10 Years of Managing Large Infrastructure Projects in Europe

Lessons Learnt and Challenges Ahead

From 2006 to 2008 the NETLIPSE (www.netlipse.eu) project researched fifteen large infrastructure transport projects in Europe looking for good practices in the management and organisation of these rail, road and waterways projects. Since then, NETLIPSE has evolved into a client sponsored knowledge network where project clients, sponsors, project delivery organisations and researchers meet on a regular basis to discuss challenges and new approaches in their projects. The main goal of the network is to improve the delivery of the large infrastructure projects and infrastructure programmes.

Now, ten years later, several members of the network have looked back at the results of 2008 to determine what has happened to the lessons described then. It is interesting to see to what extent issues that were relevant then in terms of objectives & scope, stakeholders, financial management, organisation & management, risks (and opportunities), contracting, legal consents and knowledge & technology are still relevant today, or have become part of everyday project management activities. In addition, contributors provide their view on current challenges in managing and organising their projects and strategies as well as their expectations for the next ten years.

This book provides an overall as well as personal perspectives on the different topics, provided generously by members of the NETLIPSE network.
Important contributions provided by:


Dedication

This anniversary publication celebrates ten years of NETLIPSE: a network for experts working in the field of large infrastructure projects who are constantly searching for ways to improve the management and organisation of their projects and for the past ten years have been willing to share and discuss valuable knowledge and experiences. This book is dedicated to the many professionals who have generously shared their stories and who will continue to support NETLIPSE in its goal of improving the project delivery of large infrastructure projects in Europe.
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A former Swedish minister said: “Misuse of taxpayers’ money is a theft from the people”. This simple and yet very clear statement is indeed still valid. Public funds are limited and large infrastructure investments compete with other urgent demands in society. Thus the requirement to manage large projects extremely well is obvious. And this is what NETLIPSE is about: by learning from others, exchanging ideas and experiences, using results from applied research, the goal is to contribute to successful projects.

NETLIPSE started as a research project in 2006, 100% funded by the EC with the task to make a comparative analyses between different large European infrastructure projects. This resulted in 2008 in the book “Managing Large Infrastructure Projects” describing best practices and lessons learnt in fifteen large infrastructure projects throughout Europe.

When we started planning the NETLIPSE 10-year anniversary, the idea came up to produce a new book. We decided that it should partly focus on to which extent the observations from 2008 are still valid, partly on challenges for the future.

Since 2010, NETLIPSE has been a self-supporting network. Public organisations support NETLIPSE in different ways such as through direct financial contributions, hosting the bi-annual network meetings or in kind work. To maintain the confidence from organisations involved, and create interest among other possible contributors, it is important to create an interesting programme together and above all demonstrate and discuss practical results. In summary: NETLIPSE is unique. In my mind there are several challenges ahead for the infrastructure business:

- Reaching the traditional project goals of delivering on time, within budget and to meet quality expectations will not be enough. Issues like sustainability, public acceptance, safe workplaces and environmental considerations will play a bigger and bigger role.
- New contracting forms like ECI (Early Contractor Involvement), will most likely be interesting in order to involve contractor competences already in the design of a project.
- Increased cooperation between the client and consultants and contractors in order to focus on efficient implementation instead of disputes adding non value is another promising issue. “Coopetition”, competition while bidding, cooperation after the contract has been awarded may be a success factor.
- Applied research focusing on urgent issues implemented in cooperation with public clients is also an interesting area for the future.

If I have to summarise what I think will be the single most important issue to meet future challenges within large infrastructure projects I choose: leadership qualities. The project manager should work as a coach getting the best out of the project team.

Managing large infrastructure projects is one of the toughest jobs you can imagine. But at the same time may be the most interesting. And – you will never be done learning.

Again this is what NETLIPSE is all about – increasing skills through continuous learning.

Hopefully this book can give you some inspiration. I hope to meet you at one of our next NETLIPSE events. Enjoy your reading!
Chapter 1: Introduction

1.1 An Introduction to NETLIPSE

In May 2006, a consortium consisting of eight organisations from five countries, received EC financing from the Framework Programme 6 (FP6) to carry out a two-year research project into success factors in managing and organising large infrastructure projects (LIPs) in Europe. They called this project NETLIPSE (www.netlipse.eu). NETLIPSE not only focussed on executing the research, but also on creating an interactive knowledge network of member states client organisations, project delivery organisations, universities and other research institutes, where (intermediate) research results and experiences in the management and organisation of LIPs were discussed. The research focussed on gathering information on various aspects of the management and organisation of the fifteen road, rail and waterway projects researched. This included such themes as: leadership and team organisation, financial management, policy and strategy, stakeholder management, project management, resources, contracting, project control and risk management. Within these subjects themes such as (new) technology and innovation were also analysed.

In short, the NETLIPSE project (2006 – 2008) realised four objectives:

1. Setting up a knowledge network (that is still running to date);
2. Gathering information on best practices and lessons learnt in the management and organisation of 15 LIPs in Europe;
3. Disseminating the knowledge gathered and promoting the research results;
4. Translating the best practices into an evaluation and monitoring tool: the IPAT (Infrastructure Project Assessment Tool©).

After two years, in May 2008, NETLIPSE delivered the research results to the EC in the form of a publication and applied for and was granted funding by the European Commission TEN-T Executive Agency for the continuation and expansion of the NETLIPSE network initiative from 2008 - 2010. During this time, the bi-annual Network Meetings continued; articles were published, trainings were designed and given, marketing activities were undertaken, Special Interest Groups were initiated and the IPAT (Infrastructure Project Assessment Tool) was deployed.

\(^1\) Client organisations: Ministry of Infrastructure and Environment (Rijkswaterstaat – NL); Department for Transport (UK); research institutions: National Laboratory for Civil Engineering (LNEC - Portugal); Road and Bridge Research Institute (IBDiM, Poland); Swiss Federal Institute of Technology Zürich (ETHZ – Switzerland); Erasmus University Rotterdam (NL) and private organisations AT Osborne B.V. (NL) and KPC GmbH (Switzerland).

From 2011 on, the NETLIPSE programme has been financed by a number of public organisations. The network continues to flourish by continuing the bi-annual Network Meetings, which now allow for in-depth discussions on managing and organising complex transport projects given the difficult economic context many European countries face. In addition, other activities are organised such as project leaders seminar on specific topics such as contracting and procurement, new research and networking initiatives, trainings and IPAT assessments.

