Management of Projects
a people process

Intreerede uitgesproken door

Dr. H.L.M. Bakker

bij de aanvaarding van het ambt van

Hoogleraar Project Engineering and Management

Technische Universiteit Delft

14 mei 2008

Mijnheer de Rector Magnificus, leden van het College van Bestuur, Collegae Hoogleraren en andere leden van de universitaire gemeenschap. Bestuur van de Stichting tot instandhouding van de leerstoel Project Engineering and Management. Zeer gewaardeerde toehoorders. Dames en Heren. Ladies and Gentlemen.

It is a great honour and a great privilege to stand here today and address you, wearing the official dress of a professor of Delft University of Technology. About 35 years ago I was here for the first time, not standing here, but sitting somewhere in the audience. I was visiting in the autumn of 1973 in my last year of high school, orientating myself for my further academic education. Proudly the Dean of the Faculty of Electronics told us that their biggest lecture hall could hold 350 students, but it turned out to be too small that day. That turned me off and I went elsewhere to study physics in a smaller setting. Have I since then only been involved in small scale enterprises and environments? Definitely not all the time. But there is a common theme emerging from this little anecdote, which will hopefully become clear in the remainder of this lecture.

Public opinion of project management

What does the general public know about projects, project management and project success? If I would organise a survey today, even in this audience, the majority would probably quote the newspapers and state that projects are generally completed far later than originally planned and cost a bundle more. And I must say, they would not be far off, even based on the professional literature. Experiences with infrastructural projects (Betuwelijn, HSL), projects in the oil and gas industry, the IT industry, but

also many projects in the aerospace and defence industry over the last couple of decades do not seem to be examples of excellent project management. Of course, you have to take into account that what hit the newspapers are the mishaps, the disasters. These are most often attributed to the project manager or to project management. The news value of a project delivered in time and within budget is still relatively low. And even when a successful project makes it into the media the success is in that case of course a result of the foresight and vision of the owner and his organisation.

Figure 1: Newspaper headlines from recent years

But even from the perspective of the practitioners themselves the project management profession is traditionally not seen as the discipline with the most appeal (van de Laar, 2007). This situation is changing, but up to a few years ago a career in a business management position was preferred above one in project management, if that would be feasible at all.

Nowadays most of the students that will graduate from a technical university like Delft, but also students from general universities, will find employment in organisations and companies that organise their main activities in the form of projects. Therefore, some attention to project management in their technical education

could give students a head start. Additionally, extending the research into project management experiences, methods and techniques will benefit the quality and the predictability of the projects delivered in the future. In this address I will focus the attention on the education as well as the research into project engineering and management both at universities as well as in the industry.

What is a project?

What is a project? A multitude of definitions can be found. Even the project management institutes and organisations maintain various definitions. There is no general consensus on the definition of a project and project management for that matter. The one that I personally like best is given by Turner (1999):

A project is an endeavour in which human, financial and material resources are organised in a novel way to undertake a unique scope of work, of given specification, within constraints of cost and time, so as to achieve beneficial change defined by quantitative and qualitative objectives.

Following this definition a variety of activities can be described as projects. Moving house or building your own house, buying a car, completing a PhD thesis, building a refinery, designing a new coffee machine, or reorganising your department. Even life itself is a project. You name it and it can be treated as a project. In order to give some focus to this lecture I will restrict myself in the remainder to engineering projects in the broadest sense.

Whatever the unique character of a project, it will always have a number of distinct phases. Turner (1999), for instance, distinguishes four phases from proposal and initiation, via design and appraisal, execution and control to finalisation and close-out. Others split the project life cycle into 5 or even 8 phases. However the split is made, each of them recognises the importance of sound front end development for ultimate project success. The activities undertaken in the early stages of project development have the greatest influence on the final outcome. In other words, if done correctly, a lot of time and effort and relatively little money are invested in defining and designing what we actually want to accomplish with the project before any spade is put in the ground or any weld is being laid. Thorough front end development is

money well spent, since changes later on in the project lifecycle can potentially be very costly, as is indicated in Figure 2.
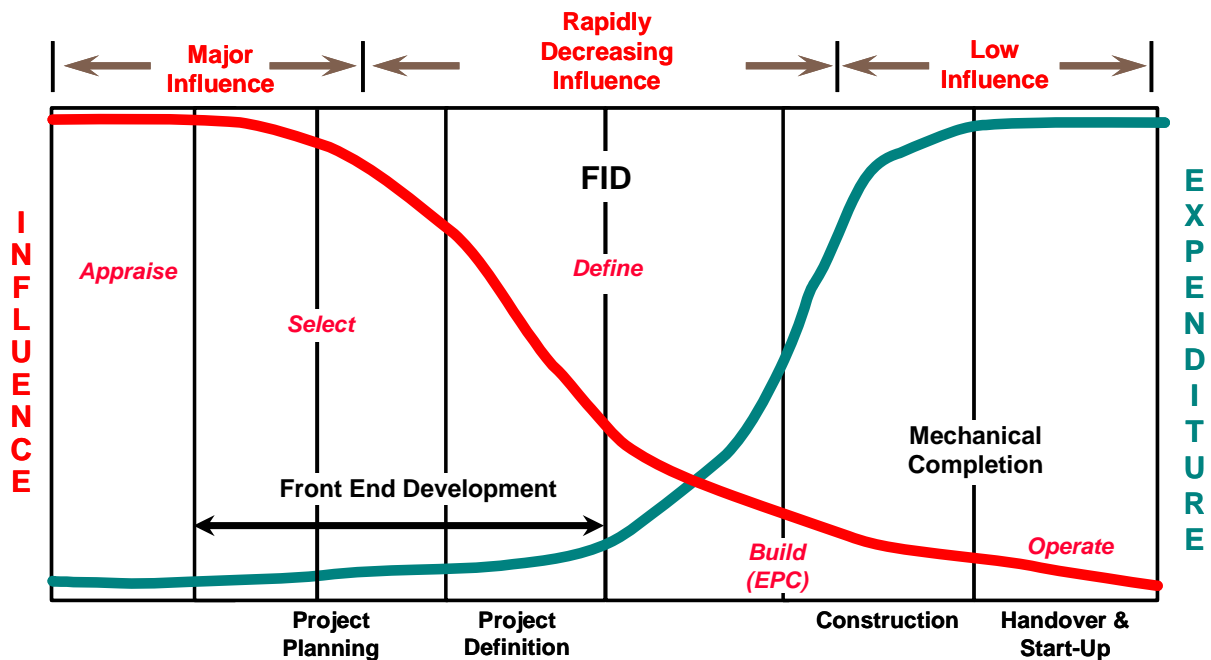

Figure 2: Relation between influence and cost during the lifetime of a project

The evolution of project management

Some authors claim that project management really started with the advance of the chemical industry in the early thirties of the twentieth century. Others claim that it was the period of the arms race during the Cold War that created a demand for and a focus on project management. Notwithstanding the above, it is generally accepted that modern day project management started with the advent of the Critical Path Method (CPM, 1957 - Dupont) and the Program Evaluation and Review Technique (PERT, 1955 - Booz-Allen-Hamilton). Both originated from the defence and aerospace industries and were subsequently taken up by the construction industry.

