on
having the Dies in the glass house at the cost of quality. Since the project team had neglected the cost
estimate for the surrounding area, the design team worked out a plan for the surroundings without having a
budget.

The design team was focussed on acquiring the highest level of quality possible. Hard work, many meetings and
discussions and pushing the time limits for design resulted in the quality level the building has today. A
controversial discussion regarding quality was the colouring of the window stills. Although there were many who
were opposed to the gaudy colourfulness of the window stills, the design team still proceeded with the design.
It did however get altered by changing the clashing colours to bright colours and only applying the design to
one side of the building due to objections from the residents in the area. Even though the opinion of the users
did not influence the choice for the coloured window stills, the plans for the glass houses was thoroughly
discussed with the model making department in order to fulfil their requirements and wishes. It is quite odd
that the design team started creating a plan for the surrounding area without consulting the project group on
the budget they could use.

The construction team only has concerns with quality management within their own sub projects. Flexibility and
creativity was offered by the contractors in agreements to work weekends if work was not up to the quality
level required or by suggesting cheaper alternatives when sub project risked getting eliminated, like cleaning
the walls instead of painting them. Often flexibility was asked as a result of design changes, like the changing
design for the interior of the east glass house, which did not correspond to the air conditioning system in the
ceiling.

(Works contractor) "Changes were ongoing and so were the meetings. Sometimes an architect was designing
something on the spot, at which time a carpenter would assist him. Everyone had a little bit more
understanding for each other’s discipline compared to traditional situations. This work attitude provided the
client with the best result possible."
Positive influences on the process | Negative influences on the process
---|---
Choices based on cost-quality ratio rather than just minimal costs (glass houses) | Celebration of the Dies takes priority from visual and functional quality
Obeying the objections made by residents in the area, regarding the window stills | Disregarding opinion of user regarding the colours of the window stills
Collect thoughts on the use of the glass house from the future user to determine design | Bringing in a lighting designer for a light plan that was meant to be basic
Flexible floors for the south glass house in order to move the heavy machinery | Designing the surrounding area without an allocated budget
Undertaking a survey to check the quality of the air climate | Flexibility from the contractors to adapt to the design changes made.

Table 13 Quality Management summary of conclusions

9.7 PROJECT HUMAN RESOURCE MANAGEMENT

9.7.1 THEORY

Project human resource management entails effective use of the people involved in the project. Through definition of roles, responsibilities and relations, an organizational planning is made. The right people are then assigned to the according parts of the project. Developing skills to enhance the project performance is part of human resources management as well. The role of client, contractor and architect is clear. The architect performs all managerial functions.

The quality of the team members and their collaboration is a key factor to success in fast tracking. Experience is a major factor in the quality of the team. Experience in prior collaboration with the other team member, as well as experience in fast tracking projects. Flexibility is another important value to be sought in participants in fast tracking. Having a good project management team is so important that it is advisable to select the project manager immediately and let him hand pick the rest of the team. The architects’ role is confined to designing, specification and obtaining consents.

9.7.2 CASE STUDY

The data collection reveals some interesting points on the matter of human resource management during the realization of BK City:

The most remarkable thing about human resource management in the development of BK City is that the university wanted to take the lead in this project. It is obviously quite a unique situation to undertake a project like this for an architecture faculty. All the knowledge to execute a project like that can be found in-house, in theory. The role of the university as client, designer and project manager can be a research on its own, which exceeds the focus of this research.

(Financial project manager) “This was a very particular project of which none of the participants had any prior experience.”

The steering committee is appointed to oversee the project. Its members, explained in the prior chapter, bring central positions from the university together under the supervision by the chairman of the universities’ Executive Board. The chairman from the design team and the project group, both employees of the university as well and members of the architecture faculty, reside in the steering committee. The steering committee acknowledged at some point that alignment with the faculty employees and the students would be essential for the success of the new office concept, flexible-working. This is why a Flex team was appointed. It is important to have support from the right people/teams at the right time. This means that teams that do not longer have a function should be dissolved as soon as possible. Dissolving a team too early could jeopardize the success of a project. Although the steering committee saw it fit to dissolve the project group, they soon realized that
transition takes time. They soon called back the abrogation. Lowering the frequency of the meetings is the first step and transferring the tasks to the permanent organization is the final step.

The project group had similar tasks compared to the steering committee. Once the brief was finished and handed over to the design team, the project group called for an abrogation of the brief team. To put an end to the constant changes in the design the project group suggested to relief the design team from its tasks. This was not an option since at the time many sub projects were still under development. Eventually some of the tasks were transferred to the project group, the ongoing project (like the glass houses) were steered by a ‘new’ design team with only relevant architects involved. An important human resources problem originating in the construction team that made its way up to the project team was the shift in construction workers after the first phase. Since they had worked all the way through the summer holidays, all workers were sent on holiday and would be replaced by new construction workers. This meant that no knowledge gained from the first phase would be used to the advantage in the second phase, unless the foreman would be able to transfer the gained knowledge of his men to the new batch. A flexible aspect of the project group was the adding of people to the meeting whenever it was deemed necessary. Municipality representatives, fire department, engineers, consultants, anyone who could shed some light on a specific problem at hand. Halfway through December, the project group halved the frequency of their meetings. Prior to this everyone was confronted with the tasks still open to make sure that the changes did not influence the work in a negative way.