Currently, main contributors are Rijkswaterstaat (NL), Trafikverket (SE), Liikennevirasto (FI), Vejdirektoratet (DK), providing sustainable funding and sponsoring, whilst Department for Transport (UK), SEA Milan Airports (IT), Österreichische Bundesbahnen (ÖBB, AT), Generalna Dyrekcja Dróg Krajowych i Autostrad (GDDKiA, PL), Wirtschaftsuniversität Wien (AU), Universiteit Gent (BE), Technische Universität Delft (NL) and AT Osborne (NL) provide invaluable support in kind and in sponsorship. In addition, AT Osborne provides the programme management and support services.

What started out as a research project has evolved into an enthusiastic knowledge network. An informal network with formal agreements between partners. It will continue as long as the partners find useful. Challenge for the future will be to extend the network in a sustainable manner.

1.2 NETLIPSE Goals
The overarching mission that NETLIPSE has defined in its strategic plan is to positively contribute to Europe’s sustainability by improving the successful development, delivery and operation of large infrastructure projects and corridors through active and effective knowledge exchange. The NETLIPSE network consists of representatives from mainly client and project delivery organisations as well as research institutes. Their perspectives are jointly covered in the NETLIPSE goals:

- How to become better clients;
- How to realise (and organise) transport infrastructure ambitions with better value for money;
- How to learn from successful projects (realised within their time, budget and quality constraints) and less successful projects (by analysing the encountered difficulties and implemented solutions).

1.3 Purpose of this Book
Today, in 2016, NETLIPSE celebrates its ten-year anniversary. What started as an EC sponsored research project officially in May 2006, is today a knowledge network of representatives from project clients and sponsors, project delivery organisations and research organisations. All based on the notion that these organisations can greatly benefit from the experiences of each other.

Purpose of this book is to:
1. Reflect on the main best practices defined in the original NETLIPSE research (2006-2008), (Chapter 3, NETLIPSE book);
2. Gather additional knowledge (experiences) on project management topics relevant to LIPs;
3. Get an overview of what has changed in ten years of LIPs project management;
4. Define challenges in managing LIPs for the coming ten years;
5. Promote NETLIPSE as a relevant and interesting forum for knowledge exchange on procuring and managing LIPs in Europe.

1.4 Methodology and Approach
In looking back at the best practices initially defined, the approach taken for this book was twofold. Next to the qualitative input gathered from individuals and groups of individuals, a quantitative comparison was made comparing the quantitative results from the initial NETLIPSE research, to the experiences of today. Core questions in both approaches was:

- To what extent is the practice described still relevant today?
- To what extent is the best practice no longer relevant and/or has the best practice described become a regular part of project management practices?
- What are the challenges client/sponsor organisations and project delivery organisations face in project management approaches in the future?

This book marks the ten-year anniversary and looks back on ten years of net-working knowledge. In total, 29 project representatives from partner organisations provided their insights on the same statements as were evaluated ten years ago. Via this approach it was possible to compare the fifty statements of the eight project management themes initially researched. The result of this analysis is described in Chapter 2.

Together with many partners, attendees of the Krakow Network Meeting in 2015, and new interested project representatives, the “best practices” as defined in 2008 were also evaluated in various ways. At the Krakow Network Meeting for example, a working session was organised with all delegates, who discussed the best practice themes in groups. In addition, many qualitative contributions were provided by NETLIPSE partners and several interviews and reviews took place. This qualitative input is described in Chapter 3 of this book.

Chapter 4 provides a description of the IPAT (Infrastructure Project Assessment Tool). The assessment tool that NETLIPSE members are actively involved in as assessors and projects being assessed.

This book concludes in Chapter 5 with personal perspectives from the 2008 writing team, on NETLIPSE, the results achieved so far and challenges for the future.

Both the quantitative and qualitative information gathered for this anniversary publication has been reviewed by core network members. We would like to thank the many people who have so kindly contributed to this publication - their names can be found in Appendix A - and we look forward to the next interesting discussions!
NETLIPSE Benefits
NETLIPSE is an interesting network for Rijkswaterstaat for the following reasons:
1. The notion of a dedicated network of project sponsors and principals.
2. Allowing us to look beyond our own borders (literally).
3. By joining and supporting a network like this one, we discover and slowly increase new knowledge.
4. The initial purpose of NETLIPSE has faded into the background for Rijkswaterstaat. The research used to be the key driver but is now far less important.

With respect to the biggest challenges for our organisation, see our market vision documents. What is still critically important is that large complex infrastructure projects need to adequately set up and guard their risk management. Their knowledge on costs needs to be extensive and they need to listen well to the stakeholders and citizens input.

The politicians need to be able to have a long term view and be able to take long term decisions. They will therefore want to take small decision-making steps about a project that is running its course. Those two controversial movements were already in place in these projects in 2006 and are becoming stronger now. More often than not we find that today, during the delivery of a project, the usefulness and necessity of the project is discussed repeatedly, too few innovations are taking place and sustainability and costs of the project are not in order. This is our reality of today and one which you need to keep in sharp focus from the start of a project.

What are the benefits of NETLIPSE for Trafikverket?
The international exchange of experiences and personal contacts between project managers are very valuable.

What are Trafikverket’s challenges in the next 10 years?
With a great number of ongoing and planned large projects we have to continuously develop our project management skills.

Other challenges are for example environmental issues like reducing CO2-emissions, safety on work sites, introducing ERTMS as a way of increasing the capacity in the railway system, modernizing our fairly old railways and introducing BIM. Within these areas I can see a need for further knowledge exchange.

How can NETLIPSE help in addressing these challenges?
Topics as stakeholder management, safety and risk management, project management education and leadership are always essential. By keeping this on the agenda NETLIPSE will support Trafikverket.
1. What was your (organisation’s) reason to join NETLIPSE?
LNEC joined NETLIPSE in 2005, as a successful project proposal to the EC for financing under the Sixth European Framework Programme (FP 6). The Board of Directors of LNEC decided to engage in this participation as a project partner, through its Transportation Department, following an invitation of the Project Manager, taking into consideration that LNEC, as a public research laboratory for Civil Engineering, could, on the one hand, provide sound inputs to the proposed research regarding large transport infrastructure projects in Portugal, and on the other hand, profit from the knowledge exchange and experience provided by the other partners representing recognized entities of other European countries, covering a set of related domains and areas of expertise. After the completion of the project in 2008, LNEC discontinued a direct participation in the NETLIPSE network activities, but remained thereafter in contact and follows its development and initiatives.

2. What benefits did NETLIPSE deliver?
The NETLIPSE project attained its objectives by delivering a thorough analysis of representative case studies in Europe, based upon an adequate methodology that led to a compilation and dissemination of best practices on the management and organisation of large transport infrastructure. Furthermore the project led to the development of a practical tool which may be applied in a systematic way to the benefit of decision makers at various levels, in the projects evaluation process. In the case of LNEC those results gave new insights for carrying out its activities of advanced technical assistance, namely for the Ministry responsible for transport infrastructures in Portugal.

