

Improving Project Management at DHV Shanghai

A structural analysis and comparison of DHV practice with the Prince2 method



July, 2007
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Preface

To finish my Bachelor Program Civil Engineering at the University of Twente, The Netherlands, I have been given the opportunity to do a three month internship at DHV Engineering Consultancy Shanghai. In these three months I have done a research in close cooperation with Daan Seesing on how to improve project management practice of Building and Industry projects within the company. All needed information was collected through a set of interviews, site-visits and available literature in the field of project management. This paper contains all relevant knowledge and the results of this research. Next to this paper, a Project Managers Manual was written to make all acquired knowledge accessible for use during the execution of projects managed by DHV Shanghai.

I will take this occasion to thank all people who supported us during our assignment. My special attention goes out to Ruud Beekhuis and Thomas Wang for their role as mentors and for their help and support during our research. Furthermore I am grateful to Chris Shi for his supervision and giving me the opportunity to come to Shanghai. I would also like to thank all project managers and staff, and Wim Jansen in particular, for sharing their knowledge with us. From the University Twente I would like to thank Andreas Hartmann for his support concerning the content of our assignment. And last but not least I would like to thank Daan Seesing for his critical comments and good cooperation during the internship.

Enschede, October 2007

Alex Korver

Summary

This paper states the results from my research in cooperation with Daan Seesing, on the improvement of project management practice within DHV Engineering Consultancy Shanghai. Shortly we will describe the process of the research and the important recommendations in this summary, if you are merely interested in the results we refer to either the recommendations or the appendix for the end-results presented to DHV.

Our first challenge was the lack of a real 'problem' within the organization that needed direct research. After a first interview with our mentors we came to the conclusion that overall project management practice could possibly be improved. To see how this practice could be improved, first a structured analysis had to be made.

The structured analysis was made using the knowledge of recent literature on different methods like PMBOK and Prince2. Beside this theoretical PM knowledge also knowledge of the context was acquired, to see things in the right perspective.

Using the knowledge mentioned above and combined with the characteristics of normal practice at DHV, a framework was set up in order to gather and analyze information on all relevant aspects. The main chapters of this framework exist of the project phases in a typical DHV project; the Feasibility Study, Program of Requirements and Initial Design, Design (Preliminary and Detailed Design), Tendering, Construction, Testing & Commissioning and Hand-over. Beside these eight phases used in common practice a ninth 'General' chapter was added to the framework, covering all information used throughout several phases or aspects which cannot be placed in a certain phase. Within each chapter, a subdivision is made on the six main knowledge areas as they are used in the PMBOK method; Scope, Organization, Communication, Time, Cost and Quality. After the framework was constructed information about project management practice at DHV Shanghai was gathered using semi-structured interviews with project managers, site visits and information from the local intranet.

The general impression of project management at DHV was positive. Projects are managed thorough, though not always optimal structured. The difficulty on finding structured documentation on a specific subject was a possible improvement which came across right away. Other points of improvement were conducted through a comparison of the current practice with the project management method Prince2. Possible improvements that derived from this comparison are mainly on the field of procedures. The set up of overall quality procedures, Health Safety and Environment procedures and a structural project evaluation are examples of the suggested improvements.

Another challenge was the non-optimal access to available knowledge. As we already analyzed and structured the information on current practice we used this information to set up a Project Management Manual. This manual contains all information on different processes, methods and techniques used by project managers during the execution of projects. A second improvement that has already been implemented during our time at the company was the revival of ShareWork. This internal knowledge database did already exist, but both the structure and files were outdated. Together with the effort of DHV staff a new ShareWork was set up containing a new structure and new up-to-date files. By linking the manual and ShareWork, this database is now used as a knowledge referring backbone for the Project Management Manual. Finally a knowledge manager and file manager are appointed to keep this knowledge base up to date.

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1 Problem description

1.1 Problem description

DHV Shanghai is as an engineering consultancy company part of the global DHV Group. One of the core businesses of DHV Shanghai is project management. Especially ECPM (Engineering Construction Project Management) of high end factories, office buildings and special buildings such as international schools, mostly, in and around Shanghai, China. Most of its clients are western companies.

To perform these tasks DHV Shanghai has a project management team of professionals (approximately 10 people) supported by a secretary, finance and a HR department. The project managers are assigned for the duration of a project to be the overall coordinator, representing the client and manage all aspects of the project. Their task varies from representing the client and the client's demands throughout the design phase to controlling time and cost in the construction phase. Especially in the construction phase a project manager works partly at the office and partly on site.

The key to success for a project manager is to keep close track of every stage within the project and thereby apply his personal skills, tools and techniques whenever necessary. There has to be made a difference between the project manager's personal skills (acquired mostly by experience and education) and the tools and techniques which are available to him to use them whenever they are required. As DHV Shanghai has managed numerous projects in its 'relatively short' life most of its project managers are very experienced. Projects are almost always a success.

After our arrival at the office in Shanghai it seemed there was not a real concrete problem, but the general opinion was that the current practice of project management, although often successful, was not optimal. So the real problem was not about knowledge itself but to gain insight into the current knowledge.

To get a better understanding of all available knowledge, the information on DHV's project management skills had to be structured in an organized way. This became our first challenge.

After the completion of the analysis it will become possible to point out possible fields of improvement.

1.2 Objective & research questions

Using the information of the previous paragraph our main objective can be read as followed:

"The objective of this research is to reveal and structure current project management knowledge at DHV Shanghai and point out possible fields of improvement by comparing current knowledge with project management standards."

To clarify our objective it is useful to define Project management knowledge. *Project management knowledge* can be defined as all locally available written knowledge and experience of managing 'Engineering Procurement and Construction Management' projects at DHV Shanghai Engineering Consultancy Company.

The research questions that have to be answered to reach the objective are as followed:

- 1) Which structure can be used to reveal the available knowledge?
 - Which different phases can be distinguished in common building and industry projects?
 - Which areas of knowledge can be distinguished within the field of project management?
- 2) What are the characteristics of project management at DHV Shanghai?
- 3) Which are the fields of improvement for DHV's project management practice?

The outcomes of the analysis are suitable to be used as a general handbook for project managers at DHV Shanghai.

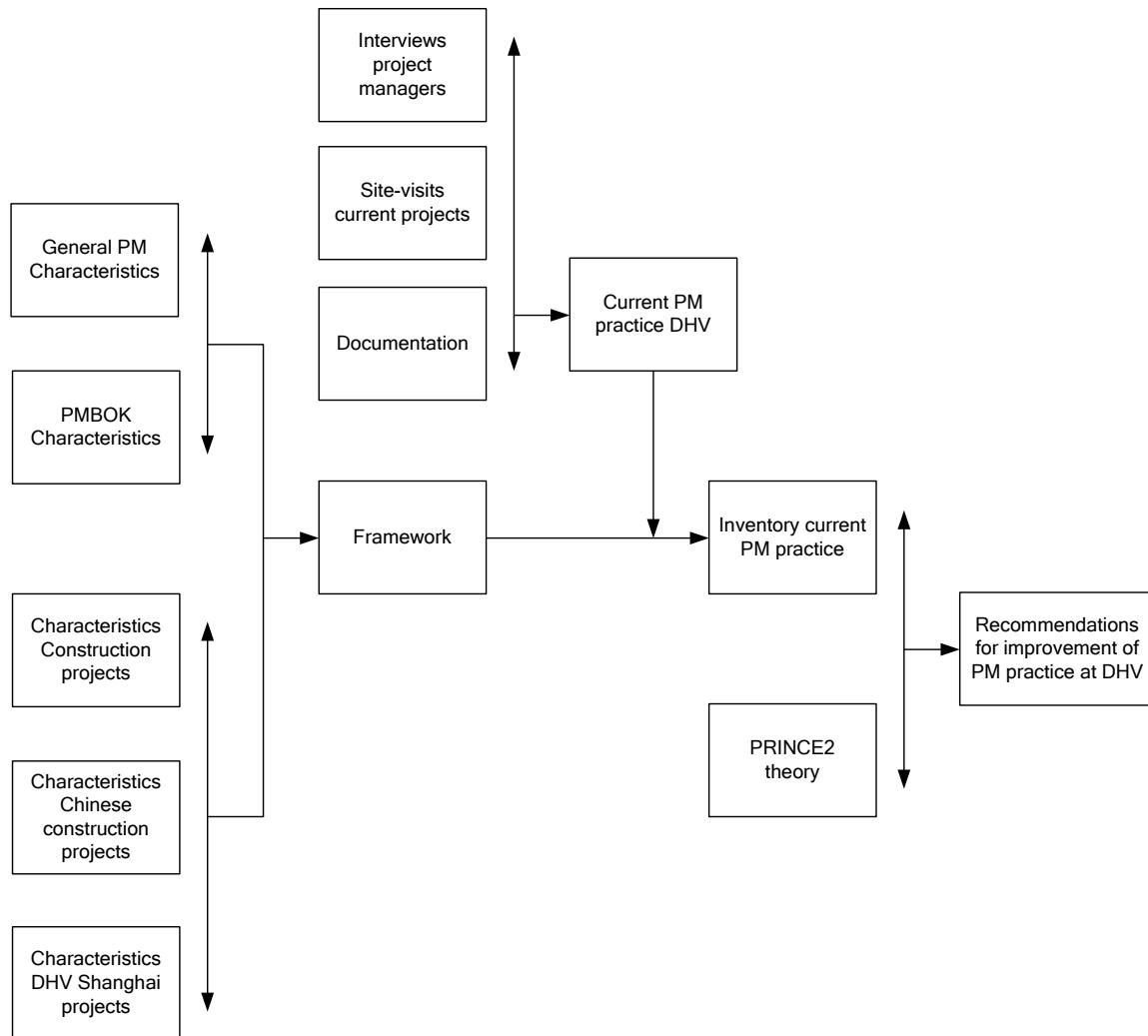
1.3 Methodology

In order to have a better understanding of the PM practice at DHV Shanghai and to have some insight in general project management procedures, a literature study was performed in advance to our bachelor assignment. With this new acquired information we had our first exploratory interviews at the office of DHV in Shanghai.

To determine the characteristics of project management practice at DHV Shanghai, first a framework had to be made to process the gathered information in a structured way. This framework was made by dividing the construction projects into seven phases. From the feasibility study up to the hand-over phase each separate phase is divided again using the PMBOK methodology. For further details about the theoretical background and the final framework we refer to chapter 2.

Using the information from the exploratory interviews and the information we gathered from other internal knowledge sources, like the intranet, the questions for semi-structured interviews with project managers and related staff were made. In total, ten people were interviewed. A listing of our interviewees can be found in Appendix D, Appendix C contains the standard interview questions that were used during these interviews. Other sources of information are a number of visits to construction sites. At the construction sites, we analyzed the project manager doing his daily tasks. These observations were used as extra input next to the interviews. The gathered information of each interviewee was structured and compared with the answers of the others. As said before, a manual (or other structured document) wasn't available but written information about recently finished and running project was. This was also input for our analysis. All gathered information led to a first version of a PM's practice document and was discussed with all the PM's in a workshop. Their input was used to update the information and filter out any flaws. As a last step, this structured analysis was compared with the Prince2 methodology from which recommendations for further improvement were derived.