The design team was a unique collaboration between five prominent architecture bureaus. The leadership was in the hands of the dean who used to be the state architect. Whenever needed, the design team would be complemented by engineers, consultants or other experts. The team worked well together because all participants were well acquainted with one and other. All had successful previous experience with the faculty of architecture.

The construction team was often confronted with human resource management. Essentially, the project organization preferred it if the contractors would be able to work with an even larger capacity. In the beginning of the project, the construction site supervisor was failing his duties and had to be replaced. The project was set up with the university leading the construction work instead of having a general contractor. Having a general contractor or management contractor is a point of attention in fast tracking. He should be an experienced manager of similar projects. Apart from having far more experienced leadership, the managing contractor supervises the works contractors at all times, since he is responsible for them. The incidents that occurred during the development of BK City; equipment stolen, damages to other peoples’ work, construction workers interrupting each other, these situations would be the managing contractors’ risk to bare. The asbestos sanitation company regularly changed contacts which led to communication errors which were a sign to others that the company was not committed to the project. They eventually had to be replaced. Contractors, like the mechanical and electrical contractors, were selected based on reputation even if they do not have the capacity to engage in the project. The result is that the contractors procure sub contractors from abroad. Not to say that foreign construction workers are no good, but apart from having language and cultural barriers you have workers within one company that have no experience working together.

(Chairman construction team) “As soon as we were concentrating on the refurbishment of the old main building at the Julianalaan, the number one priority was to find suitable partners to get the job done. During the procurement procedure we were looking for companies with whom we had a history with or who knew the building. This relieves some of the tension and facilitates communication.” “It is in situations like these that you can see how important it is to have the right people for the job. You need people who think in solutions and are willing to go the distance.”

(Glass contractor) “The thing that stood out for me was the solidarity between the regular contractors of the university.”

<table>
<thead>
<tr>
<th>Positive influences on the process</th>
<th>Negative influences on the process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appointing a team to make the transition to the new building and new office concept</td>
<td>No knowledge transfer from the first phase to the second phase by construction workers</td>
</tr>
<tr>
<td>Dissolving teams that do no longer serve their purpose</td>
<td>The practical, experienced leadership of a construction manager is lacking</td>
</tr>
<tr>
<td>Adding and subtracting experts to the project group for fats decision making</td>
<td>Architects falling behind contractors in process, due to slow communication from their part</td>
</tr>
</tbody>
</table>
Adapt frequency of meetings to amount of work to be done | A contractor who changes contact person constantly causes for agitation
Having teams with participants that have worked together before with each other and the faculty | Using contractors with limited capacity, who have to resort to foreign workers creating language and cultural barriers

Table 14 Human Resource Management summary of conclusions

9.8 PROJECT COMMUNICATION MANAGEMENT

9.8.1 THEORY

Project communication management includes the generation, collection, dissemination, storage and disposition of information regarding the project. In order to successfully execute communication management it is necessary to determine who needs what information at what time and who needs to be in contact with whom. This also includes progress reports and forecasting. Once that is established it is essential to make sure that all information travels as securely and swiftly from one to another.

Fast tracking requires extremely fast decision making. This means that information and communication needs to be as prompt as possible. The usage of advanced information and communication technology can be a huge assistance in swift communication. Literature has shown that having the full team working together in a temporary facility on the building spot can be very helpful as well. A managing contractor should be appointed at an early stage to provide all parties with the necessary information.

9.8.2 CASE STUDY

The data collection reveals some interesting points on the matter of communication management during the realization of BK City:

The quality of communication in a project is always one of the most important aspects. Most errors and problems during a project are the result of communication issues or could have been prevented through better communication. It is important to make a distinction between internal and external communication. Influences from outside the project organization can jeopardize the success of the project. Proper communication with these parties, like municipality, fire department, residents in the area, future users, etc is very important. Internal communication is divided in communication between teams and within the team. The latter is obviously maintained through these meetings. Communication can be a fragile thing. If it deteriorates, the willingness to work together may seize to exist.

The steering committee is quite involved in communication with external parties. Communication with the employees and students of the faculty was maintained by opening a website which showed weekly progress reports and pictures of the ongoing work. A newsletter was sent through email and a monthly journal provided many relevant stories. In addition, the flex team was brought in, to constantly adapt the flow of information to the needs of the users. Residents from the surrounding area protested against the colours of the window stills. Their cooperation was essential to get the work done so swiftly. If residents would have started a procedure against the university for the renovation, the municipality would have to shut the project down. The influence of outsiders is not to be underestimated. Eventually that side of the building was not coloured. The organization was very lucky that they did get into trouble when they found out they were about to cut some trees down.

(Chief university facilities) "We have invested time in communication with parties like the residents of the area and the municipality. That was a very wise decision. Obtaining permits from the municipality went smoothly and the residents were very sympathetic.

The steering committee stayed together, if only on a monthly basis, until the end of the project to keep the communication ongoing. Some of the less fortunate communication aspects were the confusion about costs,
due to three different systems, no one being aware of the conditions regarding European Procurement, and not keeping minutes in the meetings with the insurance experts. Still, the insurance experts were present in the campus every day to keep track of the progress.

(Insurance expert) "Due to the complex and vast administration and the imminent speed of requesting, judging and approving of tenders, we were offered office space at the faculty of civil engineering at the finance and control department. We were able to meet employees of the university on a daily base. The proximity has strongly contributed to quick decision making and the creation of trust."