3. What are LNEC’s challenges for the next 10 years?
LNEC follows a research and innovation strategy settled for 2013-2020, in line with European and Portuguese policies and strategic options in various fields, such as science and technology, building industry and the environment. Major challenges are identified in this program, namely those intended to deal with the response to natural and technological risks, climate changes, demographic changes, growth of urban occupation, sustainability, economic competitiveness, etc. The Transportation Department of LNEC follows, in its areas of expertise, the said strategy, and has set forth its own detailed research program. As regards transport infrastructures, special attention will be devoted the whole life-cycle of the infrastructures (road and airport pavements, railways, bridges, tunnels, ports), in order to enhance their functional and structural performance, as well as the improvement of their durability and the efficiency of maintenance and rehabilitation interventions, within the scope of advanced assets management systems, based upon suitable indicators on the condition of the networks. Summarizing, the overall challenge of the proposed research is to contribute to the delivery of a new generation of infrastructures, more “intelligent” and “green”, which comply with an optimized use of resources, including energy, and bring an improved resilience to the transportation system as a whole.

4. What should NETLIPSE focus on the next 10 years?
NETLIPSE should continue to develop and renew its path, through networking relevant players involved in the management of large infrastructure projects, enabling the exchange of advanced, and proven, practices and knowledge in this field, within a continuous learning process. Attention should be given to integrated projects (e.g. road and rail, rail and port, logistics) evaluating their advantages and identifying the difficulties involved and how to overcome them. A broader focus, from large individual projects to infrastructure networks, including maintenance and rehabilitation schemes, and to the overall planning of infrastructure investments, should also be envisaged.
2 Ten Years of Project

2.1 Introduction
The previous NETLIPSE research consisted of both a qualitative and quantitative research approach looking into eight project management themes (objectives & scope, stakeholders, financial management, organisation & management, risks (and opportunities), contracting, legal consents, knowledge & technology. For this anniversary publication, we have reconstructed the quantitative research – ten years later - with a number of current projects involved in the NETLIPSE network. This has given us the opportunity to reflect on the developments within the analysed themes in a quantitative way. The main question for this reflection is: what do today’s large infrastructure projects find challenging versus what was challenging ten years ago?

As a reminder, these were the conclusions formulated in 2008:
1. In general, scope & objectives, financial management and legal consents are the best organised processes.
2. In general, stakeholder management lacks measurement, knowledge & technology are less organised, and human resource matters appear neglected.
3. The “hard” factors are better organised than the “soft” factors.
4. The “control” part is better organised than the “open and adaptive” parts.
5. The projects are not very open to optimisation, opportunities and new ways of working.
6. Only to a limited extent are projects open to research, knowledge management and new technologies.

2.2 Research approach
Each of the eight project management themes were translated into four to eight statements to which survey respondents could react. This activity was repeated in 2016. All involved project representatives were asked to score these statements in this survey on the basis of their project experience by choosing one of these options:
1. None: it was not the case (0 points);
2. Partly: it was partly the case (1 points);
3. Fully: it was fully the case (2 points).

The score reflects on the level of organisation around these specific themes.

For each theme the final score was calculated. For comparison purposes all scores were recalculated to create a ten-point scale. The maximum score for each theme could therefore be 10 points. In 2016 we were able to collect input from twenty-nine project representatives, of which thirteen were also involved in the
At first glance it seems that there are only a few significant changes to be remarked. Just as in 2008, financial management and scope & objectives appear to be the topics that are implemented the best. The score is only changed slightly. It is also remarkable that the theme knowledge & technology again scored the lowest after all these years. When looking at the activities included in this theme, it appears they are still not that well implemented in large infrastructure projects.

With respect to stakeholder management, risk management and contracting an improvement can be noticed. The importance of these topics has visibly increased in the last decade. This improvement is substantiated by the observations presented in the next Chapter.

Legal consents is the only theme which scored lower, which is curious. The comments provided for this survey provide no possible explanation what could be the reasoning for this reduction.

2.3.1 Comparison by theme
As indicated before, most of the themes researched scored higher than in 2008. The current top-3 includes financial management, scope & objectives and contracting. See table 2.

According to these figures, especially the organisation and implementation of the themes stakeholders (+1,3), contracting (+0,8) and risk management (+0,7) seems to have improved in large infrastructure projects in the last decade. It is quite remarkable that the “hard” project management topics (such as finance, scope and contracting) occupy the top of the list, whereas the more “soft” management topics (such as stakeholders and organisation) are at the bottom of the list. On the basis of this observation, we can conclude that the “hard” factors and “control” part continue to be better organised and implemented in LiPs than the “soft” factors and the “open and adaptive” parts. The theme technology & knowledge is at the bottom of the list and has scored the lowest by far. Projects seem to give no (or less) attention to (1) knowledge management policies, (2) use of new technologies, (3) the use of research and (4) active knowledge exchange with other projects and organisations. At the same time, survey participants underpin that additional attention for this topic is needed. Perhaps an interesting topic for NETLIPSE to investigate in the network meetings in the future!

2.3.2 Comparison by statement
In total, 50 statements were assessed by the participants. A closer look at the
results on the statement level gives us more information about the specific developments within the defined themes. The complete overview of statement and their results can be found in Appendix B. Tables 2 and 3 provide insight into the top-5 of positive and negative score developments.

In the last decade, many client organisations in Europe have started to develop and experiment with new forms of contracting and procurement strategies. This development is clearly visible in the scores of statements concerning this development.

There is clearly more attention on the periodical measurement of stakeholders satisfaction, which implies a huge improvement relative to the conclusions in 2008 where it was stated that: “stakeholder management lacks measurement”. Involving stakeholders in projects is becoming a better organised process, being better measured periodically as well.

In the survey there are a few statements that relate to the periodical evaluation of processes. It is remarkable that most of these statements scored lower than ten years ago, therefore seemingly being less organised than before. It is even more curious when considering that evaluations are a crucial element for the continuous improvement in projects and project delivery organisations. When looking at which topic is experiencing better periodic evaluations and which topics do not, the best evaluated process is stakeholder management, the process being least evaluated is management of (legal) procedures. See table 4.

The most concerning development from a client and project management perspective is the negative difference in scores about the extent to which the projects are organising the identification and control of scope changes. This concern is explicitly shared by some survey participants in their clarification statements. Dealing with changes in scope and objectives over time is considered to be an undervalued topic, especially in the set up of project management systems that should deal with this complexity.