To divide this assignment between the two researchers a split up was made. Each researcher analyzed three of the six control areas in every phase.

**Figure 1: Research Model**

The discussed research method is schematically represented in the research model in figure 1. This model shows that both the characteristics from standard literature and the characteristics from the context lead to the set up of a framework. This framework is then used to structure all information of current PM practice leading to an inventory of current practice. The results from this inventory are confronted with theory using the Prince2 method and this analysis finally leads to a set of recommendations for improvements of project management practice at DHV Shanghai.

1.4 Structure

Chapter two of this paper will start off with the creation of a project framework to structure all information. First, some general theory about project management is given. From this general theory on project management, two commonly used methods have been chosen and examined further. This theoretical information will be used to determine for example the phases and knowledge areas which are used in project management methods. When a clear image of the theory is created we will proceed to the context. The context exists of the cultural context, in this case China, and the business context. The latter contains the characteristics of DHV Shanghai. Combining both the context and theory makes it possible to construct a fitting framework for this particular case.

In the third chapter an inventory of PM practice at DHV will be structured using the given framework. This inventory will be made by using the local intranet containing the previous knowledge database called 'ShareWork' and interviews with project managers or PM related staff.

The fourth chapter will give an analysis on the inventory made in the third chapter by using the Prince2 methodology. The outcome of this analysis is stated in a set of challenges and possible improvements. The fifth chapter contains possible implementations of the different challenges stated in chapter four. In the sixth and final chapter the conclusion and recommendations for the improvement of project management practice will be drawn up.

2 Creating a framework

In this chapter we work towards a framework which can be used as a structured base for the information about the used processes and procedures which will be gathered. This chapter will start off with a brief introduction about the general project management theory followed by a focus on the more detailed theories; the Project Management Body of Knowledge (PMBOK) and Projects In Controlled Environments 2 (PRINCE2). In the last paragraph the actual framework is presented.

2.1 Theory: PM Methods

2.1.1 Introduction to PM

Managing projects is as old as the pyramids in Egypt. Project Management as we know it however, as a specialist area of management, was born in the 1950s from the US aerospace and weapons Research Industries. The problem of designing an aircraft or weapon system was burdened with complexity, uncertainties and difficulties. Planning and cost control became more complex and demanded a specific approach.¹

The last decades, project management has become a prevalent organizational form for doing business in many industries. Modern Project Management can be defined as:

“The discipline of defining and achieving targets while optimizing the use of resources (time, money, people, materials, energy, space, etc) over the course of a project (a set of activities of finite duration).”²

To manage a project, a project manager has to deal with different, highly depended, dimensions and resources. A second characteristic is that each project contains a set of stages or phases in which these dimensions must be managed. This all has to be done in a changing environment with changing demands, threats and a demanding client. All of the above makes that managing a project can be a difficult task.

One of the most important ways to keep control of all different dimensions in the different stages is to use a certain methodology. In the recent decades numerous methods were developed to feed this demand. One of the most often used methods is Prince2, developed by the office of Government Commerce. The Project Management Body of Knowledge (PMBOK), developed by the Project Management Institute is another, well known method. Other models are the Rational Unified Process (RUP), System Development Life Cycle (SDLC) and Solutions Based Project. These methods all give general and extensive guidelines about how to manage a project in all the different phases, taking all dimensions into account. RUP is mainly designed for software projects and not directly usable for construction projects. SDLC is a simple ‘waterfall’

¹ Al-Jibouri, S. (2000). *Dictaat Planning, beheersing en risicomanagement*. Enschede: University of Twente.

² Wikipedia search on project management. (n.d.). Retrieved February 18, 2007, from http://en.wikipedia.org/wiki/Project_Management.

methodology and therefore less suitable for complex projects.³ This leaves PMBOK and PRINCE2 as most suitable to successfully manage a construction project. Both will be mentioned briefly.

2.1.2 PRINCE2

Prince2 is an acronym for Projects in Controlled Environments 2 and is a PM methodology which has become an often used standard since its introduction in 1996. Originally designed for managing IT projects, it now can (and is) readily be applied to non-IT projects as well. In fact, this methodology is so popular that some companies hire only Prince2-certified project managers. Prince2 is designed to provide a framework covering the wide variety of disciplines and activities required within a project. The focus throughout Prince2 is on the business case, which describes the rationale and business justification for the project. The business case drives all the Project Management processes, from initial project set-up through to the finish of the project.

Prince2 provides a tool which can be used to keep track of the valuable information of resources. This is especially useful within project team situations. The project team will become more efficiently and effectively working together.⁴ Prince2 can be seen as; "a structured checklist on how to manage a project".⁵ The way Prince2 is structured is through processes, components and techniques. The processes can proceed more than once and are shown in the figure below.

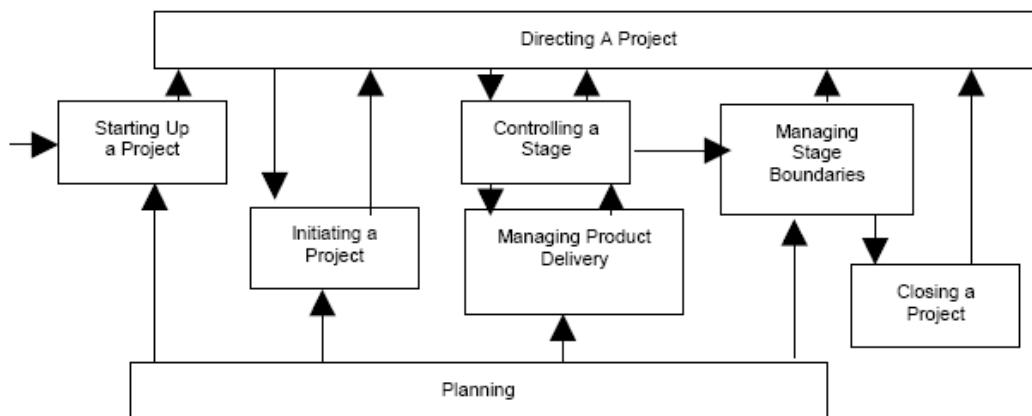


Figure 2: Prince2 processes

³ Charvat, J.P. (2003). *Project Management Methodologies: selecting, implementing and supporting methodologies and processes for projects*. Hoboken, New Jersey: Wiley

⁴ Office of Government Commerce (2002). *Managing Successful Projects with PRINCE2*. London: The Stationery Office.

⁵ APM Group Limited (2005). *PRINCE2 Case Study, PRINCE2 and PMI/PMBOK a Combined Approach at Getronics*.

Retrieved June 20, 2007, from <http://www.Prince2.org.uk/web/site/PRINCE2Resources/Case-Studies.asp>.

During these processes the components; Business Case, Organization, Plans, Controls, Management of Risk, Quality in a project environment, Configuration Management and Change Control are used.

Prince2 is capable of working with most techniques that implement best practices of project management, but three are described explicitly; Product-based Planning, Change control and Quality reviews.

Advantages

- The method is generally applicable and has active user groups in the United Kingdom and the Netherlands.
- The method focuses on project results in terms of the standard time, cost, quality, and functionality parameters, but also has a strong focus on business case and the benefits the project results deliver.
- The method integrates change management that controls the changing environment.
- The method uses management by objectives and management by exception approaches.

Disadvantages

- It can lead to huge and extensive bureaucracies when not tailored used.
- It is a method and not a cure for any project. People who use PRINCE2 should have enough knowledge, experience and continue to think.
- Human factor or soft issues are not within the scope of the methodology but definitely needed for project success.

2.1.3 PMBOK

The Project Management Body of Knowledge is a standard knowledge document first brought out in 1983 by the Project Management Institute (PMI), USA. Next to a code of ethics and a certification for project managers (PMP certificate) it includes also a standard baseline. This baseline consists of six major functions (or knowledge areas): scope, cost, time, quality, human resources and communications⁶.

The PMBOK creates a framework which splits the project processes into five distinct process groups: initiating, planning, executing, controlling and closing. It has to be noted that these groups do not imply that the project is executed in this order; they are only provided in order to be able to structure and categorize these different processes.

PMBOK also identifies several project knowledge areas: Integration management, scope management, time management, cost management, quality management,

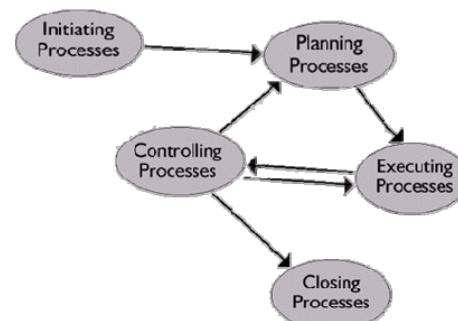


Figure 3: PMBOK processes

⁶ Duncan, W.R. (1995).Developing a PMBOK document: the US Project Management Institute's approach. *International journal of project management*, 13, 89-94.

human resource management, communications management, risk management and procurement management.⁷ By using this twin categorization in process groups and knowledge areas, it can be used to classify project processes. Generally accepted this does not mean that the knowledge and practices described in the PMBOK framework should be applied uniformly on all projects; the project manager is always responsible for determining what is appropriate for any given project.

Advantages

- PMBOK provides a general project management framework in the form of process groups and knowledge areas.
- It states the knowledge needed to manage the lifecycle of any project, program and portfolio through their processes
- It defines for each process the necessary input, tools, techniques and (output) deliverables.
- It defines a body of knowledge on which any industry can build its specific best practices for its application area.
- File all available information in a structured manner. Extra information about processes, tool and techniques can easily be added to the body of knowledge.⁸

Disadvantages

- The extensiveness of a PMBOK, it can be too complex for small projects
- PMBOK has to be adapted to the application area, industry, project size and scope, time and budget and quality constraints.
- No guideline about how to use this information

2.1.4 Similarities and differences

To see which method is best to structure the available knowledge and information within DHV, both methods should be compared to each other. Most important is to see what distinguishes each method. The main reason for the similarities between PMBOK and Prince2 is the overlap between the two approaches to project management, on the fields of requirement, method and techniques. The real difference between both is the difference between a framework with knowledge areas in PMBOK and a methodology in Prince2 as is visible in

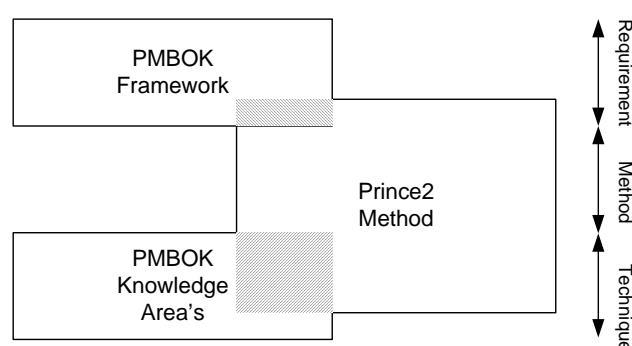


Figure 3 Similarities and differences in Prince2 and PMBOK

⁷ Project Management Institute (2004). *A guide to the project management body of knowledge: PMBOK guide*. Newtown Square, Pennsylvania: Project Management Institute, Inc.