However you look at it, project management in itself is a relatively young discipline. In the literature most of the time four periods in the evolution of project management have been identified (Kwak, 2005). The history of project management is separated in the period leading up to 1957, the period between 1958 and 1979, the period from 1980 till 1994 and from 1994 onwards. The milestones marking these periods are the

large technological developments that had a big impact on society in general: the invention of the plain paper copying machine by Xerox in 1959, the launch of the XT personal computer by IBM (around 1980) and the wider spread of internet to the public from 1994.

Throughout history significant infrastructural endeavours have been successfully accomplished: the pyramid of Giza and the Great Wall of China are great examples. More recently, the building of the Pacific Railroad across the United States in the 19th century is a remarkable example of technical courage and perseverance, although they definitely had their delays and surprises whilst building it. The building of the Hoover Dam was considered a successful project. In total 5200 workers were employed. It was built between 1931 and 1936 within budget and ahead of schedule, but still, 96 workers were killed during construction. Another famous example of a project "avant la lettre" is the Manhattan Project: the research into and the development of the first two atom bombs that ended World War II. This project involved 125.000 workers and spent a staggering $2 billion. Projects closer to home in this same period are the closing of the IJsselmeer with the Afsluitdijk and the start of the Delta Werken, the big infrastructural project to protect the southern part of the Netherlands against flooding. Successful endeavours, but the phrase project management was not launched yet until 1954.

Figure 3: Closure of the Afsluitdijk (1932)

In the second period (1958-1979), a large number of technological developments have influenced society and as a consequence also the management of projects. The introduction of the plain paper copier and the development of silicon chips and minicomputers had a revolutionary impact on the way we are doing our business. The most well known projects in this era were all based in the defence and aerospace industries. Examples of big technological projects we can all name are the development of nuclear missiles during the Cold War (Polaris and Minute man), the Apollo project by NASA and the design and construction of the Concorde. In the oil and gas industry the exploration and production of North Sea oil was a huge undertaking for a multitude of companies that lasted well into the next period.

During the third period (1980-1994) the advancement of technology in our businesses and our daily lives accelerated enormously. I remember buying my first Apple computer in 1983 for the completion of my PhD thesis. In that same period project management tools and software became widely available for the personal computer, which made project management techniques more easily accessible for the bigger community. Now for the first time the techniques that had been developed for the big projects mentioned before were accessible for almost every project engineer or project manager. Of course the big projects continued to develop and apply the techniques with high levels of sophistication. The building of the Channel Tunnel, Space Station and Space Shuttle Challenger are most probably the showcases of this era. Many articles have been written on the project management aspects of these developments.

The fourth and present era (1994 onwards) shows an unprecedented availability of and accessibility to information. With the advent of the Internet and its spread across the globe, the project management community has become more efficient in controlling and managing the various aspects of projects. The first time that the general public in its entirety was confronted with project management and its side effects was around the Millennium Bug also known as the Y2K project. The Y2K project was instigated by the belief that on January 1st, 2000, most computer programmes would not function correctly anymore. Many organisations adopted project management tools and techniques to execute their own Y2K project. In this period, the oil and gas industry started developing even larger major capital investment projects in order to keep up with the ever growing energy demand of the world. Easy oil has long been discovered and the explorations and developments have

now to take place in new and unknown territories. Projects are becoming more complex with even bigger technological challenges. Examples of these are deepwater exploration and production (~ 3 km of water depth), ever larger Liquid Natural Gas plants (liquefying natural gas at low temperature and transporting it by ship) and the Gas to Liquid plants (making liquid products out of gas via the Fischer-Tropps process).

Over-the-fence management (Kerzner, 2005) is the origin or forerunner of contemporary project management. Traditionally each discipline or function took care of its own activities. When the task was completed the job was given to the next function in the line (thrown over the fence). This meant that all the work was completely sequential in nature and the last in line would most probably get all the blame if the project went off-track. As a consequence schedule improvement was hard to realise. The majority of project activities was done by line managers who were more interested in the advancement of their own department than the success of the project. In fact, there was nobody who was really looking after the best interest of the project. Project management did not yet exist. Another disadvantage of this sequential approach was that it was very difficult for the client to keep track of where his "project" was. Therefore at a certain stage, the client (and looking at the earlier examples this was most often the government) demanded a single point of contact for the whole duration of his "project", a person who would be part of the development during the whole lifecycle. When this happened in the 1950's, the project manager was born. Initially this came with a lot of resistance from senior management as well as sales and marketing staff, since both were afraid of losing their influence.

From there on the whole approach of project management has been based on best practice sharing and handing over of experience from player to player. This system has a lot of similarities with the traditional medieval master/fellow relation, although project management is a much younger discipline.

Track record

The project management discipline as a whole does not have an incredibly good track record. Morris and Hough (1987) have analysed a large number of projects - some 3500 projects from all over the world - realised in the period 1959 till 1984. These

projects were executed in both the civil and military industry as well as in the power and nuclear industry. They came to the staggering conclusion that these projects showed typical overruns in expenditure and schedule between 40 and 200% (and bigger overruns have been seen). A more recent analysis of capital project execution in the oil and gas industry (McKenna, 2006) shows similar but more moderate results.

The independent international benchmarking company IPA produces an annual benchmarking comparison of the projects that have been completed by their member (subscribing) companies the previous year. By now, IPA has a database of more than 10.000 projects from within the process industry (oil, gas, fine chemical, petrochemical and pharmaceutical). Their analyses, although more recent, show the same sobering results. Their conclusions are that since 1993 more than 50% of the conventional Oil and Gas projects have been disasters. Disasters in this sense are described as having more than 30% cost growth and/or more than 38% schedule slippage. On top of that, less than 39% of projects lived up to their promises during the first year of operation.

Another more recent example is the analysis of my colleague professor Flyvbjerg (2007) showing a similar trend for the cost overruns in large infrastructural projects: 9 out of 10 projects have a cost overrun.

These results, whilst dated in some cases, are still shocking. They are totally in line with the perception of the general public regarding projects and project management. The main question is now what can be done further to change this situation. IPA (Merrow, 2002) has already identified a number of the underlying causes, but it is in the field of the implementation of improvements that progress still has to be made. In the remainder of this address, I will suggest improvements to project management in the areas of execution and education supported by focused research.

From project management to management of projects

Over the years the focus of project management has been mainly on the phased realisation of a project from the development of a basis of design, via a design and engineering package to the full design specification and the management of the final construction. The elements of project management to be completed in these phases

are specified by the various project management institutes and organisations in their – what are called – "bodies of knowledge". The majority of players in the process industry operate project management systems similar to the system as laid down in the "2 x 2" study (de Groen, 2003). The bigger players most often have a stage gated process in place similar to that in Figure 4.