### 2.3.3 Comparison by Project Type

The survey respondents represented multiple project modalities. The collected results for this (2016) survey contains data from road (12), rail (9), combined road/rail (1), water (5) and port (1) projects being carried out in different European countries.

Within the survey results, most of the improvements in the project management topics seems to be realised in rail projects (See figure 2). These projects scored consistently higher. The average score of rail projects rose by 1,6 points (2008: 6,9 and 2016: 8,5), where road projects just score 0,2 higher (2008: 6,5

### Tables

#### Table 2: Top-5 of processes with positive developments

<table>
<thead>
<tr>
<th>Statements</th>
<th>Theme</th>
<th>2008</th>
<th>2016</th>
<th>Delta</th>
</tr>
</thead>
<tbody>
<tr>
<td>The project organisation is open to new ways of contracting.</td>
<td>Contracting</td>
<td>4.7</td>
<td>7.4</td>
<td>2.7</td>
</tr>
<tr>
<td>Stakeholder management is evaluated periodically.</td>
<td>Stakeholders</td>
<td>3.3</td>
<td>5.7</td>
<td>2.4</td>
</tr>
<tr>
<td>The project scope is determined with other stakeholders (partners).</td>
<td>Scope &amp; Objectives</td>
<td>6.3</td>
<td>8.6</td>
<td>2.3</td>
</tr>
<tr>
<td>The project organisation has an open culture.</td>
<td>Organisation &amp; Management</td>
<td>6.4</td>
<td>8.6</td>
<td>2.2</td>
</tr>
<tr>
<td>Satisfaction of stakeholders is measured periodically.</td>
<td>Stakeholders</td>
<td>3.0</td>
<td>5.0</td>
<td>2.0</td>
</tr>
</tbody>
</table>

#### Table 3: Bottom-5 of processes with negative developments

<table>
<thead>
<tr>
<th>Statements</th>
<th>Theme</th>
<th>2008</th>
<th>2016</th>
<th>Delta</th>
</tr>
</thead>
<tbody>
<tr>
<td>The project has a specific change register for scope changes.</td>
<td>Scope &amp; Objectives</td>
<td>9.0</td>
<td>7.1</td>
<td>-1.9</td>
</tr>
<tr>
<td>The management of procedures is evaluated periodically.</td>
<td>Legal consents</td>
<td>7.7</td>
<td>6.0</td>
<td>-1.6</td>
</tr>
<tr>
<td>Contracting and contract management are periodically evaluated.</td>
<td>Contracting</td>
<td>7.7</td>
<td>6.6</td>
<td>-1.1</td>
</tr>
<tr>
<td>The project organisation knows about new developments and changes in actual procedures.</td>
<td>Legal consents</td>
<td>9.0</td>
<td>7.9</td>
<td>-1.1</td>
</tr>
<tr>
<td>The project organisation is eager in cooperation with stakeholders to optimise the procedure time.</td>
<td>Legal consents</td>
<td>8.0</td>
<td>7.1</td>
<td>-0.9</td>
</tr>
</tbody>
</table>

#### Table 4: Overview of changes in evaluations of processes

<table>
<thead>
<tr>
<th>Improved periodical evaluations:</th>
<th>Declined periodical evaluations:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stakeholder management (+2,4)</td>
<td>Management of (legal) procedures (-1,6)</td>
</tr>
<tr>
<td>Contract management (-1,1)</td>
<td>Satisfaction of employees (-0,7)</td>
</tr>
<tr>
<td>Risk management (-0,5)</td>
<td>Risk management (-0,5)</td>
</tr>
</tbody>
</table>

Table 2: Top-5 of processes with positive developments

Table 3: Bottom-5 of processes with negative developments

Table 4: Overview of changes in evaluations of processes
The comments given in the survey do not provide an explanation of this observation, but this is certainly interesting topic for upcoming NETLIPSE events.

2.4 Conclusions

On the basis of the collected data, we could say that most of the conclusions from the 2008 research are still valid today. Most of the themes (except legal consents) seem to have improved in the past ten years, but only slightly. In addition:

- The “hard” factors and “control” part of managing LIPs still seem to be better organised than the “soft” factors and the “open and adaptive” parts;
- The management of scope seems to have declined, which is indicated to be a very concerning development;
- Stakeholder management – and especially the periodic evaluation of this process – seems to have improved greatly since the previous research.
- Rail projects seem to score much higher – have improved the implementation of the project management themes in their projects - in the survey than road projects.
- Knowledge and technology have received by far the lowest scores. The comments by survey participants underpin that additional attention for these topic is needed in their LIPs.

Figure 2: Score comparisons of road and rail projects

Table 5: List of projects included in the 2016 research

and 6 more projects, which were submitted anonymously
In 2004 RWS decided to participate in a comparative analysis between projects in the Netherlands and Switzerland (HSL-South, Betuweroute, A73 road project; Gotthard Tunnel, Lötschberg and a Swiss motorway).

In contacts with Marcel Hertogh, who was starting a PhD, we decided to see if the analysis could be broadened to include more projects in Europe. We arranged a meeting with the EC to discuss this proposal and submitted the proposal with a consortium of 8 organisations in the 6th Framework Programme for funding. In 2006, funding was granted and NETLIPSE was born.

My motivation for knowledge exchange arose from my long experiences as a project sponsor and project Director. It occurred to me that there was not much knowledge sharing or sharing of good experiences in our organisation. The comparative analysis proved that the challenges faced in Switzerland in managing large infrastructure projects were very comparable to those in the Netherlands.

Important question for me was: what is the influence of cultural context on the management of these projects? For the ‘hard’ project management aspects, there are management tools, systems and methods available. The human factor of building trust, for example in tender processes, and in project teams, seemed to be a topic that many client organisations were dealing with. By sharing experiences, we could all benefit.

From 2006 until 2013, I was Chairman of the NETLIPSE Executive Board. I’ve seen the NETLIPSE network grow as organisation. One of the unique selling points of NETLIPSE is that it operates as network without a heavy institutionalised organisational framework to support it. The informal, small scale bi-annual Network Meetings allows for the intimacy to present and discuss actual client issues.

For me the highlights of the past ten years are:
1. The NETLIPSE book in 2008: Managing Large Infrastructure Projects in Europe. The result of a two-year research period, benchmarking fifteen large infrastructure projects in Europe;
2. The development of the IPAT (Infrastructure Project Assessment Tool) in 2010;
3. Discussing themes that have drifted to the surface and that many client organisations are struggling with: procurement and contracting (alliancing, Best Value Procurement, Australian model, UK business cases) and themes in stakeholder management and communication.