The project group is a centre of communication strings, the ‘heart’ of the organization. All major arteries run through the project group because all teams report to the project group. In order to have all communication coming in at one point, the project group was temporary located in the ‘temple’ building adjacent to the main building.

(Chairman brief team) "I have amazing memories from the time that the project organization was located in the adjacent ‘temple’ building. Being located together contributed greatly to the excellent communication and results of which we are so proud. Physical contact still preserves above telephone and email contact."

The project group has a direct line with the municipality which is a difficult line of communication to maintain. The pace of the process is very much dependant on the flexibility of the municipality. They need to be constantly informed on the plans with the building because permits are a necessity. This is one of the reasons the municipality brought the project group directly in contact with the fire department. The frequency of meetings is a sensitive subject. Overkill would take up too much time, but lack of meetings can lead to confusion and many problems. Participants are also stimulated to ask for information there where it is, meaning to involve engineers, consultants, and any other temporary expert to get more grip on a subject. Having the first phase operational while the second phase was being constructed was quite a challenge. Only the pile driving for the foundation caused nuisance. The project group, just like the steering committee, stayed on longer than planned to ensure the communication would still flow promptly. A very practical communication solution was the placing of telephone boots throughout the building connected only to the internal network, so students could easily find their teacher in the new building. Having too much communication can hinder as well. At some point there were so many contacts at the municipality that no one knew for sure what was communicated with whom. Another form of communication excess is the checking of tenders by the dean, the cost expert, the insurance expert and procurement department.

The design team did not have an easy task to combine the input of 5 architecture buildings into one design. If it was not for their fantastic relationship with the faculty the communication would not have been so ‘easily’. On the communication between members of the design team is no information available. Many of their meetings were not even documented in minutes. This attitude probably came forth from the ad hoc decision making done on the construction site. Unfortunately this means that many design decisions were never documented.

(Works contractor) "Changes were ongoing and so were the meetings. Sometimes an architect was designing something on the spot, at which time a carpenter would assist him. Everyone had a little bit more understanding for each other’s discipline compared to traditional situations. This work attitude provided the client with the best result possible."

When the design team was done adapting the brief to their ideas, the brief was used as communication tool in meetings with the departments. An often used method of improving communication, by the design team as well as the project group and construction team, was the creation of additional ad hoc meetings. When, for instance, the acoustics start to become a problem of considerable size, it is taken out of the design meeting and an ‘acoustics meeting’ is created in which only the required people will reside, making the meetings more efficient. In contrary to the project group, the design team was not located on the site, making daily communication quite hard. For instance, many project members were not aware what the situation was with the lighting in the glass houses. Communication was more than once the source for misunderstanding the design team.

(Construction manager) "Just because you make a decision does not necessarily mean that you are making a DECISION". (Meaning your decision might be rejected or changed before you know it)
The construction team has its communication line with the design team and the managers, yet they will need to communicate amongst each other really well too in order to organize the crowdedness on the construction site. Communication regarding work scheduling was done through supplying the manager with the contractors’ schedule after which the manager planned all activities into one overall schedule. Communication errors between design and construction led to dilatations in the floor of the glass houses which were not planned there. It is a miracle that the floor heating was not cut. This was not the only time drawings were not corresponding. A web-oriented platform might have helped in always having one central drawing up to date. Although it was agreed upon that design/scope changes would not be charged as additional work, but incorporated in the hourly rate, some contractors claimed additional work anyway. Dangerous situation can occur when communication is poor. During demolition there were some misunderstandings on the contaminated areas. Eventually contamination took place causing quite some panic on the construction site. The misunderstandings were a result of constant changes in contacts at this company. Another problem in communication is the implementation of foreign workers. Having cultural and language barriers only makes communication more difficult.

### Positive influences on the process

- Well maintained communication with students and employees through website, email and journal
- Keeping the residents always up to speed on the progress and plans
- Having half a building as a construction site while having classes in the other half
- Having phone boots to make teachers easily accessible in the new building
- Creating ‘sub’ meetings to keep main meetings efficient

### Negative influences on the process

- The window stills were poorly discussed with the residents leading to the objection
- Multiple cost control systems that are not compatible with each other, causing confusion
- Not keeping minutes with fire department, municipality, insurance experts
- Bad communication between making dilatation and placing floor heating
- Poor documentation of design plans done by design team. Incomplete drawings, missing minutes
- Long communication lines with the designers. A station on site or digital platform would be better
- Too many links in the procurement chain
- Dangerous situations due to lack of communication (asbestos sanitation)
- Multiple nationalities resulting in language and cultural barriers

Table 15 Communication Management summary of conclusions

### 9.9 PROJECT RISK MANAGEMENT

#### 9.9.1 THEORY

Project risk management is identifying, analyzing and responding to risks that threaten the success of the project. It consists both of a qualitative and quantitative analysis of the risks involved. A traditional project, also known as the over-the-wall method, makes very distinctive separations on who bares what risk.

The fast tracking delivery method comes with much greater risks than compared to a traditional approach. Most of the risks jeopardize the costs of the project, or could delay the project. As in all projects it is wise to allocate risk to the party that has the best chance of dealing with the risk, meaning that the one who can prevent the risk from becoming a fact, and the one best able to deal with the consequences, usually the same entity, bares the risk. In fast tracking there is also the option of appointing a management contractor who bares all the risk, but be aware that with risk comes a price tag.