⁸ Duncan, W.R. (1995). Developing a PMBOK document: the US Project Management Institute's approach. *International journal of project management*, 13, 89-94.

figure 4. The so called 'Framework' of the PMBOK can be seen as a collection of principles to which a method for project management should comply. This 'Framework' could be seen as a 'Project Brief' for the development of a method for project management in Prince2 terms.

The Knowledge Areas of PMBOK overlap with the Components of Prince2. The difference between both is in techniques. PMBOK discusses several techniques while Prince2 pays considerably less attention to techniques and focuses more on process. Thus, PMBOK can be best used to structure available knowledge and techniques, while PRINCE2 is best for 'how to do' projects since it is a real 'hands-on' method. We can summarize this information into these key-points⁹:

PMBOK

- Best approach for teaching knowledge areas
- Not effective as guidance for the running of a project.

PRINCE2

- Best approach for running a project
- Not effective as guidance for the necessary knowledge in project management subjects.

In our research in which no structured way of PM practice is available at the start of the assignment, it therefore seems legitimate to structure the available knowledge on PM practice into a Body of Knowledge for DHV. Therefore our framework will be built using the PMBOK framework and knowledge areas. Not the actual content of the PMBOK will be used for this first analysis, but mainly the idea of a framework and the six main knowledge areas of the PMBOK.

For the analysis of the structured information we used the Prince2 ('how-to-do') method. Using Prince2 we can analyze the DHV body of knowledge to see if there are any gaps in the common practice (the focus of PMBOK) to create the best practice (focus of Prince2), for this analysis we refer to chapter 4.

2.2 Context

2.2.1 Project management of building and industry construction projects

Construction projects are becoming more and more complex. With an increasing number of specialized contributors, stakeholders and subcontractors proper integration of many disciplines becomes necessary. Therefore a project organization is inevitable.

A construction process simply consists of the three following main phases; program, design and construction. During these phases the functions, characteristics and form become more clear with every step. Problem and solution must come together during this process. The program phase is all about getting the demanded functions clear and determining the feasibility of possible solutions. In the design phase the characteristics of the object are derived from the functions. The construction or realization phase includes the transformation from the characteristics to a usable object.¹⁰

⁹ APM Group Limited (2005).*PRINCE2 Case Study, PRINCE2 and PMI/PMBOK a Combined Approach at Getronics*. Retrieved June 20, 2007, from <http://www.Prince2.org.uk/web/site/PRINCE2Resources/Case-Studies.asp>.

¹⁰ K. Th. Veenvliet, inleiding *Reader B8 ontwerpprocessen*, University of Twente, Enschede

Construction project management differs from 'normal' project management because of the fact that building projects aren't executed within an organization. Instead they temporarily form a construction organization with the use of different external parties. This characteristic brings extra complexity, but it doesn't mean that the processes, instruments, tools and techniques from general project management are useless. Unfortunately their use often becomes more complicated. Other specific characteristics of a construction project are the commitment to a specific location, the change of coalition (partners) during the project, the extensive administrational regulations, the long life cycle of the product and the relatively high economical value.

A more detailed (standard) phasing of a construction project is the sequential phasing below:

Initiation phase: determine the need for construction

Feasibility study: analysis of project possibilities

Project Definition: defining the goals and objectives

Design phase: This can be separated again into the general design, preliminary design, and definite design

Tendering: defining the price, by making an inventory of the needed materials and inviting contractors for a bidding

Work preparation: further detail design for execution

Execution: the construction of the object

Hand over: approval of client and closing the project¹¹.

2.2.2 Construction Project Management in China

Like other sectors in the Chinese economy, the construction industry is also dependent on foreign capital, technology and expertise. The industry has some similarities with western projects but there are also some important differences. Some of these distinguishing characteristics are mentioned below.^{12 13}

First, trust and mutual respect are important values in the Chinese community. Emphasizing trust and mutual understanding shows more results than imposing power and authority. Next to that, family businesses are still very dominant in China and there is a heavy reliance on family contacts. Project managers must be prepared to face a horde of subcontractors who are connected in one way or another to the main contractor. Tactfulness and diplomacy in dealing with situations of this nature must be taken into account.

The Chinese also tend to concentrate more on the profit element and other related financial matters. A consequence is that designs and construction methods are chosen because of their economic convenience. Resource allocation can therefore be a more difficult task. There are also constraints in the use of international standard forms of contract. This is because little or no provision at all is included in these forms to provide for amendments in order to suit local conditions. Contract documents used are frequently bureaucratic and extensive. Foreign project managers should therefore be extra careful when dealing with procurement matters.

¹¹ Doree, A.G., Suurenbroek, Y.E., & Van der Veen, B. (2000). *Dictaat Bouwprocessen*, Enschede: University of Twente.

¹² Pheng, L.S., & Leong, C.H.Y. (2000). Cross-cultural project management for international construction in China, *International Journal of Project Management*, 18, 307-316.

¹³ You-Jie, L., & Fox, P.W. (2001). The construction industry in China: its image, employment prospects and skill requirements. Geneva: International Labour Office.

One of the characteristics concerning the government is the extensive amount of regulations. In China there are a lot of permits enforced by law and therefore a lot of documents need to be chopped. An important regulation is that foreign companies need to hire two third party companies in the construction process. These parties are enforced by law and consist of a Local Design Institute (LDI) and a Jianli (Building supervisor).

Most foreign companies do not have the right certificates to chop their own designs. Therefore they need a LDI for their preliminary en detailed design. Usually the foreign companies make the initial design themselves. Next to the LDI there also is a third party LDI, a Design Review Company, to review the LDI. This is also enforced by law. The Jianli is only needed during the construction phase. This company will check the building quality during construction to see if it lives up to the regulations stated in Chinese law.

Finally, bureaucracy and bribery are still prevalent in China in spite efforts from the government to exterminate these ills. Along the way, connections at the right places can speed up the application process.

2.2.3 Project Management practice at DHV Shanghai

As stated before, DHV Shanghai operates mainly in and around Shanghai, China. Therefore it has to take construction project practice, as it is in China, into account. The main characteristic that makes project management at DHV Shanghai different from the rest of China is that they mainly work for western companies and on high end projects. Especially the level of demanded quality is high. A second characteristic of DHV practice is the size of the assigned projects which are relatively large and complex and are often executed under time pressure. The third characteristic is the special task DHV project managers have during a project. DHV manages the project for a client. They try to control all aspects for this client but most contracts with external parties are signed directly by the client. In these cases DHV does not burden the risk of budget exceeding, time delays etc. This implements however, that they do not have the direct power to influence these budgets either.

The phasing used in practice at DHV Shanghai is presented below. This phasing was constructed together with two experienced project managers in a first orientating conversation.

Feasibility Study: A first study to roughly determine costs, possible locations etc. Usually a company contacts DHV after the company has done a feasibility study itself. Therefore this phase is not in the main interest of DHV.

PoR & ID: The program of requirements is put together after interviews with the client and the users. This is a combination between technical and functional demands. Usually these requirements instantly will be documented in drawings. These drawings are the initial design. This initial design is the input for LDI in the preliminary design.

PD: The preliminary design has to be made by a Local Design Institute (LDI), these drawings need to be approved by the client and chopped by the government.

DD: The detailed design is divided into two issues: the IFB or issue for bidding and the IFC or issue for construction. First the IFB is made. This is a first version of the DD. It is worked out to a certain level of detail, but some things still need to be added and a thorough inspection for possible errors isn't done in this stage. The IFC is the final document for tendering. The design quality of the IFB is enough to start the tendering.

Tendering: The tendering phase usually starts after finishing the IFB.

Construction: The actual realization of the object which also includes the work preparations. The actual construction can only begin after completion of the IFC.

Testing & Commissioning: A punch list is used to check if the structure indeed is built according the demanded standards. This involves testing of installations etc. as well as checking for errors in applied materials.

Hand over: The official handover of the object to its owner, this also includes a defect information period. This period is normally one year and has a maximum of 2 years in which DHV normally assists the client in the first months after completion.

2.2.4 Characteristics

The characteristics of DHV Shanghai consist of their present practice and the culture of the country in which it operates; China. The most important characteristics that influence project management are Governmental regulations and bureaucracy.

In China as many other countries there are government regulations to take into account when you want to start a building project. Though in European countries the rules are usually quite clear, this not the case in China. Besides this, there are a lot of parties involved to approve certain aspects of the project before you can proceed. These regulations and laws can also be interpreted in different ways, usually not for the benefit of the client of DHV.

Because there is a lot of bureaucracy, the regulations and laws are not clear and they can be interpreted in different ways, this can easily lead to bribery to gain time in the project approval process.

For the characteristics of the best practice a comparison will be used of the DHV phases with the already mentioned general stages from the literature;

No initiation phase: This is because DHV is always doing a project for their client.

No project definition phase: But the PoR & ID together in one phase. The reason for this is that DHV does not have the necessary permits to make a design that can be used directly by the contractor. They need the LDI to make these drawings. The DHV architect will therefore only make the ID, which will be drawn up directly from the PoR.

Spilt up Design phase: The design phase is the same, because this is an important task for DHV together with the LDI, it has been split up into the two phases; PD and DD.

Work preparation and execution are combined in construction phase. DHV is not building the projects, but merely responsible for managing the project construction on quality, time and money for the client. The general contractor (GC) is responsible for the construction itself.

Testing & Commissioning: This phase is not mentioned in the reference book.¹⁴ But for DHV an important phase, because clients usually have complex installations in their projects. A good effort in the testing & commissioning phase will also smoothen the hand-over phase.

¹⁴ Doree, A.G., Suurenbroek, Y.E., & Van der Veen, B. (2000). *Dictaat Bouwprocessen*, Enschede: University of Twente.

2.3 Framework

To build a framework to structure the available information we will use six of the knowledge area's of the PMBOK method in combination with the main characteristics of the context; the project phases. This framework is presented schematically in the figure below.