Project management

| Stage gate review point | Stage gate review point | Stage gate review point | Stage gate review point | Project review |

Appraise Select Define Build Operate
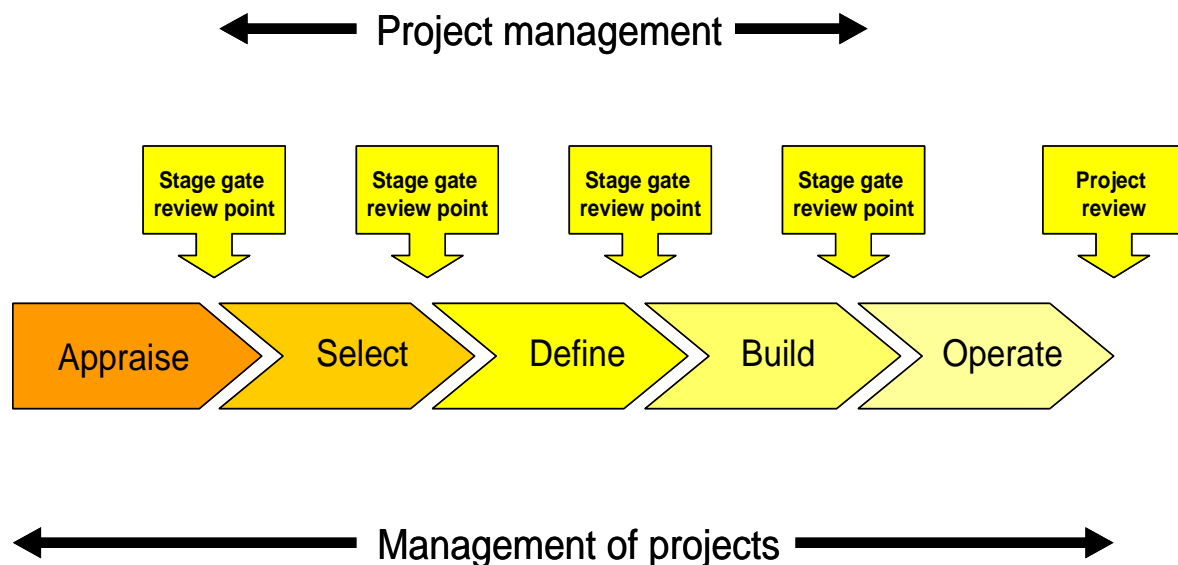
Management of projects

Figure 4:   Phases in the life cycle of a project

The project management systems are quite often based on ISO9000 principles and therefore the steps taken in the development of a project are documented and the process followed is auditable and continual learning is embedded. The project management process is quite often supported by value improvement processes and project standards defined for the various activities that are taking place in the course of a project (estimating, cost control, risk management, scheduling etc.). These systems/procedures have been developed over the years and are handed over from project manager to project manager. ISO9000 has driven the thorough documentation of these project management systems.

Morris (2003) presented an analysis of the project management practices in the construction industry (the focus of this chair) and the implications for the project management societies. What becomes evident from this analysis is that the classical project management topics such as control and organisation are very well represented in the bodies of knowledge. However, insufficient emphasis is placed on the strategic,

commercial and technological aspects of project management. Morris concludes that project management will only then be seen as totally integrated and in control, when elements such as project definition as well as implementation and early operation are seen as integral parts of the charter of the project manager. That is where the focus shifts from project management to management of projects as indicated in Figure 4. This basically means that all relevant players should be involved as early as (reasonably) possible in the definition and development of a project.

So in the future no more handing over from business developer to project manager, to contractor, to operator and finally to maintainer will take place, but all these parties should together be involved from the earliest possible stage onwards. In short - and referring back to my earlier statement - project management came from over-the-fence management and came a long way, but there are still a few more fences to be demolished. Integration throughout the project lifecycle is the key for future success.
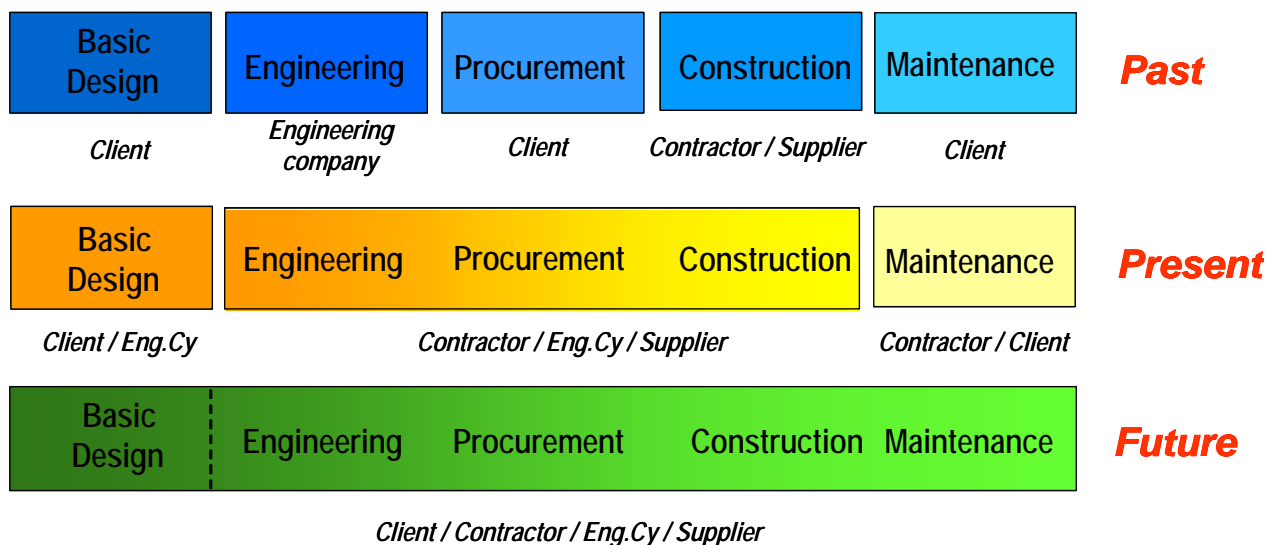
| Basic Design | Engineering | Procurement | Construction | Maintenance | **Past** |
| Client | Engineering company | Client | Contractor / Supplier | Client | |

| Basic Design | Engineering   Procurement   Construction | Maintenance | **Present** |
| Client / Eng.Cy | Contractor / Eng.Cy / Supplier | Contractor / Client | |

| Basic Design | Engineering   Procurement   Construction   Maintenance | **Future** |
| Client / Contractor / Eng.Cy / Supplier | |

Figure 5: Developments in the process industry

A major improvement as a consequence of this change will be that the business development is done in a more realistic manner taking the construction market and the project management peculiarities more seriously into account. This means that in the "appraise" phase (see Figure 4) business developer and project manager should be working more closely together to develop a realistic opportunity taking all technical, economical, commercial, organisational and political aspects of the business

opportunity into account. Also interaction with the client (when applicable) should be done in cooperation between business developer or commercial staff and the project manager.

Similarly - and well within the remit of project management itself - at the end of the project lifecycle sufficient time should be set aside to report out on the accomplishments of the project and the project management. Quite often and certainly in the present market, the demand on the human resources is so high that even before the project is completed there is already a pull to transfer the project manager to a new project and let his deputy complete the last details. That can of course be done and it is actually an excellent learning opportunity for the deputy, but what really suffers is the managerial learning (Storm, 2005). A concerted effort should be made to capture all the learning from the project, report them back and where feasible incorporate them in future procedures, tools and systems. This is done, first of all for economical reasons. Has the project really delivered what was originally promised in the business case? But this should also be done from a project management perspective. Have new methods and approaches been applied successfully in this project that are worth replicating in future similar projects or in general? I am really making a loud and clear plea here that time should be set aside after the completion of a project to seriously capture the learning together with the relevant high level data.