#### 9.9.2 CASE STUDY

The data collection reveals some interesting points on the matter of risk management during the realization of BK City:
After reviewing the moments during the project where risks were identified or dealt with, it becomes evident that the risks can be categorized. There are risks brought up in relation to documentation, to create a legal foundation for all the decisions that were made. The consequences of an audit without proper documentation of the decision making process is unthinkable. Another risk issue is the safety of the people involved in the project, and the users of the building. The risk of external parties negatively influencing the project, project delay and cost over-runs summarize the rest of the possible threats to the project.

The steering committee, who approved having the furniture and other inventory put on a different budget, conclude that the choices made for the inventory need to be properly documented, since a lot of money is used. At some point it is brought up in one of their meetings that the conversations with the insurance experts were never documented in minutes, giving not much of a legal basis. The residents of the surrounding area and their objection to the coloured window stills needs to be taken into account. Their influence in the project cannot be underestimated.

(Chief university facilities) "We have invested time in communication with parties like the residents of the area and the municipality. That was a very wise decision. Obtaining permits from the municipality went smoothly and the residents were very sympathetic.

First item on the agenda of the project group was to identify what possible issues could arise with external parties, like the municipality or the insurance experts. In order to minimize the probability of issues with the residents, a direct line was created between the project leaders and the residents, so they could contact them immediately at any time. This was not the only line of communication; the residents were constantly brought up to speed on the plans that were made to avoid legal objections at a late stage. Proper documentation is an issue in nearly all stages of the project. In the project team, only at a later stage was evident that the minutes of every meeting were never discussed or approved. The municipality was not very keen on having minutes kept during their meetings. Since all minutes were rejected the next meeting anyway, after a few times no minutes were kept, resulting in having no legal foundation for the topics discussed. The colourful window stills, for instance, were only approved verbally, but not in writing. Eventually it had to be changed by order of the municipality.

A big risk in the project was possible delays as a result of building permits lacking. The is why a good connection with the municipality was essential, meaning that they had to be closely involved to be able to know exactly when designs change. In some cases work would already start without to appropriate permits.

Many of the risks involved with the construction team were based on safety. Due to the pace, it was often neglected to clean up the debris, causing unsafe work environments. Regulated clothing was often forgotten. Asbestos contamination was becoming a re-occurring event. The conditions of asbestos sanitation do not work well in a fast track environment. The pace of the demolition crew was too fast for the sanitation crew to keep up with resulting in demolition of contaminated areas. The consequence is that the sanitation company had to be released from its duties to make way for another one. Generally the biggest safety risk came from the crowdedness on the construction site. Delays are always a big risk in projects, especially when it is a fast track project. Since the risk is project wide and can be caused at any level of the project, it is necessary to act preemptive where possible. By including an incentive in the contracts, this was stimulated at the construction team level.

<table>
<thead>
<tr>
<th>Positive influences on the process</th>
<th>Negative influences on the process</th>
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<tbody>
<tr>
<td>Argue and documenting the choices made regarding inventory</td>
<td>Not keeping minutes in meetings with the insurance experts</td>
</tr>
<tr>
<td>Taking the wishes of the residents of the surrounding area into account</td>
<td>Starting construction work without the appropriate building permits</td>
</tr>
<tr>
<td>Starting the project with an inventory of possible threats from external parties</td>
<td>Not keeping minutes in meetings with the municipality</td>
</tr>
<tr>
<td>Creating a direct line between management on the construction site and the residents</td>
<td>Leaving debris behind, resulting in unsafe work environment</td>
</tr>
<tr>
<td>Having incentives (bonus and fine) to motivate contractors to finish on time</td>
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<tr>
<td>Discharging an asbestos sanitation company when multiple contaminations result in loss of faith</td>
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</tbody>
</table>
Table 16 Risk Management summary of conclusions

9.10 PROJECT PROCUREMENT MANAGEMENT

9.10.1 THEORY

Project procurement management is acquiring the goods and services needed for the project organization to complete the project. It entails what to buy, when and how. Normal procurement takes place by submitting the specifications and conditions to a tender, and selecting the contractor with the lowest bid.

In fast tracking, the “what” is no different compared to traditional project, only that there is less time and less information available to decide what to procure. The “when” in fast tracking is essential, since the scheduling of the work packages is an essential part of fast tracking. Just-in-time delivery is the preferred form of delivery of materials. The “how” in fast tracking is quite different as well. A traditional ‘lowest-bid’ method will not work. Quality and experience are much more valuable. A highly qualified project manager is essential in fast tracking, and he should therefore hand pick his own team as soon as possible. Liability and responsibility can be outsourced by the client through procuring a management contractor, who enters into contracts with the works contractors. An important aspect of procurement is that allocation of risk is usually processed into the tender/price.

9.10.2 CASE STUDY

The data collection reveals some interesting points on the matter of procurement management during the realization of BK City:

One of the primary points to make out in the light of procurement in this case is the European Procurement Procedure. Normally a (partly) public funded organization needs to put out its projects in a European tender if the budget exceeds a certain threshold. Although this legislation is meant to unify the European Union and give all member states equal opportunity, in this case, due to the need for high speed delivery, such a procedure would destroy all hopes of making the deadline. A European procurement procedure requires a lot of preparation and the bidding period itself could go on for up to five months. Thankfully, the European Union built in an exception to the rule: Compelled urgency. This means that if there is an urgency to award a contract, and the urgency is due to unforeseeable circumstances, it is possible to bypass the procedure.