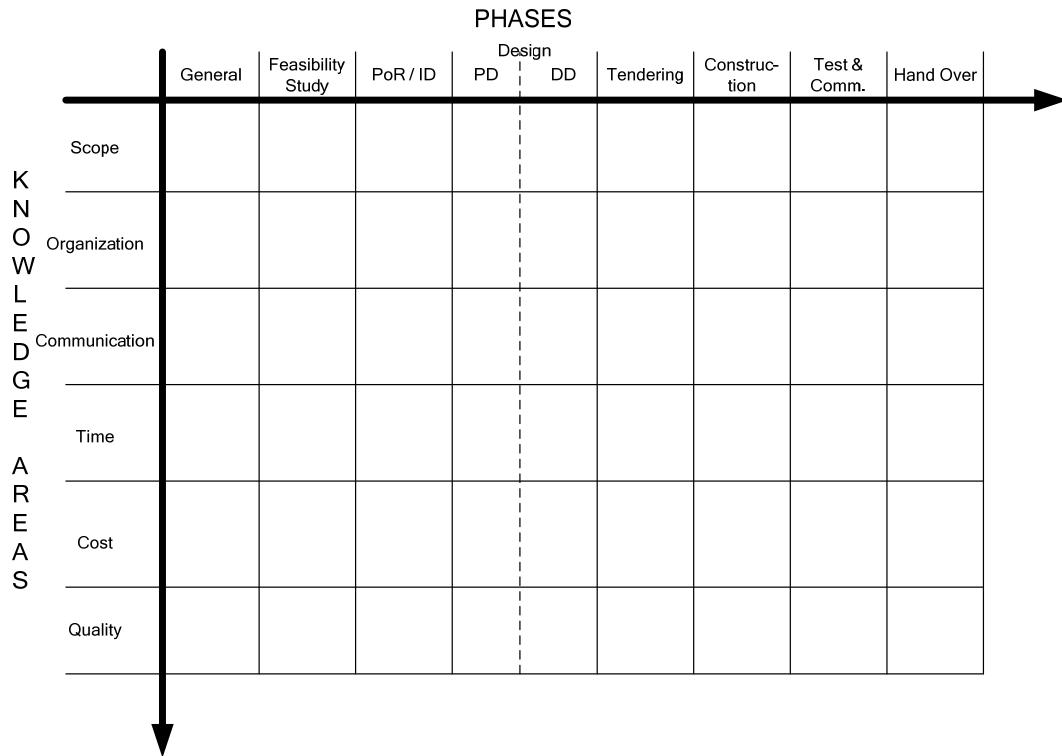


Figure 4: Schematic Framework

We built up the framework using the DHV phases as main structure in the next chapter. Next to this an extra paragraph is added to discuss general procedures that are used throughout more than one phase. For the design phase we split the paragraph into two sub-paragraphs. This main structure, in phases, is presented on the horizontal line.

As substructure the knowledge areas, based on PMBOK, are used. Though we changed the HRM knowledge area into organization, because this is better applicable in projects DHV manages for their client. Within the knowledge area 'Communication' an extra paragraph will be devoted to authority, due to the special attention this subject needs in China. The substructure, in knowledge areas, is presented on the vertical line.

During our research we used this structure to analyze and categorize all available knowledge. In this paper we have chosen however to merge the different knowledge areas per phase. We have chosen to do so to enhance the readability of the paper.

3 Project management in practice

To answer our second research question; “What are the characteristics of project management process at DHV Shanghai?” we have to take a look at the current practice at DHV and describe it. An easy and structured way to do so is to fill the framework set up in chapter two. As mentioned before the information in this chapter is mainly gathered through interviews.

Until this point of this research thesis we worked together, but we divided our tasks in different knowledge area's. As mentioned earlier there are six main knowledge area's; scope, organization, communication, cost, time and quality. I filled out the framework for the first three knowledge area's, as Daan did for the latter three.

3.1 General

3.1.1 Scope

Scope control is very important for DHV. Scope control is all about keeping the deliverables and boundaries of a project clear. The project scope can be defined as: “The bounded set verifiable end products, deliverables, or outputs that the project team undertakes to provide to the owner or sponsor of the project¹⁵”.

Within DHV the project proposal and the contract are the main documents in which the scope is clearly stated. A Work Breakdown Structure (WBS) is a good method to oversee the project and break the scope up into smaller workable packages. There are three main approaches to construct a WBS:

- Process or activity oriented: this involves breaking the project into the different activities it involves such as management, needs analysis, purchasing, testing, installation and training
- Achievement-oriented: this involves breaking down the overall project objective into achievements such as having fully trained users, and acceptance of a system
- Function or product oriented: this involves breaking the project up according to the different parts of the final product e.g. offices, production area and landscaping¹⁶

Within DHV not just one single method is used by the PM's. Often a combination is made. For example, different WBS's are made for the planning and costs.

Scope change is very common within project management, usually because a client changes his mind. Within DHV they have a step by step procedure to control such a client's wish. This usually occurs in the design stage, the effects on cost and time are taken into account. The client has to approve (e.g. extra time or cost) before continuation.

The contract is also very important for the scope, because the responsibilities and obligations of both parties will be stated in the contract with DHV and the client. The specific scope of DHV, the area it usually works on, is the area of Engineering Procurement Construction Management (EPCM).

¹⁵ Wawruck, W.A. (1987). A Neglected Dimension of Effective Performance on Diverse Projects. *PM Northwest Regional Symposium*.

¹⁶ *Self-study management training.* (n.d.). Retrieved April 30, 2007, from <http://mindtools.com>

By defining these boundaries clear together with the expectations of the client, DHV can set up a clear project scope for their own project (management). This is required, because the goals of the client and DHV are usually exactly the same.

Whether DHV contacts a company first or the client contacts DHV first, they always want to write a good proposal, which outlines the project and work scope and responsibilities.

3.1.2 Organization

The organization of projects contains of an internal organization (DHV team) and an external organization (DHV team with client, contractor, design institute etc.).

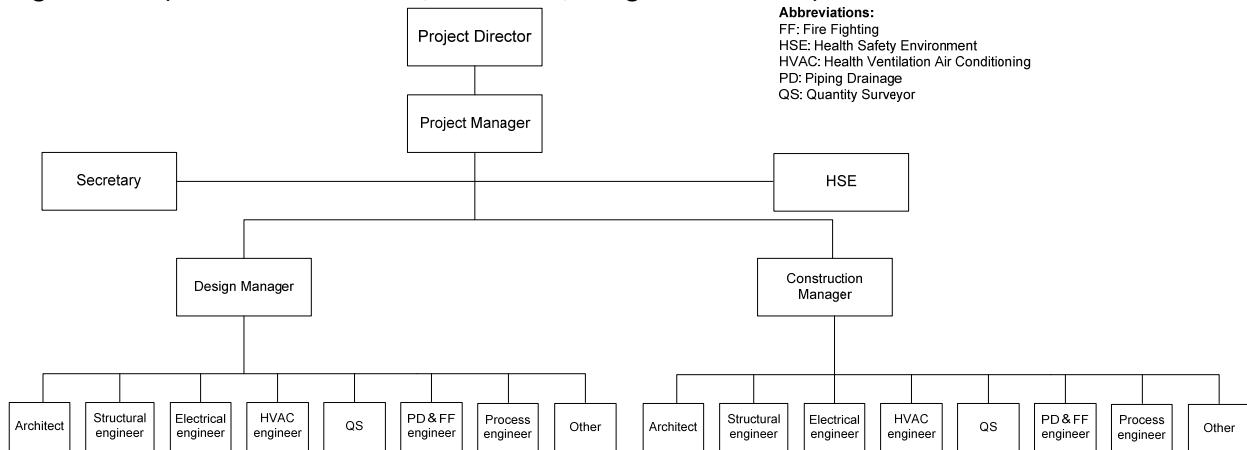


Figure 5: DHV's project team internal organization chart

The internal team usually has a Project Director as end-responsible of usually more than one project at the same time. He is a troubleshooter and helps the Project Manager with important milestones; like contracts, handover etc. The daily project work is done by the Project Manager, who is usually dedicated to one project. He controls day to day communication with the client and manages the control area's (cost, time, quality etc.). The Project Manager is assisted by the staff functions of his secretary and his HSE (health, safety and environment) personnel. In smaller projects the Project Manager also is the Design Manager (DM) and/or the Construction Manager (CM). Normally the DM is the LDI contact person and oversees the technical aspects in all design stages. The Construction Manager is the contact person for the General Contractor. Both of them will have a team of engineers within DHV working for them.

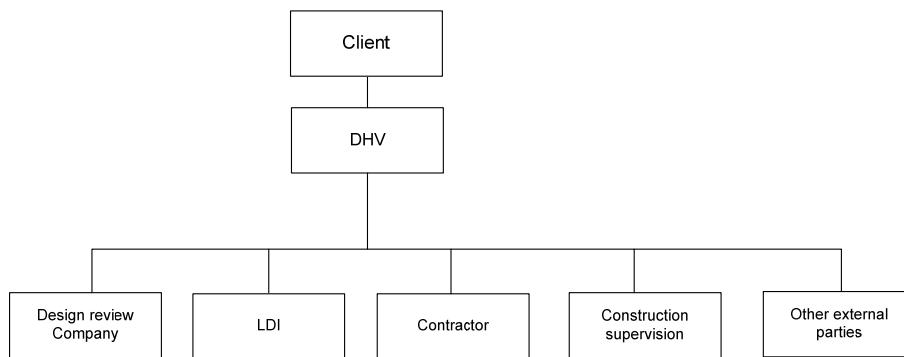


Figure 6: DHV's external organization chart

The external project organization in projects DHV is involved in usually exists of the parties mentioned above. The contact person from the client's side is usually a Project Manager who directly communicates to the project manager of DHV. The Project Manager of DHV will manage the other parties mentioned in the figure above. This type of organization is common within the entire industry. It is however important to mention that the contractual lines differ from the organizational lines. Within DHV contractual lines are almost always directly between the client and other parties.

3.1.3 Communication

Though communication is not always recognized as an important area to control, in practice it is essential. Good communication can prevent a lot of misunderstanding. Within DHV the main focus is on external communication, because internal communication is very well controllable due to the location of the team members being on the same office floor and the ease internal meetings can be held.

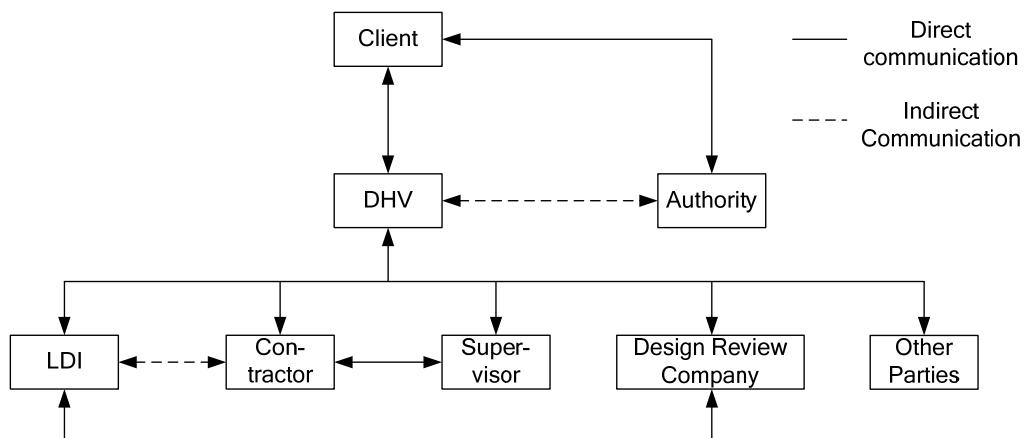


Figure 7: Communication lines

This is the communication-map for a typical project. The client, or actually the Project Manager of the client, communicates with DHV's Project Manager. The Project Manager of DHV manages his team and all the parties involved in the project process.

To be able to monitor all agreements that are made throughout a project, all communication will have to pass through the Project Manager (see the 'hourglass' model in figure 9). This might look like a 'bottleneck' in the conversation process, but actually the Project Manager can keep all parties up-to-date and can clarify any obscurities if they occur.

In China the authorities also play an important role in the communication process. Because a lot of permits need to be acquired from the local authority or the government, good communication with the authority can speed up the project process, but maybe even more important, if it is neglected it can lead to huge delays of the project.