Figure 6: Time to reflect is essential to increase the success of project management

Where possible it should be considered to make a case study out of these learnings for the education of future project managers and other project professionals. Securing that this actually happens is probably the biggest challenge for the future of management of projects.

This lack of managerial learning is a potential cause for project failure which for unknown reasons hardly ever shows up in the top ten reasons for project failure. Cooper (2002) has given a few reasons that hamper the managerial learning. His remarks as quoted below clearly resonate with and have been augmented by my own experiences and beliefs:

- The misguided prevalent belief that every project is different
- The difficulty in determining the true causes of project performance
- Projects are transient phenomena and few companies have sufficient resources for the very purpose of gleaning and improving upon transferable lessons of project management
- While there are individuals who learn, their limited span and career path make systematic assessments and learning of transferable lessons that get incorporated in subsequent projects extremely difficult
- The nature and character of project managers

In order to broaden project management from a skill to a discipline it is essential that the learning in all phases and at all levels is institutionalised. This requires that time is set aside for capturing the learning of individuals, teams and the project as a whole and to analyse in an open and honest manner where improvements still could be made and what should have been done differently in case of a mishap. This should not be done in isolation, only amongst the project professionals, but in a concerted effort with all players with the aim of further improving the management of projects as a professional discipline.

Another way of transferring learning is that a project team takes a young upcoming project professional on-board to train him or her on the job. Handing over the experience and integrating the learning in the execution of a project is essential for future success. This is actually my first area of focus for future research.

The project manager

One task of a project manager is to actively plan the end (or completion) of a project. But it is also his task to bring the project to life. During the lifetime of a project, the project manager brings something to life and terminates it. He or she basically ends the life that needed to be created for the duration of the project. This distinguishes the nature of project management from the nature of normal business management. In order to accomplish this, a project manager must transform himself from an entrepreneur at the start to a close-out manager at the end. A project manager acts as a systems designer, a community builder, a liquidator, a marketeer and many more.

Best practice sharing has resulted in the development of procedures and processes on how best to execute certain parts of the project. But be aware, procedures are not a replacement for knowledge and insight. Project management might not be scientifically challenging or difficult, but it still has its complications and requires talent. It is at least a skill requiring many talents from a wide variety of academic and social disciplines. The project manager is a "jack of all trades". He or she is a real general manager, who knows a little of many things and is not a specialist in many of these disciplines. What the project manager does require, are a number of special character traits: focus, overview, courage, dexterity, perseverance, dedication, diligence, compassion, interpersonal skills, analytical powers, emotional intelligence, negotiation skills, precision and many more. Do these sheep with five legs actually exist? As you can imagine, these people are scarce and hard to find. Some of these skills and attitudes can be learned; others require experience and a lot of stumbling and getting up again. And some of them you have to be born with. In short, project management is still a talent and we can educate and develop people to become professionals in it.

Currently a project manager is nothing more (and that is already quite a lot) than a facilitator and an integrator. Of course he or she needs to have a technical background (but that is as broad as it comes), but he/she does not have to be an expert in any of the disciplines that are a constituent part of the project. If all is well, this experienced project manager will be able to manage any type of project in any type of business. The project manager has a number of widely accepted tools at his disposal to make this happen. Amongst others, GANTT charts, PERT, CPM, earned value calculations, work breakdown structures, cost estimating tools and cost databases. However, the

usage of these tools also has a flip side. Endless time can be spend on updating schedules, estimates and plans losing track of the reality out there. The project manager has to strike the balance between planning and delivering, between technology and people, between cost and time, between structure and agility, between customer and team. In fact the project manager is a balancing artist - an equilibrist.

Figure 7: A project manager has the attributes of an equilibrist

What has not been proven yet is that we can predict the outcome of a project on the basis of the usage of tools, procedures and skills. Even in the literature, no evidence can be found that a project managed by a trained project manager (using all best practices, tools, systems and procedures that he/she could get his hands on) will be more successful for the client than that of a self made project manager without all this support and experience. I am not saying here that everybody can be a successful project manager, but I am actually making a plea to further investigate what is required to make a project a success.

Developing project managers

My personal experience in project management has been gathered in the oil and gas industry. I have been heavily involved in the organisation and the development of the project management procedures, processes and tools of one of the major players in that industry. In a way, that has been and will be my frame of reference for the further development of the chair Project Engineering and Management.

The first step in the further development of future project managers is to make sure that they have access to and embrace the contents of the project management processes and procedures. Most of the experience, however, has to be build up in practice. The best way to do this is via coaching on the job by an experienced project manager. Unfortunately, in the present resource constrained world this is not always possible. How to overcome this problem? The capturing and retrieving of lessons learned has been included in the method by which Shell develops and manages projects for its specific businesses. In theory, the lessons learned process is the backbone of the project management system. Theory and practice differ a bit unfortunately.
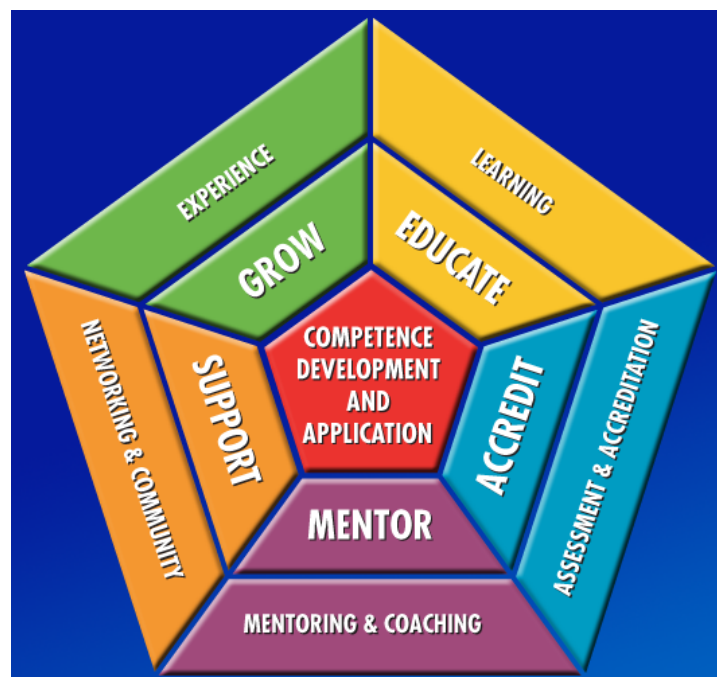

Figure 8: Pentagon model of the Shell Project Academy

For the education and training of future project managers within Shell the Project Academy has been developed. I have been intimately involved in the development of both the project management system as well as the Project Academy. In the original vision document for the Project Academy a step was built in to capture the managerial learning. After demobilisation of a project team the experience of the project practitioner was supposed to be captured and his/her personal learning should have been written down in a case study aimed at being used in subsequent courses and to further improve the project management system. Reality however teaches that the resource demand in project land is so immense that there is hardly ever time (and money) to allow the incumbents to actually capture their learning - both within a project and between projects - and reflect on it.

From the literature a wider number of reasons can be found for the limited interest in the collating and sharing of learning (Storm, 2005). The quoted bullet points also support many of the comments made above.