How long will NETLIPSE continue? As long as people remain enthusiastic to keep supporting the network and organising and attending the meetings. It is crucial however, that there are some people to organise it! Paulian and Tom are very important to the network and at the same time represent its weakness. The network needs someone to manage and organise the network, its activities and manage the funds. This can not be done on a voluntary basis. In addition you need people willing to contribute time and effort.

Since 2010 NETLIPSE has been self-supporting. There is enough interest from government organisations to continue supporting the network. Although there is no EC funding in NETLIPSE anymore, references to the NETLIPSE approach is specifically mentioned as good practice, for example in the report ‘Improving Transport Performance on trans-European rail axes: have EU rail Infrastructure Investments been effective?’ by the European Court of Auditors (2011) and by the EC Directorate-General for Internal Policies: “Update on Investments in Large TEN-T Projects” (2014).

Tips and suggestions for the future
It is important that the network continues focussing on the broad spectrum of project management issues. Pitfalls and obstructions of project management including the basic project delivery themes: delivering on time, within budget and to quality expectations. In line with the IPAT (Infrastructure Project Assessment Tool) developed and used by NETLIPSE, the project delivery itself and client satisfaction are also important issues.

But most importantly:
1. Use the strengths of the network. Continue creating an informal and open atmosphere of mutual trust so that delegates are able to discuss the key issues they are facing;
2. Make sure you keep the sustainable financial contributions in order to keep the network going.
3 Good Practices in Project Management after 10 Years

3.1 Introduction
Besides the quantitative reflection carried out, as part of this anniversary research, the NETLIPSE network also undertook several activities for a qualitative review of the best practices defined in the 2006-2008 NETLIPSE research. Most important questions to be answered were:

1. To what extent are the best practices defined in 2008 now part of our regular project management approach?
2. To what extent are we (client/sponsors and project delivery organisations) facing the same challenges in managing our projects as ten years ago?
3. What are the project management challenges in the coming years?

In order to be able to compare the results from 2006-2008 and 2016 we organised several activities, varying from a working session at the Krakow Network Meeting (fall, 2015) to interviews. In addition, several project managers and researchers were asked to reflect on the following themes (the same themes as in 2006-2008):

1. Objectives & Scope;
2. Stakeholders;
3. Financial Management;
4. Organisation & Management;
5. Risks (and opportunities);
6. Contracting;
7. Legal Consents;
8. Knowledge & Technology.

This Chapter contains all the input received. Again, the information provided in this Chapter is not complete, but should be seen as a collection of interesting perspectives provided by experienced client/sponsors, project managers and researchers involved in the realisation of LIPs in Europe.

3.2 Objectives & Scope
The best practices described ten years ago are very clear about the importance of thoughtful scope definition in LIPs. The project management needs to have a clear vision about the project objectives and stakeholders need to be involved to secure a complete and supported project scope. Management of possible scope changes is evidently important, and flexibility of applied contracts with contractors is necessary to prevent huge cost overruns due to scope changes. The following best practices were defined 10 years ago:

1. Define objectives in interaction with stakeholders;
2. Formulate a vision;
3. Translate objectives into scope, work packages and milestones;
4. Assess and authorise scope changes;
5. Use configuration management to assess the impact of scope changes;
6. Implement a variation (scope change) procedure;
7. Organise adequate expertise to be able to deal with scope changes.
3.2.1 What’s different in 2016?
The defined best practices in the area of Objectives & Scope mostly focus on following correct procedures from a perspective of work packages and milestones. Although it is an iterative process, scope- and configuration management are quite important in order to succeed. Projects still experience difficulties because they for example cannot always clearly be defined in an early stage in terms of outputs. As projects evolve they could obtain a more developing, adaptive approach. A current challenge for projects is avoiding too much stress on scope control and risk management that could result in less focus on opportunities, such as adding extra scope, innovations, and/or other new ideas. These all could be more beneficial towards the defined ambition than the original project scope.

Scope changes due to political involvement is still a challenge and something that needs to be dealt with continuously. The LIPs we are involved in often outlast governments. As a result much management time is needed for communication with and informing of client/sponsor representatives. The most effective measures to handle the political risk is the maturity of the project manager to withstand such influence and the business case analysis tool to provide numerate evidence about the effect of a change. Good communication skills and much flexibility are traits that are required.

3.2.2 Expectations and challenges for the next 10 years
The main challenge was - and still is – the definition and stability of the ob-

Transfer of clear and transparent project objectives from early phases to later phases is still one of the main challenges in our projects. Mladen Radujkovic

It is clear that defined infrastructure ambitions have become broader and broader during the past ten years. Where a decade ago the ambition was to improve mobility between location A and B, today the ambition is to generate an impulse to transformation of a network of cities. Because of this, more and more programmes are defined as a set of related projects. This means that the network, or part of the network, such as a corridor, has become more important than a single project. This higher programme level should prioritise to maximise overall value. On the other hand, in adaptive programmes, the organisation can learn from these projects, and make the overall programme more fit-for-purpose. In general in terms of a business case, it is more flexible and manageable to have small projects linked together via a strategic plan. But sometimes mega projects are needed for huge interventions in the network, and for politicians to assure budgets when there is support.

Scope changes due to political involvement is still a challenge and something that needs to be dealt with continuously. The LIPs we are involved in often outlast governments. As a result much management time is needed for communication with and informing of client/sponsor representatives. The most effective measures to handle the political risk is the maturity of the project manager to withstand such influence and the business case analysis tool to provide numerate evidence about the effect of a change. Good communication skills and much flexibility are traits that are required.

3.2.2 Expectations and challenges for the next 10 years
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The transport, political and social reality is developing much faster than the consultants and designers (and of course politicians) are able to envisage and/or forecast. Therefore “surprises” occur during the project implementation and after opening for traffic. (The D1: Mierová – Senecká road project in Slovakia is a good example and/or migration problem which is EU facing now).

The challenge that I see for the future is that the complexity of LIPs will grow. The methodologies for incorporating e.g. climate change would be necessary. New challenges are related to the composition of the vehicle fleet (using of electromobilies, intelligent vehicles). Even a conservative approach must admit that when the number of vehicles without combustion engines will create a substantive portion of the vehicle fleet the existing mitigating measures would be redundant (e.g. noise barriers or width of the protective zone for the road infrastructure).

Generally the whole transport sector could be substantially influenced by a massive deployment of drones (flying objects) for transport of goods and persons.

Ľuboš Úrič

Conditions and surrounding circumstances of projects (legal, technology, stake- holders, politics, ...) are changing faster and infrastructure projects can not change in the same way (or perhaps: shouldn’t...). As a result:

• Change management must become management of changes (especially in specific additionally added supplements) AND management of when (and how) to say “NO” to these additions.
• Establish and keep commitment in public for large investments. Because: financial crises in western countries and public participation requires excellent argumenta-
tion for need of a project. Public claims the right to get good explanation for spirit an purpose of large projects. Project management has to react to these issues throughout the whole project.