Another important part of the procurement procedure in this project was the choice to do all the management in-house. As the literature suggested appointing a management contractor to burden with the liability and responsibility of the works, in this case the university wanted to have complete control. This is not unthinkable, since the university has a lot of knowledge on the building industry, especially the faculty. Furthermore, if you, as a client, want full control during the project, it is not wise to contract someone to carry the responsibility. A negative aspect of doing this is that you have to act as management contractor (general contractor) and supervise all works contractors. During the project a lot equipment and material was stolen or damaged, and the resulting additional costs would usually be paid by the university.

The influence of the insurance companies is very specific to this project as well. The loss of revenue and all extra costs were covered by the insurance. This meant that the insurance companies had a lot of influence in the decision making and therefore procurement. It meant that every procured item needed to be checked and approved by the insurance experts. This was done on a weekly basis. This hardly slowed down the project as most of the decisions were already made and procured. This did not mean that approval was unnecessary, it was important to make sure that all that was procured was necessary.

The steering committee was confronted with the delays of payments to the works contractors. The procurement system of the university is not used to high speed projects. It was clear very soon that in order to push the contractors to high speed work, the payout system needed to be accelerated as well. Some other parts of the procurement side of the project were discussed by the steering committee, but decisions were mostly made by the project group.
The project group started off early in deciding how to procure, what the tender process would be and which contractors to select. Because the procurement did not need to be public due to the compelled urgency, a short-list was drafted with contractors that worked with the university in the past. Not everyone in the project organization was up to date on the facts surrounding the ‘compelled urgency’ and ‘European tendering’. In fact, questions like ‘how long can we use this method?’ were brought up several times. Eventually the period was prolonged till June 2009, making it possible to procure till May. Some of the contracts were set up with an incentive to motivate the contractors. The delivery date was therefore incorporated in the contract. Yet, in many cases, a contract was formed based on ‘plus basis’ (regiebasis) which meant a concept offer was given based on an estimation of the hours and materials that were to be spend, and after work was completed the actual hours and material costs were invoiced. The project group saw it fit to procure like this, since it was unclear what the works would actually entail up to the point of execution. It did however leave minimal room for competitive bidding or cost control. Some contracts did have incorporated that once a decision was made, but minor modifications were necessary, these would be at the expense of the contractor. These ‘adjustments’ or ‘flexibility’ were therefore incorporated in the basic costs. The glass houses, which were planned further ahead, had less time pressure, so when the offer for the finishing of the glass houses came in far overpriced, the project group decided to call for a second opinion by having an engineering company assess the offer. The company agreed the offer was overpriced, so the work was put out to tender and another contractor was awarded the job.

The design team was primarily focussed on the design and not interfere much in procurement side of the project. They were obviously indirect confronted with procurement the moment budget over-runs limited their ideas. They were subject to procurement issues as the architects themselves were procured on a ‘plus basis’ system, meaning they could continue designing endlessly without financial consequences. This is the main reason why the project group insisted the design stopped their work at some point. It was very particular that all architects were offered the same contract. The hourly rate would be the same for everyone, whether it concerned the chief architect or the intern, the interior architect or structural architect.

The construction team was at a constant war regarding procurement. Late payments were a subject that came up at nearly every meeting. The offers and invoices were subject to a long route of people before it was processed to payment. Although it was suggested to speed up the project by speeding up this procedure, it still needed to be checked by a number of people. Some contractors tried to claim additional costs even though the contracts stated that these additional costs were included in the hourly rate.

<table>
<thead>
<tr>
<th>Positive influences on the process</th>
<th>Negative influences on the process</th>
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<tbody>
<tr>
<td>Filing for compelled urgency at the EU in order to bypass the EU procurement legislation</td>
<td>Payout system cannot keep up with the speeds of the work being executed. Systematic late payouts</td>
</tr>
<tr>
<td>Taking control and responsibility in order to have complete control about the outcome</td>
<td>No control, on the construction site, leading to property stolen and many damages</td>
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<tr>
<td>Having contracts with incentives to stimulate the fast delivery of work</td>
<td>Project group not up to date on the status, duration and meaning of ‘compelled urgency’</td>
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<td>Having the finishing of the glass houses out to tender competitively, to reduce costs</td>
<td>Having ‘plus basis’ contracts that can produce substantial costs</td>
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<td></td>
<td>Architects on an hourly basis, not bound by a maximum of hours to spend on a design</td>
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Table 17 Procurement Management summary of conclusions

9.11 ANSWERING THE RESEARCH QUESTION

The problem that was stated at the beginning of this report was that if a building project is pressed on time, and therefore fast tracking was implemented, whether or not this would have consequences for the success of the project. The objective is to improve the implementation of fast tracking in the Netherlands to benefit the building industry. The main research question was:
In order to find an answer to that question we have discussed a few project management theories of which the Project Management Body of Knowledge was adopted for this research. The nine knowledge areas and their processes were described to have an understanding of what project management entails. A literature survey on fast tracking resulted in few perspectives on this type of project delivery. This was eventually discussed in terms of the same nine knowledge areas. An in-depth data survey on the case BK City was used to obtain insight into a situation where methods from fast tracking were used. These three views were compared and discussed in the last nine paragraphs. In this paragraph of the report, the research question is divided in nine sub-questions and answered briefly.