- A project manager is alone, has not many sparring partners and limited opportunities to share learning and knowledge to and with others.
- A project manager often works outside his comfort zone with respect to the geographical environment: at least unfamiliar and new, sometimes maybe even hostile. He/she is quite often the only representative of the owner company. The working environment is probably less open than at the home base. Free flow of information is not always possible, since it can (and probably will) be used against him/her.
- A project manager's effectiveness is more difficult to assess. His/her functional line is farther away and has often different objectives. The local or direct line is not familiar with the execution of projects of this size.
- Project teams have a limited lifetime and are clearly performance driven organisations. Traditionally, project managers have to learn by doing. There is hardly any time for training sessions between the matches and there is unfortunately very often no continuity.

Since these reasons seem to be widely spread and more or less accepted, during the development of the Project Academy a concerted effort was made to not only focus on the learning events (in which the project management system is taught in detail) but also to give broad attention to formal and informal networking and coaching as

well as the enhancement of on-the-job experience to develop the broadly groomed project management professional of the future. The difference between the Shell Project Academy and other similar types of initiatives in the industry is that the Project Academy is aimed at development of all levels of project professionals from junior project engineer to seasoned project director and from new to experienced staff with attention to all phases of the management of projects. Training assignments for upcoming project managers early in their career are essential in this approach. Again similar to the earlier mentioned master/fellow system.

However, as mentioned in my introduction, I am not interested in the big projects only. The focus of the chair Project Engineering and Management will be on improving the quality of the project management processes and outcome for the process industry as a whole. So the focus will be much more on smaller projects, starting project engineers and project managers running a project department with a portfolio of (smaller) projects. The education of project managers can already start at the graduate level. The majority of the students graduating from engineering faculties of technical universities find a position as design or project engineer with engineering companies of the process industry, equipment suppliers or construction companies and reach in a few years the function of project manager. Therefore the purpose of my lectures is to cover the most important aspects of project engineering and management in order to prepare the university graduates to meet the challenges of the process industry.

Can project success be predicted?

Once we have a system in place based on best practice sharing to manage our projects, does this mean that from now on all our projects are successful? In order to be able to investigate that, we first have to define what project success looks like. Traditionally the answer is a very short one: deliver the project within budget, on time, safe and according to agreed specifications. However, in the literature a wide variety of success factors can be found. But more often, those success factors are not seen as the only indicators of success of a project or of the project management. This certainly is true when we are changing our focus to management of projects (as argued in the previous paragraphs) in that case it also matters whether the product (as produced by our project) delivers the results (economical, safely, environmental) that

were anticipated. Furthermore, it is also important whether all needs of the stakeholders have been met and (in some special situations) whether the project is also a success in the eyes of the press and the general public.

Quite often the end result is a trade-off between various predictors of success: the trade-off between cost and time, the trade-off between investment costs and operational costs, the trade-off between cost and time and quality. In my view more attention should still be given to the total cost of ownership. This means that in taking the decision to go ahead with the project, management should not solely look at the cost of the investment, but at the total costs - capital and operational expenditure - for the total lifetime of the investment (constructing, operating and demolishing).

As I have said earlier, up to now I have not been able to find a study that has compared the results of projects managed by means of systems and procedures based on the current project management body of knowledge versus a project that has hardly used any of that body of knowledge. The present belief seems to be that the difference found in such a study would be minimal. There are various reasons for that lack of differentiation. Many people who do not consider themselves as project managers do deliver projects in a successful manner (compare the definition on page 5). Despite the fact that we use best practices in project management and share the learning, there is still a considerable number of unsuccessful projects across any industry and the thorough application of these best practices and the various metrics that go with it, does not seem to be a guarantee for success.

Why is it so difficult to establish and influence project success? Historically projects have been managed as technical systems instead of behavioural systems. That has also been my approach up to now in this lecture: the technical, predictable approach to the project and its success. But in all fairness managing a project towards success is more often an ongoing battle to continuously manage change in the project team and the project environment. Nevertheless, there are also a great many activities and tasks that are consistent throughout all phases. The required behaviour of the project leader changes with the phases of the project. A different style of management is required in an appraise phase compared to the execute phase. There are in fact many similarities between the management of change (in the organisational sense) and the management of projects.

Kotter (1996), one of the leading experts in the field of managing change, has defined eight steps for the successful implementation of managing change. These eight steps can easily be applied to the development and evolution of a project team as well.

Strong similarities can be found between the eight steps of Kotter and the four steps identified by Storm (2004) towards project success: focus, alliance, momentum and performance. Focus combines Kotter's steps 1, 3 and 4 (see Figure 10). Translated to a project this means that the justification, the vision and the goals for the project together with the scope and the strategy have to be clearly defined.

Alliance is covered by step 2 and 5 of Kotter. The project management is all about setting up a team and building alliances between the various contributing organisations. Alliance is about having the right team structure, all belonging to a single team striving towards the same common goal: no "us and them" feeling. This is an area where the industry can make a distinct difference in changing its way of behaving and changing the outsourcing culture. Alliances and the accompanying cooperation should be built on trust.

> 1. **Create a sense of urgency**
>
> 2. **Put together a guiding team**
>
> 3. **Create visions and strategy**
>
> 4. **Communicate for buy in**
>
> 5. **Empower people**
>
> 6. **Produce short-term wins**
>
> 7. **Build momentum**
>
> 8. **Nurture a new culture**

Figure 9: The eight steps of managing change

The third element is momentum. Literally the same noun as used by Kotter. The team members have to see a positive change in the speed with which the project progresses. They have to see this in all of the essential processes that make up the project.

Finally, the last element is performance. Not a direct link to one of Kotter's steps, but the best possible analogy is with the combination of short-term wins and nurturing the new culture. There is not a universal approach to establish high levels of performance, but definitely the culture of the team as represented by its norms and value system has an impact on the cooperation and the end result. Furthermore, it is common knowledge that a strict regime to restrict scope changes and tight monitoring and control (of time, money, quality and safety) contributes positively to performance.

Celebrating success is not a part in either of these approaches, but essential in my view. It goes without saying almost, that rewarding and giving people recognition for their performance both individually and as a team are the most important elements of sustained team performance and the corner stone of successful management of projects.

The predictability of the outcome of a project will be my second area of focus. The research will be aimed first of all at mapping out the actual practice against the theoretical process. The outcome of that comparison together with the categorisation of the complexity and size of a project, should be leading to an improved more fit for purpose project delivery process for both small and big projects.

Building relationships

Based on my description of management of projects, the need for having a strong guiding team in place (see Kotter) and building on the alliance element (see Storm), it will have become clear by now that successful projects are mostly based on the existence of successful teams.

My definition of a team goes far. It is not only the project manager and his direct reports. In fact for me it should be an integrated team across all the phases of the project. Early involvement of operations and maintenance staff in the definition phase is as important as the business developer having a clear view on what can and can not be accomplished by the project. It also means, and that is the focus of this section, that the engineering and construction contractors as well as suppliers should form an integral part of the team.