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The biggest challenge in the Objectives & Scope theme is the interaction between a stable and solid scope towards flexibility and agility in projects. Large infrastructure projects need a solid base that may not be able to adjust to changes in circumstances of stakeholders. Jasper Tils

Objectives and the related project scope. Challenge is to maintain the relation between ambition and project scope in order to secure a successful project output. Infrastructure projects are becoming larger and larger and the project timespan is increasing as well. On the other hand, technology is developing faster as well. The combination of this more lengthy processes and technology development results in a higher risk that the project’s output could be out-of-date even before completion.

So when the main challenge is to maintain the relation between ambition and project scope, which methods could project management provide to overcome this challenge? Methods are mostly linked towards verification and validation, terms which are missing in the best practices from 2016. Methods like system engineering and functional specification are more and more focusing on these terms.

Most of the time, projects are assessed as individual projects with their own objectives and goals. The challenge for the future is the consistency between individual project objectives and its contribution to the overall ambition.

Jasper Tils

Bigger-Better-Faster-Cheaper

The NETLIPSE findings related to project purpose and business cases are still relevant on a high level. The focus on the strategic perspective, as a balance of technical, business and social components is still very much appropriate for today’s approach. It is fact that each LIP has a long project lifecycle and is often strongly influenced by a political party in power, which is often changed during the project realisation time. Therefore, transfer of clear and transparent project objectives from early phases to later phases is still one of the main challenges projects face today. Each megaproject is driven by mega interests which, on top of all kinds of cross topics complexity, create mega challenges for the project management profession. The strong foundation on societal needs and environmental protection, should highlight the major direction for each LIP. It provides a firm guarantee that the project is serving society, and not only for one generation, but for society at large. Moving the business case through project phases to the delivery phase is still an issue of concern. It includes dealing with all kind of interests, risks, changes and restrictions, such as perceptions, and only top class project management competences can respond to such mega challenges. Decisions and approaches taken in the early stage, or front end phase, is still crucial for each infrastructure project. It is obvious that mega project governance becomes recognised as a key driver of a success for that phase. In parallel, there is a need for more efforts in developing transparent criteria about infrastructure project success and related project management success. The wheel of “bigger-better-faster-cheaper” is moving faster and faster, so each new project in a new time will be challenged to demonstrate new achievements.

Mladen Radujkovic

“In the cases of road construction, the traffic forecasts have been exceeded almost immediately and the new highways have led to better journey times and improved safety”. This main finding from 2008 is still valid today.

On the basis of common practice, road traffic forecasts are typically correlated to the economic growth and in most of the cases are associated with the GDP growth trend. However, there are some emerging theories in literature on the decoupling of traffic to GDP. This is particularly factual for the freight road traffic demand which is highly affected from the dematerialisation of the industrial production with manufactured goods in decline together with the supply chain efficiencies whereas the tertiary sector is increasing.

Moreover, for decades the EC has been pushing towards policies for modal shift from road to rail or other more sustainable transport modes. In addition, the concept of “food miles” and “zero kilometre policies” will increasingly change the road users’ behaviour. The promotion of car sharing, technological development as well as integrated land use and transport planning lead to a reversal of the trend towards motorisation and urban sprawl.

Massimo Corradi
Portfolio and asset management are tools to maximise value over multiple projects and the overarching ambitions. Managers need to have skills to spot opportunities across the borders of their projects and need to have the courage to ‘lose’ a project in order to win more on another!

In order to do so, we need to find adaptive management strategies. Searching for added value should start at the project inception and continue (opportunity framing). These projects are more than ‘just’ realising the physical infrastructure. This could imply that the flexibility of the project scope needs to increase to be more resilient and open to opportunities. Opportunities in the near future are related to, for example, the composition of the vehicle fleet. What do current infrastructure projects need to do to facilitate future development of its users?

3.3 Stakeholders
LIP project organisations never act in complete autonomy. They often have strong links to both internal and external organisations, such as the parent organisation, client/sponsor organisation, local communities (inhabitants, shopkeepers, businesses, end-users), non-governmental organisations and interest groups, as well as adjacent projects. All of whom can influence the project organisation and the scope of the project. We define a project stakeholder as any organisation or person who is influenced by, or perceives itself to be influenced by, the project.

The best practices defined in the 2006 NETLIPSE research, focused very much on recognising stakeholders and their importance. The following best practices were defined:

1. Stakeholders are very important to project delivery organisations in terms of achieving the consents and approvals for work to commence;
2. An open approach to stakeholders helps build credibility of a project team;
3. A proactive liaison with key influencers and obtainers of legal consents is essential;
4. Wide stakeholder support throughout the project is important for sustaining political support;
5. Categorise stakeholders according to their impact on the project;
6. Project branding gives the project a very clear identity;
7. Sustaining the relationships and measuring the effectiveness of communication with stakeholders can yield strong benefits for a disproportionately low amount of time and expenditure.

3.3.1 What’s different in 2016?
When revisiting the best practices defined in 2008, it is clear that many topics found in the projects researched in 2006 – 2008 were related to stakeholder involvement in relation to obtaining legal consents for the project. Since then, addressing stakeholders and their needs, proactively liaising and creating sustainable relationships, have become normal project management practice in many more areas of our projects, not just dealing with legal consents. Involving stakeholders in a structured manner and increasing stakeholder engagement throughout the project lifecycle has become daily routine in most European countries. Even when in some countries such as the Netherlands and Sweden, stakeholder initiatives are elaborated and detailed, the stakeholders are not the decision makers. It remains a challenge to balance stakeholder initiatives, interests and benefits.

The best possible way to approach stakeholders remains the open and proactive approach. Lessons from projects such as the Amsterdam North South Metro Line have taught us that open and transparent communication increases the credibility of the project team and increases the understanding of the community about what is happening in the project. Even so, in some cultures, dealing with stakeholder groups remains a challenge, that sometimes forces the project organisation to rethink their strategy and forces delays. The experiences of the Lyon-Turin High Speed Line organisation, for example, responsible for linking the Italian and French high-speed rail networks, is an interesting case study for this. Not only dealing with external stakeholder groups
but also dealing with the internal stakeholders involved in managing a cross border project of that magnitude. After years of negotiations, the two countries have recently created a new company to manage the project, Eur Alpine Tunnel Lyon – Turin (TELT), a 50:50 percent joint venture between the Italian State Railways (FS) and the French state. This is an innovative approach to managing the project.