DHV acknowledges the difficulties of authority handling in China and therefore DHV can assist the client in dealing with the authorities by preparing the necessary documents for a permit request.

Within DHV a distinction is made into three types of meetings; internal meetings (DHV team), external (with LDI, contractor or other external party) or client meetings. To document the agreements in a proper way, with each of these meetings 'minutes of meeting' (MoM) are made by DHV.

For the procedure of filing and archiving all documentation the PM's use the 'Guidebook project documentation'. The secretaries usually take a big share of the work of filing and archiving. The secretaries have a manual of their own ('project & construction document control manual') for documenting. They keep copies of all written communication (fax, e-mail, letters, proposals etc.) and always check with the Project Manager for any incoming or outgoing communication. This is done to make sure all agreements with all parties are on paper. Especially in the Chinese culture this can come in handy as some parties can 'forget' an agreement.

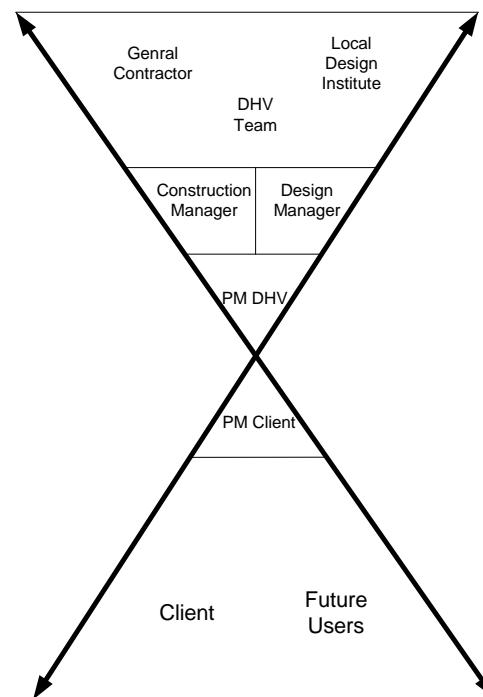


Figure 8: The 'hourglass' communication model

3.2 Feasibility Study

The feasibility study is an important preliminary study to determine and document a project's viability. This phase though, is usually done by the client themselves. In practice DHV will only make a feasibility study sporadically and on special request of the client. If DHV executes a feasibility study for the client, usually a special contract for this specific phase is set up. To actually start a project a project approval from the government should be acquired by DHV for the client. In the feasibility the construction itself is estimated using a set of rough prefixes and unit-prices. Additional budgets are estimated by adding a certain percentage to the construction costs. Complimentary, DHV can also assist in the selection of suitable sites. Similar to common project organizations, this phase is primarily a task of the client and DHV can play an advising role in this.

3.3 Program of Requirements & Initial Design

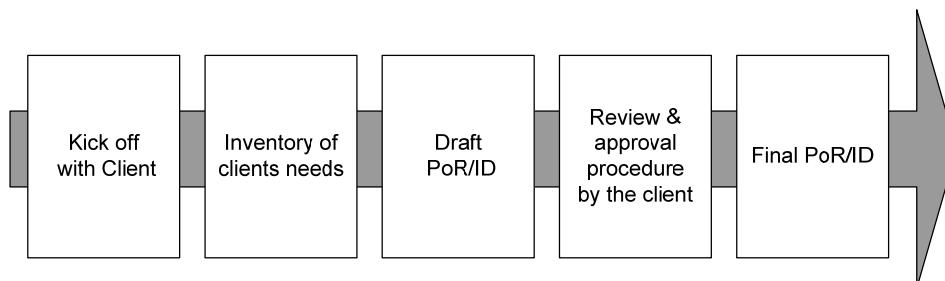


Figure 9: Steps in the PoR/ID phase

The program of requirements and the initial design phase are joined together into one phase. The main reason to do so is because a drawing can sometimes say more than a thousand words. A second reason is the government's demand for plans in an early stage. This joint designing and

sketching is a difference with common project practice. As said this is done to streamline the process and due to governmental permits.

A kick-off meeting is held as the formal start of the project with the client. DHV uses interviews and questionnaires to make a complete and structured inventory of the client's needs. The PoR & ID phase does not need an approval by the authorities or a third party. Approval from the client is crucial however because the PoR is seen as the base of each project.

3.4 Design

The design phase is subdivided into the Preliminary Design (PD) phase and the Detailed Design phase (DD). Within the design phase DHV always uses a Local Design institute (LDI) for the PD and DD. Due to government regulations foreign companies are not certified to draw the PD and DD. Therefore they need a local design institute to make these drawings, the LDI will ask the government to approve these design drawings and 'chop' the designs. There also is a third party, a Design Review Company (DRC) who also needs to approve the drawings before continuation.

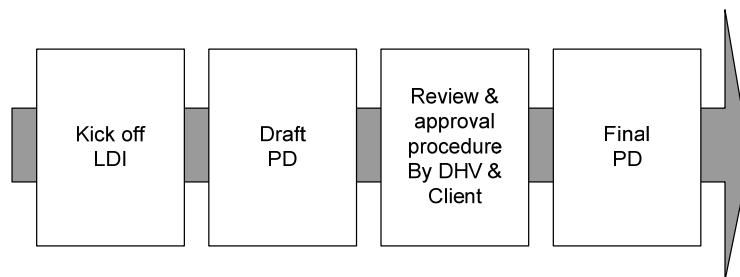


Figure 10: Steps in preliminary design phase

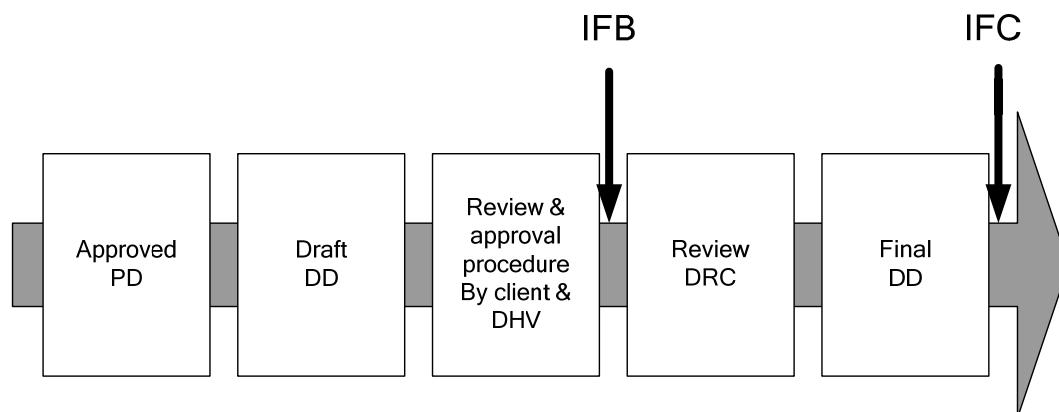


Figure 11: Steps in detailed design phase

In the design phase it is very important to keep close track of the design process and especially of any changes or modifications in the design. Within DHV these requests for change are structured using a 'design change notification' (DCN) document. The client needs to fill in such a document and sign it for the extra time and cost the change will probably take. This will prevent any future disagreements with the client and other parties.

There can be different forms of contract. The normal form of contract in the design phase is a contract signed by the client and the LDI. Sometimes however, a contract for the design is signed by DHV and the LDI.

To select the right LDI for a certain project the key factors are the location of the LDI (is it based in the same city as where the project will be located) and the right knowledge. These factors are important because culture and governmental regulations can vary greatly between different provinces and even cities in China. Also designer-expertise in a specific field can make the design-process much easier. If there are many qualified LDI's a tendering procedure for the LDI will be started.

Though the LDI usually 'contractually' does not work for DHV, in the day to day practice it is seen as a part of DHV. The design drawings are as much the responsibility of DHV as of the LDI. The reason why DHV feels this responsibility is because the client will always feel that DHV is responsible or at least expects DHV to foresee any design difficulties.

Communication is of vital importance in the design phase, because in this phase things can still be easily changed on paper, in stead of during the construction phase in concrete. To streamline communication the preferable way of communication (by DHV) is the 'hourglass' model. The PM is the pivot in all communication. Figure 13 shows the communication lines in this phase.

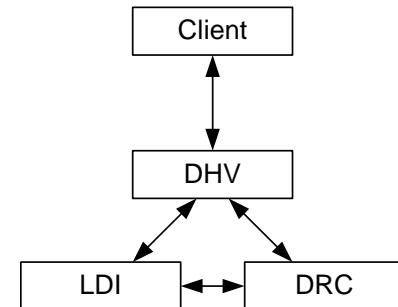


Figure 12: Communication in the design phase

The design process will start with a design 'kick-off meeting' with the LDI. There is a weekly progress-meeting with the LDI to keep a close look on the design and to make sure all which has been stated in the PoR and ID is really used for the PD and DD. At the end of the PD and DD a 'review and document approval procedure' takes place which has to be approved and signed by the client before continuation.

3.5 Tendering

The tendering phase in practice will start before the actual end of the design phase. Since this is a vital part of the preparation for the construction phase the steps taken in this phase have a huge influence on the progress in the construction phase. The most important part of this phase is selecting a General Contractor (GC) and negotiating a good price for the client.

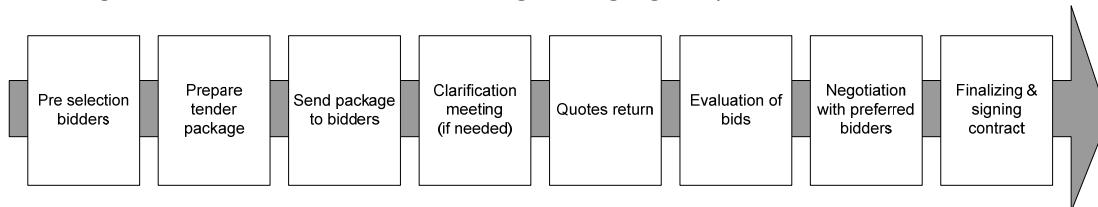


Figure 13: Process steps in the tendering phase

After completion of the Detailed Design it will further result in a package for Civil, Architectural and Structural works (CAS) and in a Mechanical, Electrical and Process works package (MEP). Tenders are to be based on the Issue for Bid (IFB) packages that include the Bill of Quantities (BOQ) to be prepared by the LDI in close cooperation with DHV's National Registered Quantity

Surveyor (QS). At the end of this phase, the final construction budget will be prepared in close cooperation with the DHV QS. Finally the tenders will be evaluated, clarified and negotiated, resulting in finalization of contracts with one General Contractor (GC). This contractor will usually manage both CAS (Civil, Architectural, and Structural) and MEP (Mechanical, Electrical, and Process) works.

For the tendering phase a contract has already been set up by DHV together with the client in the design phase. These were called the IFB and the IFC; the actual contract will be based on the bidding of the GC on the IFC. The contracts are based on the FIDIC (International Federation of Consulting Engineers) general conditions.

There are two forms of contract generally used within DHV; a Lump Sum and a Re-measurement contract. The Lump Sum contract means one price for the whole contract. This is the easiest form for DHV to manage, though design changes are more difficult to integrate and will need new negotiations with the contractor for the price of the change. A Re-measurement contract is usually preferred by the GC. The GC gets paid per unit which goes into the building (e.g. steel beams). The advantage is that design and construction changes can be easily made without changing the contract. The disadvantage is that all the work that is actually put in to the building must be checked, this causes extra work for the QS and the Project Manager.