9.11.1 "HOW DO YOU CONTROL INTEGRATION MANAGEMENT IN FAST TRACKING IN A CRISIS SITUATION IN THE NETHERLANDS?"

When applying fast tracking, the creation of work packages, and the integration of it, is essential. This means although there is not enough time to define a design, a scope needs to be defined immediately in order to divide it in packages. The best way to control integration is by making sure everyone knows at all time what is expected of them. Short communication lines help tremendously. Since many parties are working at the same time, integration is also applicable to the relationships between the parties. Trust, respect and willingness are needed from all participants to come together in the project.

Theory on project management suggests processes to integrate and coordinate all plans throughout the project. Theory on fast tracking suggests subdividing the deliverables into so called work packages and executing them simultaneously where possible. It further suggests appointing a managing contractor as soon as possible to oversee the integration of these work packages. In the case study, a project group with representatives of all aspects of the project was created to perform as a managing contractor. The university wanted to be in complete control of the project, therefore taking up the responsibility to integrate all aspects. Lack of experience in fast tracking was counterweighed by the familiarity and success in collaboration with each other.

Pitfalls in integration management are usually a consequence of ambiguity in communication. This is why theory suggests the appointment of only one managing contractor instead of a team of people representing all aspects.

9.11.2 "HOW DO YOU CONTROL SCOPE MANAGEMENT IN FAST TRACKING IN A CRISIS SITUATION IN THE NETHERLANDS?"

A complete and thorough scope is essential. Since complete designs are not ready, it is important to have the scope as clearly defined as possible. The work packages, planning, cost estimates, quality... it is all dependent on the scope. Scope changes can have a huge impact on all aspects of the project. When defining scope, one needs to keep in mind that only the necessary should be included.

Theory on project management proposes several processes to define and divide the project deliverables and controlling changes in the course of the project. Fast tracking theory suggests investing time in defining the scope, because it can prevent a lot of change orders at a later stage. It suggests designing the project for buildability and speed, thus simplifying it. The case study had the unique situation that most of the brief was already formulated in research undertaken prior to the destruction of the building. This only needed adaption to the chosen building on the Julianalaan. Simplifying the design for buildability and speed was a starting point, but during the course of the project, quality became more important than buildability.

Pitfalls are changes in scope to improve overall quality which usually leads to additional costs, problems in the planning and possibly loss in quality in other areas, or even elimination of elements to compensate. It is therefore important to know what the consequences are of scope changes.
9.11.3 "HOW DO YOU CONTROL TIME MANAGEMENT IN FAST TRACKING IN A CRISIS SITUATION IN THE NETHERLANDS?"

Getting the project delivered within the proposed time is the number one priority. Time is mostly saved by the concurrent execution of the work in packages. The schedule should be leading in all decision making. Since the schedule is already minimized in fast tracking, compensating matters must be undertaken when delays occur. So, primary time saver is concurrent work packaging, the secondary time savers are penalties/incentives in contracts and adding workforce or longer working days. The case has shown that prior collaboration experience benefits the speed of the project.

Project management theory describes time management as formulating a schedule based on the sequence and duration of all necessary activities. Fast tracking suggests minimizing the activities, and maximizing the pace at which these activities are executed. The main time management factor in fast tracking is the sequencing and overlapping of the work packages. Theory furthermore proposes the implementation of incentives and penalties to assure timely completion. The use of advanced information and communication technology and additional workforce can be used as well. The theory hardly mentions anything about permit applications and approvals. This was essential in the case study. The project would never have been completed on time without the request for ‘compelling urgency’ and the close collaboration with the municipality, fire department and other approving institutes. Incentives were hardly used.

Pitfalls in controlling time are underestimation of time consuming activities, time lost in communication failure and letting quality or other aspects rule over the schedule.

9.11.4 "HOW DO YOU CONTROL COST MANAGEMENT IN FAST TRACKING IN A CRISIS SITUATION IN THE NETHERLANDS?"

It is very likely that the costs for a fast track project will exceed the costs of executing the same project in a traditional procedure. Yet the savings made through early delivery should compensate some of the extra costs and should therefore not be neglected. Proper definition of scope should help in defining the budget. It is advisable to bring in the expertise from a contractor onto the project at an early stage. Controlling the costs can be stimulated by having elements of the project that can be dropped if necessary.

In traditional project management it is not very difficult to estimate the costs since the project is well defined. Some contingencies will be taken into account, but the general picture is clear in the over-the-wall method. Fast tracking deals with a lot of uncertainty regarding the work to be executed. Literature therefore suggests bringing in the contractor at an early stage to make the design as efficient as possible. The theory also points out the division of risk and its consequences in the contracts. The university wanted a certain level of quality, therefore the influence of the contractors in the design were kept to a minimum. The architects still made an effort to keep the design as efficient as possible, trying to reuse as much as possible. Cost control was still problematic as the unknown variables in the designs turned out to be quite more expensive than estimated. High quality and timely delivery were far more important than staying within the budget.