In the period 2010 – 2012, NETLIPSE had a Special Interest Group (SIG) in place, focusing on the topic of stakeholder management. One of the first discussions that the group had, was about the name “stakeholder management”. The general consensus at that time was that we could not “manage” our stakeholders at all and we needed to change the name. For that reason and from that moment on, the SIG was called “Stakeholder Participation & Communication”, representing the ideas that in our large and complex infrastructure projects, creating stakeholder participation via various communication forms, is a far more effective approach than the traditional stakeholder management approaches in place (identify stakeholders, describe their needs and wishes, see if these change over time).

Another activity that members of this SIG undertook was to participate as a sounding board for the PMI-sponsored research “Rethink!Project Stakeholder Management”; a research project carried out by Vienna University of Economics and Business and the University of Southern Denmark (2012-2015). The rational behind this research was:

1. Even though stakeholder management is a key to project success, still many projects fail or are extremely challenged by project stakeholders;
2. The global request for considering sustainable development increases the need for project stakeholder management even more;
3. Practitioners and researchers alike need a deeper understanding of how to practice stakeholder management to support benefits creation.

NETLIPSE representatives participated in several working sessions and workshops, discussing the research approach and (intermediate) results with the research group. Most important result of the research was the awareness of delegates that a shift in stakeholder approaches had been taking place, as described by Martina Huemann.

Projects are no longer “managing” their stakeholders (managing “of” stakeholders) but throughout the project lifecycle have evolved their approaches to a more integrated and proactive liaison with stakeholders (managing “for” stakeholders). An approach which seems more effective, especially in the later phases of a project lifecycle.

From managing of stakeholders to managing for stakeholders

All the best practices from 2008 are still relevant although the topic of stakeholders has become more important. The extent to which a proactive stakeholder management approach is applied in infrastructure projects depends very much on the cultural/national context, what is required. There are big differences between countries such as the Netherlands or Scandinavian countries, and Eastern European countries in how far such proactive approaches are taken.

What have we learned with respect to the topic in the past 10 years? Quite a lot. Some developments, I am aware of are:

• Researchers have linked back project stakeholder management to stakeholder theory. The approaches of managing of stakeholders and managing FOR stakeholders have been described as stakeholder strategies/approaches for the projects. In the context of sustainable development, a managing “for” stakeholder approach fits well and supports co-creation processes. However, the project organisation needs to be equipped to deal with the contradicting interests and expectations on the project, otherwise the inclusion of stakeholder interests remains superficial, leads to frustration and confusion. Thus, project owners/sponsors and Project Management teams require more social competences and different methods to deal with the contradictions and complexity that becomes visible by taking stakeholders and their interests more seriously.

• Stakeholder management is considered as a task that is distributed in a project and not the sole responsibility of a stakeholder or communication manager. However, we find this role of an explicit stakeholder or communication manager more in large infrastructure projects, which reflects the importance of the topic.

• Researchers have looked into methods of family therapy to provide project teams with methods that helps them to deal with the complexity of stakeholder landscapes. Such methods are for example, systemic board constellations, systemic constellations, management constellations.

Martina Huemann
For the communication strategy of the Vienna Main Station Project (2006 – 2015), stakeholder management was one important pillar of the project’s success. The project was divided into three chronological stages: planning-, construction- and operational-phase. In 2007, it started with intensive neighbourhood communication that focused mainly on the conveyance of facts, figures and impact of the project. Several exhibitions were held and the public was able to discuss the project in detail with experts and planners.

During the construction phase, we invited the public to attend so called “Construction Site Open Door” events to visit the project site. Over 17,000 people took this opportunity to get specific insights and look closely at the construction workers doing their job. Over 380,000 visitors were attracted by the 42m meter high platform which housed the project Information Centre “Bahnorama”. People were enthusiastic about the complete view of the construction site and the possibility to get deeper understanding in the 400m² exhibition hall, in an entertaining and informative experience.

At the start of the operational phase of the railway station in 2012, specific campaigns were carried out at more emotional levels. In all phases, there was consensus that providing information is the duty of the Project Manager and should be communicated early and proactively, be consistently transparent, continuous and delivered at a personal level, no matter whether it is communicating with neighbours, journalists or visitors. Numerous PR-awards and honourary distinctions confirmed the success of these eight years of communication efforts.

Karl-Johann Hartig

3.3.2 Expectations and challenges for the next 10 years
When asking NETLIPSE members what their expectations and challenges are in terms of stakeholder management (or shall we call it: stakeholder participation & communication?) in the coming years, all agree that most client and project organisations face the same types of challenges. One of the biggest challenges is how to implement an infrastructure project in an ever-growing complex stakeholder arena: how to get parties to focus on the objectives instead of focusing on their own interests. In addition:

- Stakeholders are better organised;
- Stakeholder groups are becoming more vocal and are better informed;
- In some countries, stakeholders expect to be involved in the design process;
- Management of expectations is under-valued;
- The influence of new media;
- The use of new media. Realistic and risk based communication with stakeholders is required;
- The European Commission focusses more on corridors rather than on individual projects;
- There is an increasing need for (cross-border) cooperation.

In addition to these challenges, there seems to be a shift – at least in the Netherlands – in stakeholder management approaches. In line with a strategic stakeholder management approach, large infrastructure projects are no longer approaching the topic by identifying and monitoring individual or groups of stakeholders. Instead, these projects are taking a different approach, by identifying issues – relevant in a specific project phase. Defining the issues, includes defining the stakeholders involved and their opinions to and interests in that specific issue. The level of power these stakeholders have as well as their profiles, determine the issue and/or stakeholder strategy the project organisation puts in place. As such, stakeholder management has become a strategic topic, and has become a formal role in the 5-processes integral project management model implemented in most Dutch Ministry of Infrastructure and the Environment projects. (The other processes are: project management, technical management, contract management, project control.)

Overall, finding the right tools to balance the interests and influence of different stakeholders is seen by NETLIPSE members to be a challenge for the future. Managing their expectations and being able to predict stakeholder impact over time – during the project lifecycle – are topics currently being focussed on in our discussions.

Interesting in this light is another challenge for the future: with more and more integrated contracts with contractors as part of the client organisations’ strategic long-term policy, is it possible to tender out stakeholder management or should the client and/or project management organisation keep the (end) responsibility for this topic?

In short, enough interesting topics to discuss and investigate further at future NETLIPSE meetings and initiatives.
Stakeholder management challenges in the next 10 years

Infrastructures projects have a large construction part, however they need to be framed and considered more comprehensively and holistically. The successful project outcome is much more than the piece of the infrastructure delivered.