The authorities are also involved in the tendering phase. Before the construction phase can be started a formal document called the 'construction permit' needs to be acquired from the authorities. Sometimes DHV uses a 'authority specialist' to speed up this process since the Chinese system is quite bureaucratic and the regulations concerning permits can be interpreted in many ways.

3.6 Construction

In the construction phase all the designs and preparations will be put into work. The construction phase is all about making sure the GC completes the building according to the agreed design. The main focus in this phase is on time, to complete the project within the deadline with of course no or minimum of extra costs, while maintaining the pre-defined level of quality.

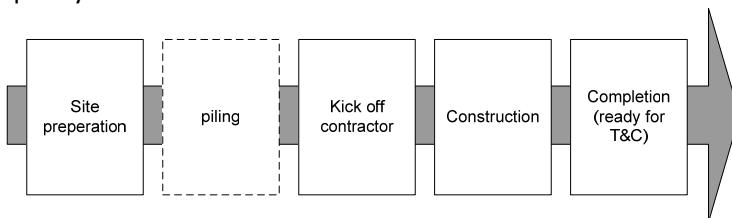


Figure 14: Steps in construction process

For the DHV PM the main task is to smoothen the work of the GC. One of the company motto's which surely applies to this phase is; 'you can not be responsible for what you can not control'. So the DHV PM is not responsible for work carried out by the GC, but should create an optimal working environment for the GC.

Throughout the construction phase DHV's main responsibility is to monitor the construction processes to assist in ensuring that all the requirements of the client for such processes have been met.

The communication in this phase is quite similar to the design phase. When there are questions from for example the GC about the design this will go through the PM. But when the GC just needs specifications he can ask the LDI directly.

The in chapter 2.2.2 already mentioned Jianli is the on-site authority during the construction phase. The filing and archiving of the documents by DHV is especially important in the construction phase, because they need to be available for the final permissions by the government.

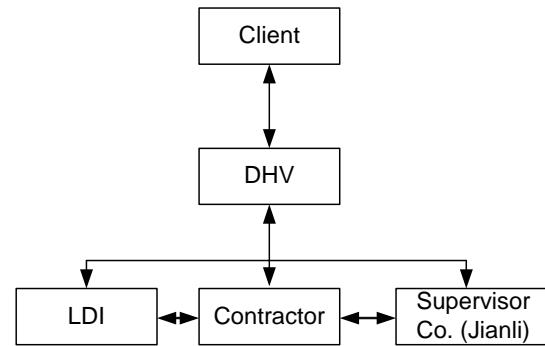


Figure 15: Communication map in the construction phase

3.7 Testing & Commissioning

In the testing and commissioning phase the structure (whether it is a building or plant) is tested to see if everything works properly. There is a checking on building errors, installation errors, as well as details like scratches on doors etc.

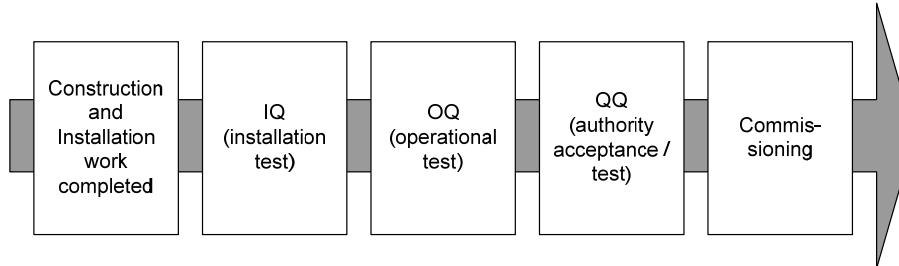


Figure 16: Steps in testing & commissioning phase

In the testing phase the different smaller items are first tested separately followed by the testing of a complete system, like the fire-fighting system. After the testing phase the commissioning phase starts, this means putting the whole building 'into work' and checking for errors in for example building temperature (heating, AC). DHV accompanies the commissioning for the crucial systems on which government approval is needed (e.g. fire fighting). During testing and commissioning all tests are documented in the testing and commissioning report.

3.8 Hand-over

After testing and commissioning, the building or plant will be handed over to the client. This is the last phase with responsibility for DHV. After this hand-over the client is responsible. DHV will merely assist in the communication with the GC in the defect information period.

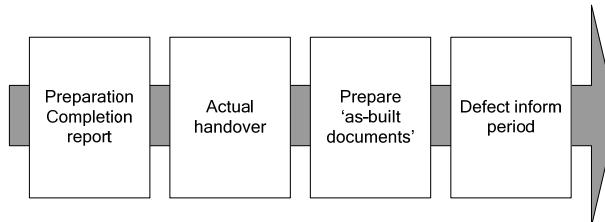


Figure 17: Steps in hand over

Alex: In the hand-over phase DHV will be responsible for the actual hand-over to the client. Before DHV can hand-over the building or plant, they first need a completion approval from the government.

4 Challenges & possible improvements

In this chapter a comparison is made between project management practice at DHV Shanghai and project management literature. The former is described in the previous chapter, for the latter the project management method Prince2 will be used. In the first paragraph the method of comparison is discussed. In the second paragraph the results from the comparison are stated in challenges and improvements. The last paragraph is used to add the challenges which are not extracted from the comparison directly.

4.1 Comparing practice using Prince2¹⁷

As mentioned a comparison is made between the project management method Prince2 and project management practice as it is executed at the DHV Shanghai office. As PMBOK was useful structuring the information, Prince2 is useful for its complete and structured manner of executing a project. This advantage of being a comprehensive method, together with the advantage of its general usability, makes "Prince2 the best approach for running a project"¹⁸. It therefore seems justifiable to choose Prince2 when making a comparison. When comparing this method with current practice, Prince2's disadvantages must be kept in mind. The method's tendency to lead to bureaucracy and the lack of focus on the human factor is too important to be left out. For a more extensive explanation of the method we refer to chapter 2.1.2.

When DHV's project management practice is compared to the Prince2 method certain dissimilarities come to the surface. It is important however, to distinguish a dissimilarity from a challenge. There are several reasons why a difference between practice and literature does not directly demand a change from practice towards literature. A possible reason for a so called 'gap' between practice and literature can be the specific context in which DHV practice is situated. This includes the cultural characteristics, national and local governmental characteristic and the company culture. Second, the sector of industry, in which DHV operates, can demand a specific approach. This includes the characteristics of Building and Industry projects, the project's scale, its complexity and the 'special' field in which DHV operates being a consultant and project manager for a client.

In this paper we will not enumerate all differences, only the actual challenges and improvements will be given. This comparison between DHV practice and the Prince2 method is made on a more abstract level. As it is not in our scope (and not desired by DHV) to actually implement Prince2, practice is scanned and compared to Prince2, pointing out only the possible challenges and improvements. Wherever Prince2 terminology is used, the accompanying Prince2-abbreviation will be given as well.

¹⁷ - Akker, van den, A. (2002). *PRINCE2 Compact*. Heeswijk: Lagant Management Consultants BV.

- Office of Government Commerce (2002). *Managing Successful Projects with PRINCE2*. London: The Stationery Office.

- Fredrikz, B., Hedeman, B., & Vis van Heemst, G. (2004). *Projectmanagement, een introductie op basis van PRINCE2*. Zaltbommel: van Haren Publishing.

¹⁸ APM Group Limited (2005). *PRINCE2 Case Study, PRINCE2 and PMI/PMBOK a Combined Approach at Getronics*.

Retrieved June 20, 2007, from <http://www.Prince2.org.uk/web/site/PRINCE2Resources/Case-Studies.asp>.

4.2 Challenges & possible improvements

Formal start-up document: A first challenge can be found at the very beginning of the project. As we compared the start up process of a project executed at DHV with the theory from Prince2 it becomes clear that a formal start-up document or Project Brief/Business Case (SU4) is not available within DHV. This deficiency can be explained by the fact this is primarily the task of the client. DHV enters the project after the client has made a decision to start-up a project.

It still is important however to clearly in all aspects. All roles and expectations must be defined clearly. Although this information is partly written down in the contract between the client and DHV and also talked over during the first exploratory meetings, some subjects, are not suitable for a contract but are too important to only be discussed during meetings and written down in minutes. For example a contract is not a suitable document for a summary of the most important risks during a project but they are too important to only be mentioned during the first exploratory meetings.

Project Quality Management: A second challenge is the lack of an overall quality plan (IP1). According to Prince2 a project quality plan must contain all activities that are needed to meet the client's quality expectations. It consists at least of a; Quality system, Quality control, Quality assurance and a Quality planning. The quality system includes the different procedures, processes and organization to implement quality. Such a system is the basis of a quality plan but unfortunately not structured available at DHV. In other words; Quality of the various sub-products is ensured through numerous procedures, but no guarantee can be given that every aspect and sub-product of the project is checked properly as there is no overall quality system. This quality system is useless however without good Quality control. Quality control consists of the actual quality monitoring itself and can be done through several techniques. One of them is the Quality review technique provided by Prince2. The reviews performed by DHV, for example during the design phases, are quite similar to this Prince2 technique. Adjustment of Quality Control therefore is not needed. Quality Assurance is about the correct use of the quality system. This is not available but is probably not needed with the size of the projects executed by DHV. The same applies to a separate Quality Planning; as such a separate planning is time consuming and is integrated into the existing time schedules. Summarizing, project quality management can be improved by the set up of an overall quality system fitting the quality control techniques used at this moment.

Handing over tasks/assignments: When certain tasks or assignments are handed over to a project team or external team, Prince2 advises to formally authorize a Work Package (CS1), or any defined work assignment. The scale of the projects executed by DHV makes the formal set up of a Work Package for every task unwanted. But when, for instance, tasks are outsourced in the design phase, a Work Package and the formal authorization could be a useful tool to make clear agreements. These agreements can be for example on the subjects of resources, tolerances and reporting demands. The only current possibility to clearly state such agreements is in a contract or during a kick-off meeting. Quite similar to the first challenge there is however information that is not suitable for a contract neither a meeting. A basic procedure for the managing of a Work package can be extracted from the product delivery process (MP) as well.

Risk assessment: Risk can be defined as the possibility a certain problem occurs, multiplied by the effect of this problem. Managing those risks is one of the most important tasks of a project

manager. A small risk can undermine a whole project. Prince2 supports this view and pays great attention to the assessment of risks. Within Prince2 its importance is represented by the component; Management of Risk. Management of Risk can be divided again into a risk analysis, which contains the search and assessment of different risks, and risk management, containing the execution of risk-reducing measures. Although the DHV project managers pay great attention to the management of risks, an explicit assessment (or explicit and structured analysis) of risk is not performed. For example a risk-log is not kept. Especially for DHV's practice the explicit assessment of project's risks would increase its service and level of professionalism to the client. As the client often runs all risks, an explicit mentioning and update of these risks during meetings would ease the assessment of those risks by the client.