Figure 10: It's all about teamwork

In reality, it goes much further. We might have developed a technologically magnificent project with prime examples of innovation and world-class technology, but if we are not able to convince the authorities and the public (represented by our neighbours and/or non-governmental organisations) that this project and the way it is implemented represents a sustainable solution, then the project might never take off. So our project success is definitely dependent on how successful we manage our stakeholders and whether we, during the course of the project, are able to build and manage our relationships.

Real and fruitful relationships are built on trust and mutual dependency (Berends, 2007). In my view the most successful projects are the ones with project teams that were managed as a single team, in which all participants benefit from a good and successful project and suffer equally as well from a less than optimal (or lousy) result. The team culture has to be built in a team like that and the team members are carefully selected to fit in that team. Teambuilding focused on creating a team charter and a common set of norms and beliefs is then subsequently the first step towards the successful completion of the project.

An approach as sketched here requires a shift in paradigm in the approach taken by the owner's organisation and possibly also in the thinking of the engineering and construction industry. Whether the present time, with its extreme market conditions and shortage of resources, is the right time to explore those avenues might be under debate. But in order to enhance the performance of the project management industry a fundamental shift in approach will be required and cannot be postponed too long.

This is actually the third focus area of my future research. Together with the sponsoring companies, I would like to investigate whether other contract forms and more importantly more intimate cooperation models are feasible in the present and future market.
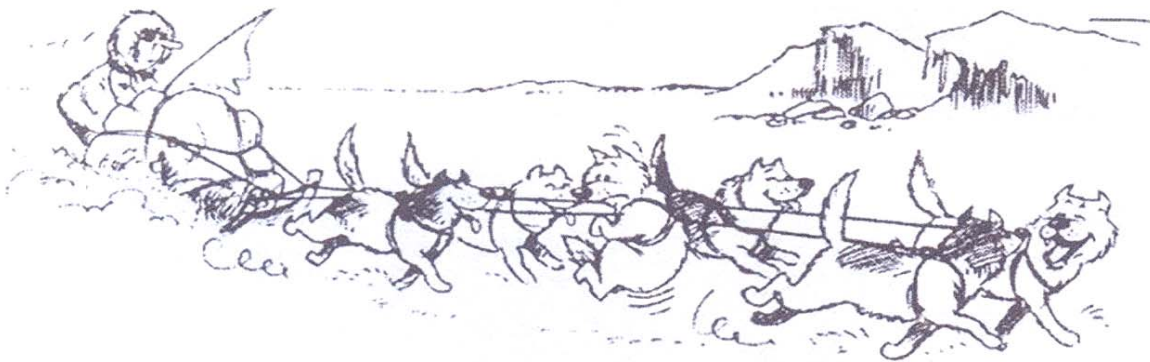

Figure 11: "We all have to go in the same direction, isn't it?"

Position

For historic reasons the chair Project Engineering and Management has found a place within what is now called the Process & Energy department of the faculty Mechanical, Maritime and Materials Engineering of the Delft University of Technology. This location has to be seen in the light of the original focus on Project Engineering only, and is of course related to the nature and activities of the sponsoring companies. Wherever the chair has its base, the most important part is that we expose the technology and engineering students during their under-graduate curriculum to the basic principles of project management and cover the most important aspects of project engineering and management in order to prepare the

university graduates to meet the challenges of the process industry. Most often the graduates will find a first job in or related to their main discipline, so to place the chair close to one of those disciplines is a logical choice.

However, as I have indicated in the course of this address, management of projects is a multi-disciplinary profession. The project manager or engineer is responsible for the impact his/her project has on its surroundings. As a consequence, linking or embedding it to a technological discipline alone is probably not sufficient. In the further development of the chair close links are and will be established with the faculty Technology, Policy and Management. That faculty offers a wide variety of courses and research focused on the relation between technique and society, addresses the societal implications of technical developments in its research and education and contributes in that way to the formation of "complete" engineers. That is exactly the complementary part that is required for the development of full-blown project managers for the future.

Furthermore, and not solely because the chair is embedded in the Process & Energy department, the chair will contribute to a number of the broader research themes within the Delft University of Technology. On the project engineering side of the chair a clear link will be established with the research themes "sustainable industrial processes" and "next generation infrastructures" and of course with the Delft Centre for Project Management. By introducing project management principles early in the design and development phase of a research theme, the time to market might be impacted in a positive way and the total cost of the development might be influenced in a positive manner. An example of this could be the modular approach I am considering as part of my future research interest, but there are potentially many more interfaces between project management and the research themes mentioned.

Over time I hope to be able to attract, apart from the traditional group of undergraduates from the mechanical engineering faculty and the staff from the sponsoring companies, students from other disciplines and potentially also other universities as well. Project based management is a skill that will complement many of the traditional technical disciplines as well as some of the β-sciences.

Looking from a broader perspective, for many of the multi-national energy companies as well as companies in the process industry, the successful completion of their

capital investment projects is crucial for their future success. The predictable delivery of the future projects will be differentiating the successful owner organisation from its competition. Especially with the ever-increasing size and complexity of the present and future projects, the predictability of the investments will be a key success factor for a company. Deliberately and by design the education and research of the chair of Project Engineering and Management will not be aimed at the completion or even improvement of these big projects. However, the learning from the whole spectrum of management of projects, both big and small, will be scaled down and applied to projects in the sizes that are of interest to both students and the sponsoring companies.

Focus of future research

In part of the literature the discussion is at present ongoing whether project management is a profession, an occupation or even an art. Especially in the engineering and construction industry project management is seen as a set of methods and procedures aimed at delivering the requested product and not as a profession in itself. One of the identifiers of a profession is the availability of a clearly specified and strongly developed specialised and theoretically founded knowledge base. At the moment, project management is at best an emerging profession.

In the present market situation the pressure on the project manager is ever increasing to deliver his project faster, cheaper and safer with a greater predictability of success while maintaining the quality. The way the project manager has been educated (sharing and replicating best practices), however, does not stimulate him to think out of the box and develop new ways of delivering the project. The pressure to deliver and the overheated market do not stimulate a more fundamental drive to improve project management and enhance the related chance of success. Examples from Hartman (2005) show that the more comfortable we are with the way we do things, the more likely we will stick to those proven practices. Only newcomers might be willing to try a new approach (due to their lack of historical knowledge) and succeed in delivering projects more effectively. In this way the newcomers might be capable of starting a shift in paradigm.

Research in project management is actually still quite young. Much of the work done is based on building on or validating the existing claimed theories. In these instances

a look is taken at industry best practices, and improvements to existing tools are being proposed and developed. A concerted effort is made to try to understand why these practices work. Is this the right approach to further the project management as a profession or are we building on a wrong set of assumptions?

The strength of project management as an occupation and as an emerging profession is probably that it is based on a multitude of skills. As mentioned earlier the project manager will need to have sufficient technical, interpersonal and organisational skills. Therefore, the research will not be solely technically based but should take account of the multi-disciplinary character of the profession as well.

Building on the foregoing and as already indicated in the previous paragraphs, I am at the moment pursuing four potential avenues for future research. I will shortly summarise and recap these four areas in the last section of the lecture.

A. Project predictability

The first area of focus for future research is the predictability of the outcome of a project. The research will be aimed first of all on mapping out the actual practice against the theoretical process of project management. The outcome of that comparison, together with the categorisation of the complexity of a project, should be leading to an improved more fit for purpose project delivery process for both small and big projects (measured by complexity and size). Can projects be delivered with a higher chance of success via a fast track while maintaining an adequate front-end development process and not jeopardising the quality of the end result?