Pitfalls are in the procurement. An ideal contract form for fast tracking is yet to be developed. Since the project is not thoroughly defined an over-the-wall approach would be very costly since all ‘unKnowns’ will either drive up the price, or lead to a high amount of expensive change orders. Cost+ incentive contracts should work, providing that there are clear arrangements regarding what is considered to be part of the contract and what is additional work.

9.11.5 "HOW DO YOU CONTROL QUALITY MANAGEMENT IN FAST TRACKING IN A CRISIS SITUATION IN THE NETHERLANDS?"

Quality, like cost, runs the risk of being the victim of the rushed process. Controlling quality can be helped by using standardized elements in the design and doing as much as possible pre-fabrication. The best way of controlling quality in a fast track project is by constantly checking the quality through use of a quality plan, keeping in mind that the checks follow up faster in a faster process.
Theory on project management describes a quality control system composed from quality planning, quality assurance and quality control. Fast tracking theory suggests adopting standard and easily available elements, applying a cost-benefit analysis and quality assurance through continuous quality checks. It differs from traditional project management only slightly, by suggesting to make the choice of materials depending from availability. Quality management in the case study took place through decision making based on cost-quality ratio rather than the cheapest option. Technical quality control was done by the project leaders at every milestone. The many architects involved were concerned with the aesthetic and functional quality, but since no aesthetic quality level was noted at the start of the project, this was subject to their vision.

Pitfalls are the influences of the architect(s). Because the design and construction phases are overlapping, the risk of an architect trying to keep improving his design is eminent. Striving for more quality is great, but the consequences can jeopardize the quality of the whole project as the schedule and the budget is exceeded.

9.11.6 “HOW DO YOU CONTROL HUMAN RESOURCES MANAGEMENT IN FAST TRACKING IN A CRISIS SITUATION IN THE NETHERLANDS?”

Fast tracking requires everyone to give a bit more than usual. This is one of the reasons why experience is an important factor in picking participants for fast track projects. Having experience working together usually means you understand each other’s way of working, making it easier to work together on something. Experience in fast tracking would be a great asset, however, the chances of finding many companies in the Netherlands with this type of experience is unlikely. Flexibility is another great asset to look for in partners for a fast track project. The case study has shown the importance of prior collaboration. There was hardly any experience in fast tracking amongst the participants, but this was compensated by the strength of the collaboration.

There are not that many pitfalls to be named here. Maybe to be aware that hiring a company which you have had good relations with does not necessarily mean you will work with the same people you have had the experience with. In other words, you might be able to control the direct human resources, but indirectly others will determine who ends up on your construction site.

9.11.7 “HOW DO YOU CONTROL COMMUNICATION MANAGEMENT IN FAST TRACKING IN A CRISIS SITUATION IN THE NETHERLANDS?”

Fast tracking requires fast decision making and therefore fast communication. Ways of stimulating communication is the implementation of advanced technology, usually web-based or at least digital. Another method, proven useful by the case study, is the settlement of the project organization in a temporary structure near the construction site. It is also important not to forget communication aspects regarding third parties, like municipality or residents from the surrounding area. Their support is essential and usually it is sufficient to just keep them involved and informed.

Project management theory states that communication management is determining who needs what information at what time, and who needs to be in contact with whom. Theory on fast tracking suggests the use of advanced information and communication technology in order to prevent communication problems through the pace of the project. It also suggests appointing a managing contractor at an early stage who provides everyone with the latest information. The case shows the benefits of communication management through the excellent contact with third parties: municipality, fire department, students, teachers, residents. Having the project team work at the construction site helped a lot in communicating with all parties. The case also provides situations where communication failed. On multiple occasions work errors were made because the drawings
used were not the last version. Apart from documentation problems there were still some communication lines that were too long.

Pitfalls are not fast tracking specific. Communication problems arise due to different designs, plans, schedules or other documentation circling around. Communication problems can also occur between parties that do not seem to work together properly. Keeping everyone happy, their spirits up, can motivate communication.

9.11.8 “HOW DO YOU CONTROL RISK MANAGEMENT IN FAST TRACKING IN A CRISIS SITUATION IN THE NETHERLANDS?”

Controlling risk in fast tracking is best done by allocating risk to the party best suited to prevent or mitigate the risk. One should keep in mind that parties who have to carry substantial amounts of risk will calculate this into their offer.

Traditional project management, the over-the-wall method, has clear definitions on which party bares what risk. In the Netherlands this is stated in the DNR and UAV. In fast tracking the involvement of different parties is ongoing and there are no clear boundaries to who bares what risk. Literature suggests allocating risk to the party best suited to deal with the risk. It is possible to appoint a managing contractor to bare all risk, but this will be an expensive solution. The case shows a few situations where risk was handled well, and not so well. The most remarkable thing is that the university took on almost all the risk. It seemed the fastest way to work with everyone, since fighting over who is responsible for what would only slow down the project.

Pitfalls are lack of documentation, which is considered too time consuming to do but may cause legal problems later on, and safety, which is also a result of the high speed at which everyone is working and the crowdedness.

9.11.9 “HOW DO YOU CONTROL PROCUREMENT MANAGEMENT IN FAST TRACKING IN A CRISIS SITUATION IN THE NETHERLANDS?”

Procurement in fast tracking is controlled by having the right contract with the right party. The proper scheduling should clearly define ‘when’ to procure ‘what’. It is the procurement procedure that needs extra attention. You cannot put the project out to tender and select the cheapest contractor. The quality, reputation and experience of a contractor are far more important than the price.