Project Evaluation: After the actual hand-over of a project DHV uses two evaluation forms to evaluate its projects. In an external form the client is asked to give its opinion about the project. In the internal evaluation DHV-staff themselves are given the chance to evaluate and write down lessons learnt. These documents form a good foundation for a structured evaluation. To be useful for future projects it is just as important to actually use gathered information. Unfortunately this is not performed at DHV Shanghai. Using the Prince2 method (CP3) gives good directions for the further use of these valuable evaluations. An example is the set up of a lessons learnt report after the projects closure.

4.3 Additional challenges

Next to the challenges stated above there are also challenges that emerge parallel and independent of the analysis made in the previous chapter. These, often more concrete, challenges were gathered during site-visits, observations and especially interviews. Some of these 'parallel emerged' challenges are definitely worth mentioning.

Knowledge sharing: The first additional challenge can be found in the field of knowledge sharing. Access to available information and knowledge is not optimal at present. There is no easy access to previous projects and no easy access to templates, best practices and literature. All of which are a great source of knowledge. The second challenge concerning knowledge sharing is the lack of written (digital or not) documentation. As stated before there is a large amount of knowledge available within in the office, but this information is mostly not written down. To learn from each other it is crucial for an organization to have all knowledge available.

Health, Safety and Environment: Partially overlapping the challenge concerning quality, 'Health, Safety and Environment', or HSE, is becoming an increasingly important term in construction projects. Especially western companies and chemical companies increasingly demand a certain guaranteed level of HSE. DHV however, has no standard HSE procedures, accept for the regulations that are enforced by law and ad-hoc handling if requested by the client. In this way it is very difficult to guarantee a certain level of HSE quality.

Maintenance: This challenge looks obvious but is certainly worth to be mentioned. When a comparison is made between the different phases in a DHV project and the phasing in standard literature about construction it immediately becomes clear that maintenance is not included in DHV Shanghai practice. This 'gap' can be partly explained by a lack of interest in this subject in the whole of China. Nonetheless it seems worthwhile to explore the possibilities on this field as it can be an extra service to the client and an extra source of income for DHV itself. As this challenge is purely the content of a project and not about project management itself this challenge is not in our scope. This challenge will therefore not be analyzed.

Design Integration: Before discussing this challenge we will first define the term design integration. Design integration, in this context, is the whole process of integrating all different fields of knowledge and requirements during designing. This challenge is especially important in complex projects as engineers often tend to work on their own subject and do not look over their task boundaries. Another challenge in design integration is the communication between the DHV office (engineers) and the external designers (LDI). This also influences design integration and is non-optimal because of the lack of standard rules. Now different people have a different understanding of some drawings or terms. This challenge is, similar to the previous challenge, not directly about project management but is related to the content of each project itself. It therefore is left out the analysis as well.

As we overlook all challenges and possible improvements listed above a certain type of improvement can be recognized. This type of improvement can be found in the field of procedures. The challenges which mainly concern procedures are:

- Formal start-up document
- Quality procedures
- Handing over tasks/assignments
- Risk Assessment
- Project Evaluation
- Health safety and Environment
- Knowledge sharing

As mentioned above the following two challenges are not in the scope of this research and therefore not further addressed.

- Maintenance
- Design Integration

5 Implementation

Since the challenges and improvements have been stated in the previous chapter it is now possible to look at the implementation of these challenges. In this chapter we will go through the possible implementation of each challenge/improvement, in other words 'how' to make the improvement work. The main issues of each improvement in the previous chapter will be mentioned and a suggestion on how to implement will be given.

5.1 General procedures

As the listing in the previous chapter shows, the biggest room for improvement lies in the field of knowledge sharing.

Knowledge sharing: During our internship we created a PM manual which states the current knowledge within DHV. This manual is used as a general source of knowledge which can be consulted by all project managers at their own will. The structured analysis carried out during this research functioned as a basis for this manual. The framework designed in chapter 2 was used to fill out all gained information. Next to the current practice from the analysis we have also paid extra attention to practical tips and best practices (templates and examples).

The currently used templates and example documents were put in the knowledge database called Sharework. Sharework was set-up over three years ago, but had not really been used ever since. During our internship we discussed the benefits of a knowledge sharing database with a senior Project Manager. Due to his effort a new version of Sharework was launched. The manual and all related documents have been put into Sharework. Now the PM manual can be used as an easy operating document which is linked to Sharework as its backbone.

The current IT system within DHV is also a subject for improvement and can be seen as a part of knowledge sharing. On the mid-long term this will be solved by a new developed IT-system for all global offices, in which all information will be stored on one server. This will make information available whenever and wherever as long as you have a internet connection. On the short term though, the IT system should still be improved. The server maximum capacity has been reached at the moment. This means that staff can not save their work on the server and make it accessible to other staff members, besides this will make the pro-active use of the knowledge database Sharework for example impossible. Therefore a simple solution like adding extra hard-drive capacity to the server can be implemented as soon as possible. This is a simple improvement that could be easily executed by the current IT-manager.

Other improvements can be made through procedures. Therefore each of these procedures will be shortly discussed and a possible way of implementation will be suggested. However, one important note must be made by each of the following procedures: Implementation is not only about setting up the procedures and manuals. In fact, it is only the first step. Making the *people* use these procedures is just as important. A whole bookshelf filled with procedures is useless when no one ever looks at them. Making the procedures easy accessible and easy to use are just as important. Maybe even more important is to make the users familiar with its content and to show the users what the benefit is for them. In other words: why should they use it in the first place? The following suggestions for implementation must be read with this note in mind.

As mentioned in the previous chapter it is best to focus on a quality system when trying to improve overall *project quality management*. This quality system should contain a set of procedures on how and when to use which quality techniques. These techniques to monitor, test, check or ensure quality are, as said before, already available. The quality system that is to be designed should oversee all these techniques, making sure that quality is ensured during the entire project. This will prevent 'gaps' in the process of controlling quality.

As this future quality system should be integrated and combined with the current quality techniques, it is not easy to simply take a standard quality system and implement it without any major changes. At best the DHV Shanghai quality system should be designed bottom up. Beginning at the basis, using the available techniques and working up to the general and overall quality procedures, this document could develop similar to the General Project Management Manual. This means that the current practice is analyzed and written down first after which fitting procedures are (gradually) added filling the 'gaps' in quality management practice. This improvement depends mainly on the effort and time that is put into it. This implementation can be performed by either a DHV employee or a student during an internship.

For the overall *HSE procedures* it will be best to create a manual to write down the procedures, though a careful distinction has to be made between different construction projects. Building projects on one hand and industrial plants on the other. Because of the severe effects and media attention when incidents occur at an industrial plant, the HSE procedures are extensive and specific and demand for extra measures. In practice DHV has already made a specific HSE plan on request of a client. This HSE plan can be used as a foundation to create a standard DHV HSE manual. The actual writing of the manual can once again be done by a DHV staff member or a temporary workforce like a student.

The overall *risk assessment* is a point of improvement which can be implemented by the set up of procedures as well. Set-up of these procedures can be a bit more complicated than a HSE manual though. To make such a procedure there should be an active form of Risk Management, which should contain:

- Access to reliable, up-to-date information about risks.
- Decision-making processes supported by a framework of risk analysis and evaluation.
- Processes in place to monitor risks.
- The right balance of control in place to deal with those risks.

This will need a more extensive approach from an experienced staff member of DHV. In the procedure to manage the risk, a risk log or other kind of document should be used within each phase to keep track of risks.

The final procedure which is suitable for improvement is the procedure for *project evaluation*. To improve an organization it is important to learn from experiences. This learning can be done by an internal project evaluation procedure on how successful the project is. It hereby is important to focus mainly on the project execution more than on the end-product. In this way it becomes possible to write a 'lessons learned report' and an 'end project report'. The reports of several different projects can be compared and analyzed together, for example once a year. In this way this valuable source of knowledge becomes available using only a minimum of extra effort. It is however important to keep a project evaluation concrete and simple. As people are often busy with a new project they will easily lose their interest in the closed project. It is

better to have a short and simple evaluation that is easy to perform, than an extensive one that is never used.

Implementation of *the formal start up and task hand over* are relatively simple and can be implemented by writing a basic procedure, making a template and explaining the use of both in the Project Management Manual and during, for example, a workshop.

6 Conclusions & Recommendations

Project Management is well executed at DHV Shanghai. This is the main conclusion that can be drawn from this analysis. Although project management is well executed, there still is room for further improvement of this practice. In this chapter a recommendation for the implementation of the improvements is given.

As stated in the previous chapter, most improvements can be implemented through the set-up of various sets of procedures. The less complex procedures, which are easy to implement and integrated into day to day practice by adding them into the Project Management Manual, are the procedures for a formal start-up document, task hand-over and evaluation. The procedure containing a structural risk assessment throughout all projects is more complicated but can be integrated into the Manual as well. We recommend implementing these procedures as soon as is reasonably possible:

- *The set up of 'formal start-up', 'task hand-over' and 'evaluation' procedures and integrate these into the day to day practice through a workshop and through the use of the Project Management Manual.*
- *Create and start an overall Risk Assessment procedure throughout all projects which regulates the explicit assessment and monitoring of all possible threats and uncertainties. This procedure can be integrated into the day to day practice by adding it to the manual and through a workshop for all project managers.*

The other procedures take considerably more time. Nonetheless these tasks can be partially performed by, for example, students during an internship. To make sure all processes and procedures can be integrated gradually and the organization does not get burdened too much, the following sets of procedures, whether or not put together in a manual, can best be performed subsequent:

- *The set up of overall quality procedures to ensure a certain level of quality during all phases of any project.*
- *The development of an overall set of Health, Safety and Environment procedures to ensure a certain standard of HSE during the whole project and especially the construction phase.*

The analyzed challenges concerning the Sharing of Knowledge are important, as they are a foundation for all other improvements. Great steps in the implementation of these improvements are already made though. This has been done writing the Project Management Manual and a 'revival' of the superseded ShareWork. To make sure the process of a structural build up of knowledge in, let's call it the DHV Project Management Body of Knowledge (DHV PMBOK), will continue, it is important to always keep the attention focused on this continues process. A PMBOK, of which the ShareWork and the manual can function as a base, will never be finished. By keep updating, adding and reviewing the knowledge, procedures and examples in this DHV PMBOK the organization, and the people working in it, can keep improving their skills and knowledge. To keep this focus on knowledge build-up and knowledge sharing, real time and effort has to be put into this subject. Appointing a file-controller and knowledge-managers to

ShareWork, as it is done right now, are perfect examples on how to do so. So our final and most important recommendations can be stated as:

- *Keep a continues focus on Developing & Sharing knowledge by keeping the documents 'alive' and supporting initiatives on this field.*

Especially the last recommendation is crucial as it is actually a strict condition to develop the other recommendations.