First, a framework to analyse the front end development phase of a project will be defined and a model representation of project complexity will be developed and validated. In-depth information from real projects will be required to develop model representations. To gather the in-depth information on activities in the front end development phase as well as the factors determining and influencing project complexity, a case study approach will be followed. Parallel to detailed study of written (historic) material (close-out reports and project archives), semi-structured interviews with project team members will be performed. The information gathered will be used for further development of the project complexity model and will be the framework for analysing the front end development phase. The exploratory case

studies will also be used to assess to what extent the project practice matches the prescribed project management procedures and what choices have been made on scaling them (fit for purpose, adaptation). Validation will be done by using expert opinions and by reworking a limited number of already completed cases. In this manner it will be proven whether the model can deal with subjective assessment of project complexity and whether it can successfully classify projects according to their complexity.
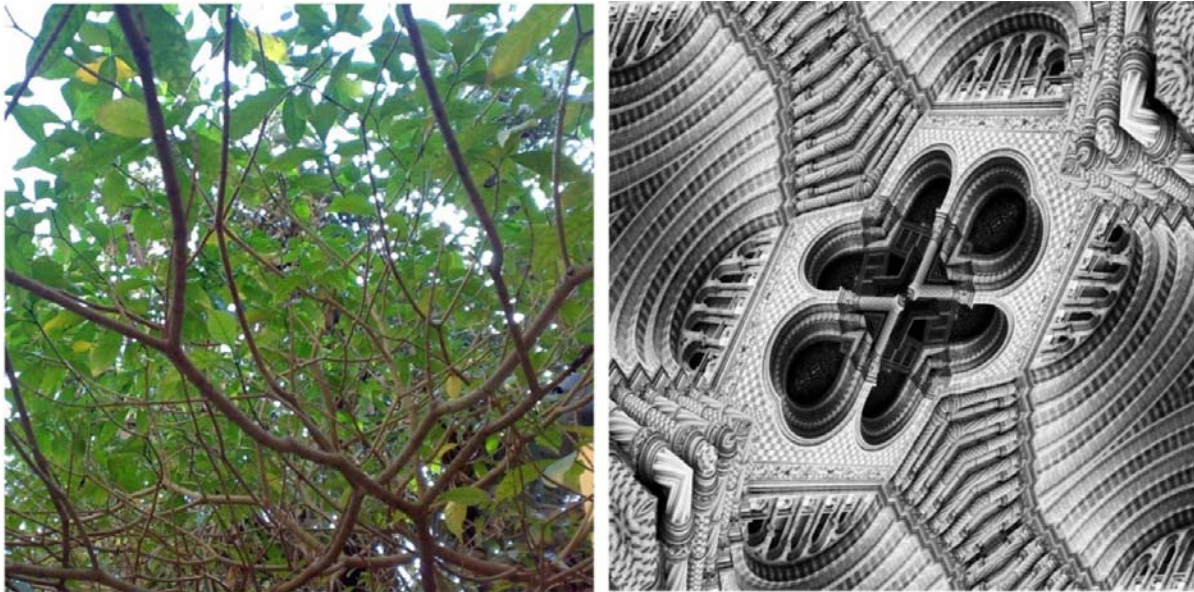

Figure 12: Complexity comes in different shapes and forms

In the second phase, the research is focused on finding the relationship between project complexity, the activities in the front end development phase and the project result. To enable inclusion of large amounts of general data, a survey study will be done amongst a large number of projects. The survey will be used to investigate and quantify the relationships between project complexity, project management and project result, e.g. to validate the conceptual model. The analysis depends on the model representation of project complexity and the actual front end development phase as well as the number and dimensions of underlying variables. Potentially, multi-variate analysis methods will be applied. After the validation of the conceptual model, an iteration loop is foreseen for further improvement of the models and additional calibration.

In the third phase of the research, the predictive value of the research findings will be demonstrated by an intervention study: either an intervention in the front end development phase of a real project or a virtual intervention in a simulated project. This part of the research will be action-based. In other words, the effect will be investigated of certain actions that will be implemented. The use of either reference measurements or a control group will be contemplated to evaluate the effect of the intervention.

This part of the research has already started in close cooperation with the colleagues of the faculty Technology, Policy and Management.

B. Managerial learning

The second research subject will be improving the close out of projects and capturing and incorporating lessons learned. In order to broaden project management from a skill to a discipline it is essential that the learning in all phases and at all levels is institutionalised. This requires that time is set aside for capturing the learnings of individuals, teams and the project as a whole and analyse in an open and honest manner where improvements still could be made and what should have been done differently in case of a mishap. This should not be done in isolation, only amongst the project professionals, but in a concerted effort with all players with the aim of further improving the management of projects as a professional discipline. Integrating the learning in a more structured way in the execution of a project is essential for future success. The research will be focused on facilitating and finding ways of improving this process of what is called managerial learning within a project and between projects. It has to be realised - and that will be a part of the investigation - that the process of learning will probably be different in the various phases of the project development cycle.

In the first phase of this research an inventory will be made of the quantitative information that is being gathered of completed projects over the last 5 years. Linked to the previous subject, complexity and success will have an influence on the data to be gathered. The first deliverable of this part of the research will be a comprehensive template for gathering the necessary data post-completion of the project. Based on the outcome of the first phase, in the second phase the investigation will be started how the learning can be implemented earlier in the project development phases as well as

how the learning can be shared between various projects. One of the potential goals is to improve the project delivery process and procedures by incorporating the lessons learned and a second goal will be to embed the lessons in the formal training of future project managers and project staff. A difference in approach between owner's organisations and contracting organisations will have to be taken into consideration as well.

An integral part of this approach is to have another look at what constitutes project success. Together with the results of international benchmarking that will influence the weight the learnings will get and will prioritise the manner in which they will be shared or incorporated. The mechanism for this incorporation will also be developed in the course of this part of the research.

The research activity in this field has already been kicked off via the completion of a master thesis through a 6 months student internship.

C. Building relationships

The third area of focus for research - building relationships - will be aimed at integration throughout the whole project life cycle. In my view this can be improved within the owner's organisation and between the owner and the contracting organisation.

First of all, together with the sponsoring companies, I would like to investigate whether new forms of contracts and, more importantly, more intimate cooperation models are feasible in the present market. We will be looking for different cooperation models between owner and contractor aimed at mutual benefit and increased project efficiency and effectiveness. Not only focused on the project execution however. Also in the early development phase different approaches and forms of cooperation are already required within the owner's organisation. On this side, earlier involvement of the project manager and project management skills are necessary to prevent the design of unsuccessful projects. Influencing the design, the economics and the timing might improve the overall delivery of projects and at the end of the day also the perception of the profession. An attempt will be made to link this subject back to the focus areas mentioned earlier. Complexity and success will be influenced by the amount of integration/cooperation in the early phases of a project.

The approach in this focus area will be to establish a network of owner and contracting companies and investigate the possibilities of an integrated approach to improving the management of projects. Clearly this is a softer approach than the earlier subjects, but as already mentioned before, the management of projects is a multi-disciplinary skill and in order to be successful attention has to be given to the elements of trust and cooperation and establishing common ground for further improvement.