Traditional project management has a straightforward way of procurement. The specifications and conditions are submitted to a tender, where all contractors get the opportunity to provide a bid for the works. The contractor with the lowest bid wins the contract. In fast tracking the cheapest solution might not be able to get the building finished in time. Therefore quality and experience are more important than price, making the selection criteria for the tender more complicated. Procurement in the case study was not always running smoothly. Decisions would take so long that by the time the order was formally agreed upon, the works were already finished, preventing any type of competitive tendering. On a positive note, due to the compelled urgency of the situation, the university was free to decide which contractor to use, instead of submitting to the European Procurement Legislation which would take a very long time.

Pitfalls are losing control over the procurement due to ‘plus basis’ (regiebasis) contracts. Another pitfall is European Procurement. Although this special case made it possible to avoid this procurement procedure, most other public project would not be possible in a fast track method due to this legislation.

9.11.10 CONCLUSIONS IN SUMMARY

As this chapter has shown, there are differences between traditional project management, fast tracking management and the management that took place at the construction of BK City. All nine knowledge areas provide elements that are important to successfully manage a fast tracking project. These nine areas are not completely independent but have strong relationships and affect each other. It is impossible to name just one of the nine subjects as the most important one. Obviously time management is essential since fast tracking is used to speed up a project. Still, communication management seems to turn up at every other element as an
influencing factor. In general, one could state that fast tracking deals with a lot of unknown variables. And although good overall management can provide support, it is likely that unforeseen event will take place. It is the flexibility and commitment of the parties involved that, in the end, make or break a fast track project.
10 RECOMMENDATIONS

This chapter looks back at the research to see what recommendations can be given for implementing fast tracking into the Dutch building industry. It also makes a distinction between recommendations regarding projects in general and recommendations specifically for this particular case. Another objective of this chapter is to see if the research was sufficient to answer the problem statement. If it was not sufficient, the reasons why not and the suggestions for future research are discussed.

10.1 GENERIC RECOMMENDATIONS

Although fast tracking hardly has a proven track record in the Dutch building industry, there is certainly room for implementation of aspects of fast tracking. The first and foremost thing to realize before starting a fast track project is if it is necessary to deliver the building this fast. There is a driving force needed to maintain the critical deadlines. This can be commercial (being faster than competitors or being able to start production or sales sooner) or social driving force (providing shelter after a disaster).

In order to use fast tracking successfully in the Netherlands there are a few points of attention:

- Overcoming scepticism: both (public sector) clients as well as contractors fear the increase of risk involved in fast tracking. The lack of experience amongst all parties causes this, therefore, the technique and the benefits needs to be spread more.
- Avoid excessive paperwork: a lot of time can be saved by reducing the bureaucratic paperwork, especially with regards to public bodies and obtaining approvals. This will be easier to accomplish in the case of a disaster, in comparison to commercial objectives to use fast tracking.
- Provision of standard forms of contracts: at this time there is no standard form of contract aimed at fast tracking. Contracts and procurement techniques have to be adapted to suit. By creating successful standard forms, some of the scepticism may be overcome.
- Use a managing contractor if possible: having an experienced professional controlling the management aspects can be vital in the success of a project.
- Assure contractors of continued work: make sure that they can keep their key personnel occupied and avoid a ‘hire and fire’ situation, or non-workable hours.

10.2 BK CITY SPECIFIC RECOMMENDATIONS

Based on the literature on fast tracking, some actions can be pointed out with room for improvement regarding the BK City case.

- Combine the scope with a quality level, so budget estimates can be more accurate and to prevent changes in the design to improve quality beyond the agreed level.
- Keep the schedule tight in the design phase as well as the construction phase. Freeze the designs at some point to prevent continuous changes.
- Only select contractors that are able to work under these conditions. If they do not have the manpower or the flexibility to perform in a fast track project, they become a liability.
- Use advanced information and communication technology to support short communication lines between parties and prevent circulation of ‘old’ information/designs.
- Award a contract before it is executed. This means that a bid needs to be checked immediately if the work is tendered in packages. If the work is tendered in one large tender with only hourly rates, a competitive dialogue is required before agreeing to an offer.
- Use one system to monitor all finances. Planned work, executed work, paid work, budget, etc should all be in one system. Having different systems leads to confusion.
- Thoroughly document everything. Many decisive situations were never documented. Although it never backfired in this situation, proper documentation is needed to substantiate the decision making process and provide a legal base for possible problems later on.
10.3 FUTURE RESEARCH RECOMMENDATIONS

This research was set up quite broadly. Project management is a large field of knowledge and the nine knowledge areas are all important processes to take into account. By researching nine different areas of project management, the results were quite vast, but lacked some depth. Some of the knowledge areas need no further investigation, but others can be singled out for in depth research. There could also be more research done on the relations between the knowledge areas; how they overlap and influence each other.

In this research, only one case was compared to theories on fast tracking. Each project is unique in its own way, but this particular project was very special. The results would have had a stronger position if more cases were used. For instance, literature suggests implementing fast tracking for commercial reasons as well as the relief of disasters. A case where fast tracking is used for commercial reasons would shed light on that motive.
11 REFERENCES & BIBLIOGRAPHY

11.1 LITERATURE


**11.2 ARTICLES**


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### 11.3 WEBSITES