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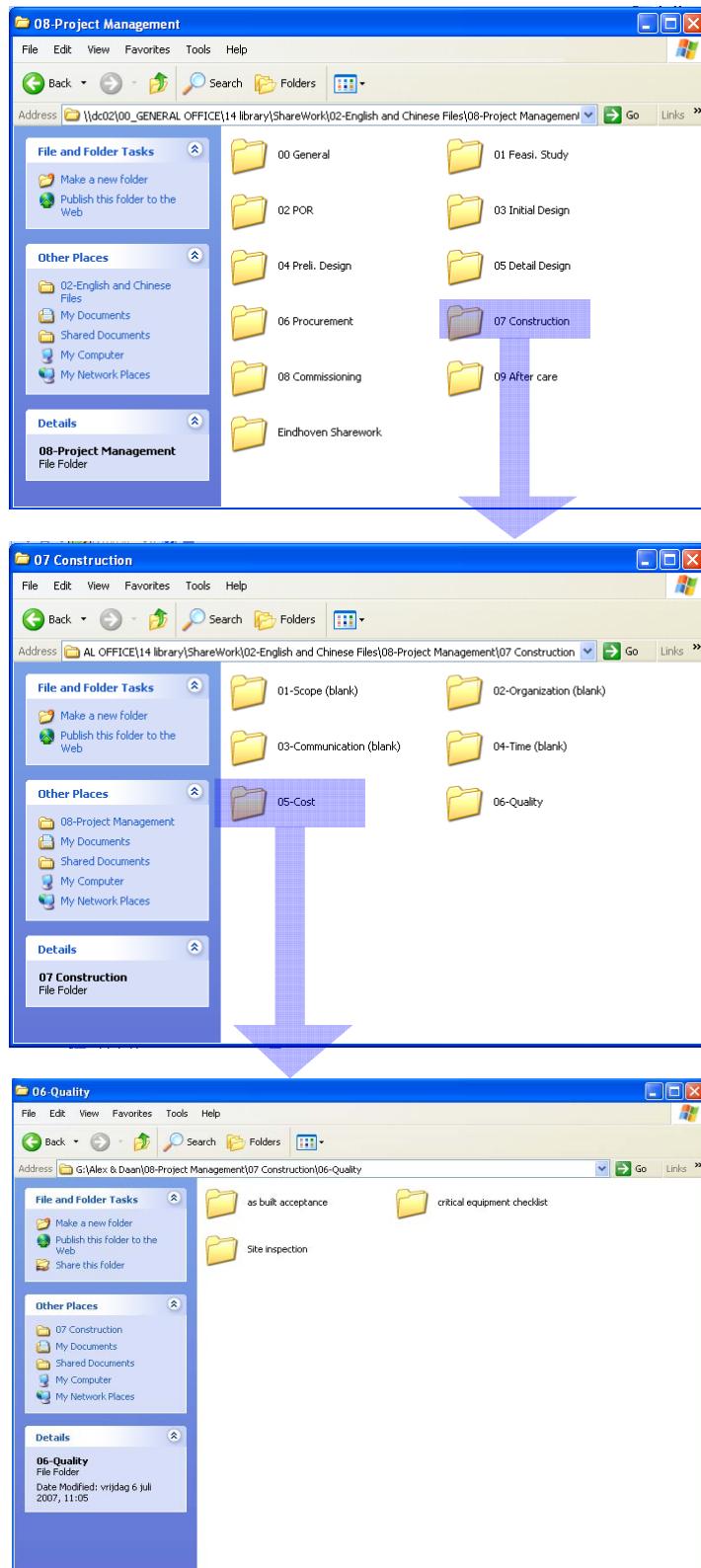
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List of abbreviations

AC	Air Conditioning
BD	Basic Design
BEEC	Beijing Environmental Engineering Company
BOQ	Bill Of Quantities
CC	Current Copy
CAS	Civil, Architectural, Structural
CPA	Critical Path Analysis
DD	Detailed Design
DCN	Design Change Notification
DIN	Deutsches Institut für Normung (German, like ISO)
DRC	Design Review Company
EPCM	Engineering Procurement Construction Management
FIDIC	International Federation of Consulting Engineers (this acronym stands for the French version of the name)
FS	Feasibility Study
FW	Forward
GB-code	General Building code
GC	General Contractor
HSE	Health, Safety & Environment
HVAC	Heath Ventilation Air Conditioning
IEC	International Electrotechnical Commission
IQ	Installation Quality
ISO	International Standardization Organization
LDI	Local Design Institute
M&E	Mechanical & Engineering
MEP	Mechanical Electrical Process
MoM	Minutes of Meeting
MS	Microsoft
OQ	Operational Quality
PD	Preliminary Design
PDP	Preliminary Design Package
PM	Project Management
PMBOK	Project Management Body Of Knowledge
PoR	Program of Requirements
QS	Quantity Survey(or)
RFI	Request For Information
RFQ	Request For Quotations
SMART	Specific Measurable Accurate Realistic Time
WBS	Work Breakdown Structure

Appendix A: PM Manual

Appendix B: Structure ShareWork



Appendix C: Interview questions

General points of importance

- Introduce ourselves
- Short introduction about the purpose of the interview
- Ask if the interviewee agrees with the recording of the conversation
- *Arrange drinks etc./ make comfortable*
- *Enough paper, also to draw/write for interviewee*

General Questions

Information Interviewee

Name:

Function:

Work situation / project:

Check information found on the intranet. First get to know more about the person and his current project, let him talk. Later this information can be used to refer to.

- What do you expect from this manual?
- What do / don't you want in this manual?
- Biggest problems you encountered and how did you overcome them? (In current or past projects)

General Questions per knowledge area

- What procedure and / or tools do you use? Why? When?
- Is this tool / procedure used during the whole project or only in a specific phase?
- Does its task / form changes during the project?
- How do you analyze risks?
- How do you handle changes in requirements by client, designer etc.
- Does it work (refers to all above subjects)? Why/Why not?
- Do you have an example (document)

Scope Control

- What is scope control to you?
- How would you define it?
- Which tasks does it contain? In which phase is it used /changed?
- Which tools do you use for scope control?
- How do you determine the project definition?
 - o Who are you working for, what is his/her responsibility?
 - o What is their main goal?
- What are the projects boundaries? What is included, what is not, how to determine?
- Which role does the contract plays in this and how?
- How do you determine what basic information is needed? How do you retrieve it from the client?

Organization

- What does a project organization mean to you?
- How would you define it?
- Which tasks does it contain? In which phase is it used/changed?
- Which tools do you use to organize a project?
- How do you select your project team?
- How do you make a plan for personnel allocation?
- How do you determine responsibilities?
- You have a team member who is not meeting his commitments, what do you do?
- Which working structure do you use?
- Which influence does the client has in which stages and why?

Communication

- What is communication to you?
- How would you define it?
- Which tasks does it contain? In which phase is it used/changed?
- Which tools do you use for communication control?
 - o For example: How and do you make a communication map?
- How do you determine the meeting schedules?
 - o What frequency?
 - o What kind of meetings? Formal/informal?
 - o Level of decision making in these meetings?
- What kind of archiving and filing system do you use?
 - o What do you think of this system?
 - o Do you share information or do you use shared information with others?

Timing Control

- What is time control to you?
- How would you define it?
- Which tasks does it contain? In which phase is it used/changed?
- Which tools do you use for time control?
- How do you determine the start date and planned end-date?
- How do you determine the start date and end-date per phase?
- How do you plan activities, capacities and means?
 - o Gantt-chart
 - o PERT
 - o CPM
 - o Do and when do you make a capacity plan?
- How do you determine the progress and how often?
- In the construction field, if the timely delivery depends on the supplier, how do you manage the supplier and what contractual agreements would you put in place?

Cost Control

- What is cost control to you?
- How would you define it?
- Which tasks does it contain? In which phase is it used/changed?
- Which tools do you use for cost control?

- How do you determine the project budget?
 - o Do you use WBS to estimate?
- What do you do when a client budget isn't sufficient?
- Do you have a standard method to keep track of the cash flow?
- Which procedures of payment are there?
 - o Certification?
 - o Contract?
- Which procedures do you use in procurement control?

Quality Control

- What is quality control to you?
- How would you define it?
- Which tasks does it contain? In which phase is it used / changed?
- Which tools do you use for quality control?
- How do you see to it that the requirements actually can be lived up to?
- What is the review and approval procedure on quality control?
- Are there any standards?
 - o Regulations?
 - o Check list?

HSE (only during construction phase)

- What is HSE to you?
- How would you define it?
- Which tasks does it contain?
- Which tools do you use for controlling HSE?
- Which requirements are commonly given by:
 - o The government
 - o Client 's company (Global, Europe, Asia, Other)
 - o DHV itself

Appendix D: Information Interviews and Site Visits.

Interviews

Name Interviewee: Tim Jeanne

Function: General Manager DHV Shanghai / Project Management

Current project(s):----

Topics of interview: Project Organization, Contract Management, Scope and Cost

Date Interview: May 16, 2007

Name Interviewee: Chris Shi Yu Cheng

Function: Deputy General Manager DHV Shanghai / Project Management

Current project(s):----

Topics of interview: Project Organization, Contract Management

Date Interview: May 15, 2007

Name Interviewee: Wim Jansen

Function: Senior Project Manager / Project Director

Current project(s): DSM China Campus, Smit & Zoon Leather Chemicals

Topics of interview: Project Organization, Contract Management

Date Interview: May 18, 2007

Name Interviewee: Frans van Gunsteren

Function: Chairman DHV China Advisory Board

Current project(s):----

Topics of interview: Overall advice

Date Interview: various teleconferences

Name Interviewee: Ruud Beekhuis

Function: Project Manager

Current project(s): DSM China Campus,

Topics of interview: Scope, Cost and Quality

Date Interview: May 14, 2007

Name Interviewee: Thomas Wang

Function: Project Manager

Current project(s): Philips R&D Campus

Topics of interview: Quality, Time, Communication, Tendering phase and Design phases

Date Interview: May 14, 2007

Name Interviewee: Kong Zhen

Function: Project Manager

Current project(s): Smit & Zoon Leather Chemicals, Eurocampus International School, Semperit Rubber & Plastic Products.

Topics of interview: Governmental permits and Cost, Quality, Time, Communication, Organization in the Construction phase.

Date Interview: May 14, 2007

Name Interviewee: Dai Xin

Function: Project Manager

Current project(s): Siemens Shanghai Medical Equipment.

Topics of interview: Construction phase, Testing and Commissioning phase, Hand-over phase.

Date Interview: May 21, 2007

Name Interviewee: Eric Yong Zhao

Function: Quantity Surveyor

Current project(s): ----

Topics of interview: Cost, Quantity Survey, WBS.

Date Interview: May 16, 2007

Name Interviewee: Eric Yong Zhao

Function: Quantity Surveyor

Current project(s): ----

Topics of interview: Cost, Quantity Survey, WBS.

Date Interview: May 21, 2007

Name Interviewee: Jasmine Ye

Function: Project Secretary

Current project(s): ----

Topics of interview: Filing and Archiving, Communication

Date Interview: May 16, 2007

Name Interviewee: Li Hua

Function: Architect, Design coordinator and construction coordinator

Current project(s): DSM R&D Campus

Topics of interview: Design phase and Construction phase.

Date Interview: May 18, 2007

Site-visits

Project: Philips R&D Campus

Phase: this project was at the end of the construction phase.

Date of visit: May 9, 2007

Project: Siemens Shanghai Medical Equipment

Phase: this project was in the Testing and Commissioning phase / Handover phase.

Date of visit: May 22, 2007

Appendix E: Example time schedule DHV Shanghai