The idea is to investigate a number of project cases from both the owner's perspective as well as from the contractor's perspective. A successful project for the owner does not necessarily have to be a successful project for the contracting organisation. By agreeing a format for investigating and reporting out, the sensitivity of information and the anonymity of the partners will be guaranteed. Again, defining or redefining project success will establish whether there are changes to be advised in the way the contracting strategy is defined in the early stages of a project and whether there are alternatives feasible with a higher chance of future success.

D. Modular design and construction

Finally, I would like to contribute to the engineering side of the activities as well, by focussing on modular design and construction. In analogy to the plug and play approach that we all know from the Information Technology sector, could we develop a modular design and maintenance approach that would dramatically change the working of the process industry? This approach, if successful, will have a massive impact on availability, constructability, maintenance downtime and health and safety for the workers. A dream at the moment, definitely, but with some concerted effort elements might be realised in the not too distant future. For this part of the work the collaboration with the colleagues within the sections Process Equipment and Process Intensification will clearly be sought.

With the expression of this dream I have come to the end of my inaugural address. Whether all of this can be realised within the part-time assignment given to me, will have to be proven over time. At least, the ambition, the enthusiasm and the drive are present. With your help in whatever shape or form, we will deliver.

Acknowledgements

Op deze plek wil ik tenslotte een aantal personen bedanken, die het mogelijk gemaakt hebben dat ik hier vandaag sta. Allereerst natuurlijk de NAP, de samenwerkende Nederlandse Apparatenbouw en Proces Industrie en de Stichting tot instandhouding van de leerstoel PEM, via welke 19 ondernemingen deze leerstoel al jaren ondersteunen en mogelijk maken.

Secondly, I would like to express my gratitude to my employer Shell Global Solutions International BV for allowing me to take on this challenge. My appointment to the chair is clearly seen as a broadening opportunity and as a token of appreciation for the department and its accomplishments.

Ten derde dank ik het College van Bestuur van de Technische Universiteit Delft, die de ruimte biedt om deze leerstoel als onderdeel van de Faculteit Mechanical, Maritime and Materials Engineering (3mE) in te vullen. Met de collega's van de afdeling Process & Energy en de collega's van de afdeling Techniek, Bestuur en Management wordt de verdergaande samenwerking gezocht als die al niet is gevonden. Voorts dank ik de leden van de benoemingsadviescommissie, die mijn aanstelling hebben mogelijk gemaakt.

En tenslotte, zonder de steun en het geduld van mijn vrouw en drie dochters zou de invulling van deze twee banen niet vol te houden zijn. Meiden, bedankt.

Dames en Heren, ik dank u voor uw aandacht.

Ik heb gezegd.

Valbella-CH
February 2008

References

Berends T.C, 2007, Contracting economics of large engineering and construction projects, PhD thesis, TU Delft, December 2007

Cooper K.G., J.M. Lyneis, B.J. Bryant, 2002, Learning to learn, from past to future, Int.J.of Project Management 20 (2002) 213-219, Elsevier Science

Flyvbjerg B, Truth and lies about Megaprojects, Inaugural speech, TU Delft, September 2007.

De Groen T, J. Dhillon, H. Kerkhoven, J. Janssen, J. Bout, 2003, 2x2: Your choice for projects, twice as cost effective, twice as fast, NAP association, Nijkerk

Hartman F, 2005, Redefining the foundations for project management, Carayannis E.G, The story of project management, Westport, Praeger

Kerzner H, 2005, Background to project management Carayannis E.G, Westport, Praeger

Kotter, J.P., 1996, Leading change, Harvard Business School Press, Boston

Kwak Y.H, 2005, Brief history of project management, Carayannis E.G, Westport, Praeger

Laar, B. van de, A. Roosendahl, 2007, Is project management een vak? Projectie 14 (2007) December 30-33, IPMA-NL

McKenna, M.G, H. Wilczynski, D. Vanderschee, 2006, Capital project execution in the oil and gas industry, Booz Allen Hamilton

Merrow E.W, 2002, The elements of project system excellence, Proceedings of Government/Industry Forum, National Academy of Sciences

Morris P.W.G, 2003, The irrelevance of project management as a professional discipline, University College London,YCL, GB

Morris P.W.G, 2005, Managing the front end: how project managers shape business strategy and manage project definition, PMI Global Congress proceedings 2005, PMI

Morris P.W.G, G.H. Hough, 1987, The anatomy of major projects: a study of the reality of project management, Chichester, John Wiley & Sons

Morris P.W.G, I. Loch, 2003, Organisational learning and knowledge creation interfaces in project-based organisations, Bartlett School of graduate studies, University College London

Morris P.W.G, M.B. Patel, S.H. Wearne, 2000, Research into revising the APM project management body of knowledge, Int.J.of Project Management 18 (2000) 155-164, Elsevier Science

Storm P.M, R.E. Jansen, 2004, High performance projects, IRNOP VI Project Research Conference, Open University, NL

Storm P, C. Savelsbergh, 2005, Lack of managerial learning as a potential cause of project failure, Open University, The Netherlands, Open University, NL

Turner J.R, 1999, The handbook of project management, 2nd edition, McGraw Hill Companies, London

Chair Project Engineering and Management

The chair Project Engineering and Management does exist already at the Delft University of Technology from 1990 onwards. My predecessors to the chair were Prof.dr.ir. A.W. Veenman and Prof.dr. J.S. Dhillon. The chair is established by the Foundation for the preservation of the Chair Project Engineering and Management.

The sponsoring companies are:

ABB	AKER KVÆRNER	AKZO NOBEL	bluewater
CBI	DOW	DSM	FLUOR
GTI suez	HOLLANDIA	Heineken	NEM
ROYAL HASKONING	Shell	SIEMENS	SPIE
STORK	TEBODIN	Technip	

Curriculum Vitae

Education

1974	Gymnasium B, St. Ignatiuscollege, Amsterdam
1980	Doctoraal Natuurkunde met Wiskunde en Electronica, Vrije Universiteit, Amsterdam
1985	PhD in Solid State Physics, Vrije Universiteit, Amsterdam

Employment

1985	Research Physicist, Koninklijke/Shell Laboratorium, Amsterdam
1989	General Research Planner and Management Assistant, Koninklijke/Shell Laboratorium, Amsterdam
1991	Head of Materials Engineering Standardisation and Coding, Shell Internationale Petroleum Maatschappij, Den Haag
1993	(Acting) Manager Research and Institutional Support, Shell Research and Technology Centre, Amsterdam
1996	Area Maintenance Manager, Shell Pulau Bukom Refinery, Singapore
1999	Consultant Maintenance and Inspection, Shell Global Solutions International BV, Den Haag
2000	Production Unit Manager, Shell Nederland Raffinaderij, Rotterdam
2002	Manager Global Project Services, Shell Global Solutions International BV, Den Haag
2006	Regional Operations Manager Projects, Shell Global Solutions International BV, Den Haag
2007	Part-time Professor Project Engineering and Management, Delft University of Technology

Public

1981	Honorary Member Hockey Club HIC
1987	Charter Member Lions Club Amsterdam Oud-Zuid
1998	Chairman Bakker-Arts Foundation