From the investor perspective, most of the transport infrastructure projects are development projects (or programs) contributing to the development of a region. Thus there are change components that need to be explicitly considered. It needs a shift in mind set. Stakeholders are becoming even more important. The City of Vienna for instance, is increasingly considering the social embeddedness of their (infrastructure) projects, which leads to a much higher acceptance of the project outcomes.

To achieve social embedding of a project, such as a new train station, a tunnel or a new underground line the project needs professional and proactive stakeholder engagement to ensure the acceptance of the project outcomes.

Professional project marketing (having a brand is only part of this, however it supports the communication) needs to be done by the project organisation, the investor and supplier organisations.

Social media will play an increasingly important role in stakeholder engagement, communication to support co-creation processes. Ideas from open innovation can be brought into infrastructure projects, to include the end users better into the process.

I expect an even clearer link between stakeholder management, benefit realisation management and sustainability issues in the future.

New challenges for the successful delivery of large infrastructure projects

The need for a new mind set, that there are (almost) no pure construction/infrastructure projects anymore, but construction/infrastructure is just a part of a more comprehensive development project/program. Thus more and different stakeholders are becoming relevant, when framing the project more holistically. To achieve social embeddedness of a project and ensure the full acceptance of the project outcomes needs proactive stakeholder engagement and a managing FOR stakeholders rather than a managing OF stakeholders. That all means taking stakeholders (even more) serious for sustainable development. Prerequisites are different values and behaviour such as cooperation, co-creation, transparency of cost and benefits, comprehensive business cases considering (as many as possible/adequate) stakeholder interests.

Martina Huemann

Some new relevant literature

- Silvius, G., 2016, Strategic Integration of Social Media into Project Management Practice, Hershey, PA: IGI-Global, in press.
3.4 Financial Management
When assessing the theme Financial Management, the NETLIPSE research groups looked at how the client provides the funding for the project as well as how the project organisation plans and controls costs during the complete project life cycle. The translation from scope, time schedule and risks towards a proper financial model needs to support project decisions and thereby secure project funding. It is clear that the financial component is highly correlated with every aspect through the project, which makes it an everyday complexity in your project. Situations like multiple sources of funding, multiple contracts and scope-funding relations makes this theme even more interesting.

Projects are properly defined against a specific output requirement and strategic purpose. Projects should be developed, assessed and prioritized in relation to the extent to which those defined outputs contribute to the solution of transport, economic or social problems;
• A clear set of appraisal guidelines for projects should be issued on a national or possibly a European basis so that effective comparisons can be made to inform choices of both priority and affordability. This would help mitigate the risk of projects proceeding because they were the particular ‘babies’ of certain politicians or parties;
• A best practice relates to the use of levels of optimism bias, i.e. making an extra allowance in the appraisal to recognize that there are many elements at early stages of a project which have yet to be quantified or indeed identified. As the project proceeds and the levels of definition improve, the percentage of optimism bias is reduced, until, at the ‘go ahead’ stage, this is replaced by a risk margin within the overall project costs. It was a helpful practice in some projects to quote a price range at early stages of project development;
• Major Projects take many years to implement, usually much longer than the length of governments and a clarity of purpose and business case justification is vital if projects are not to be hampered by changes in government, either from a change of party or of key individuals. Equally, it is helpful to seek as much as possible “all party support” to ensure that the project is widely understood to be of national importance and is not a point of controversy between political groups;
• Several of the smaller projects studied formed part of a longer term strategic plan for development of a network of routes. This is best practice – the appraisal and consideration of a main network being completed enables an overall goal to be achieved in sections as affordability considerations allow;
• Clear project objectives, if defined at the early stage, can be very helpful for the project organisation in defining design parameters and project specification as well as in undertaking consultation and staff communication;
• The project objectives should be clearly translated into a functional output specification. The functional specification should be translated to required technical outputs, scope of work, work packages and milestones.

3.4.2 What’s different in 2016?
Financial figures are one of the key drivers for decision to start a project. For proper decision-making it is necessary to achieve a complete and correct translation of the project purpose and the financial figures. In other words, what is the project business case? The next text box contains the related finding in the previous research on this link between the business case and the project purpose.

3.4.3 Expectations and challenges for the next 10 years
The recommendations about the financial management of LIPs defined 10 years ago – and challenges accompanying them - are still valid. In addition, new challenges have arisen. Discussions in the past few years at NETLIPSE meetings, have focused on the following subjects:
• Definition of economical value and ecological losses of LIPs;
• Integrated contracts including project finance;
• Ensuring project funding over the project life cycle.

Often, you can identify a better solution in economic terms, but simply have to choose a good, but cheaper option to fit the budget. Stuart Baker

The following best practices were defined 10 years ago:
1. Use proper calculations to support decision-making;
2. Search for financing and funding possibilities;
3. Control costs and budget in relation to scope.

3.4.1 The Project Purpose and Business Case lessons learnt in 2008
• It is essential that major infrastructure projects are properly defined against a specific output requirement and strategic purpose. Projects should be developed, assessed and prioritized in relation to the extent to which those defined outputs contribute to the solution of transport, economic or social problems;
The clear NETLIPSE recommendations from 2008 remain absolutely valid, even with the passage of a few years after the research was undertaken. It is absolutely vital that there is a clearly defined project purpose, linked to the definition of the problem that the investment intervention is seeking to assist or resolve.

In Britain, we have recently developed a ‘5 case’ assessment process which ask simple, clear questions about a possible investment option. The economic assessment requirement was already strong but this has been balanced among other key factors. See below:

Within this framework, there is a very detailed mandatory economic appraisal framework with very strict rules about how projects are quantitatively assessed. This is set by the Treasury (UK Ministry of Finance). This national assessment framework enables projects across the whole spectrum of public sector investment to be fairly compared. For example in transport projects one can value journey time savings, comfort, quality and various other parameters.

Following the work done in 2003 by Bent Flyvbjerg ‘Megaprojects and Risk’, the UK guidance has mandated the inclusion of “optimism bias” – effectively a safeguard against the over optimism which he found project promoters usually have. People pushing for a project to be funded have an inevitable tendency to under estimate the costs and risks and to over estimate the benefits the project will deliver. The optimism bias is calibrated according to the phase of project development – the earlier the development stage, the more the uncertainty and the higher

the optimism bias which should be applied.

Over time, the business case methodology is updated by looking at the results from projects which have been delivered. It will also change over time as people’s habits change. For example, the journey time values of a business traveller has been slightly devalued for train travel for all but the very longest distance journeys – innovations such as excellent mobile connectivity, laptops and tablets have triggered the change from journey time to be ‘waste’ to being productive time.

The various models are usually incremental – e.g. value of a minute journey time saving caused by the investment. At this level the models are highly accurate, but when there is a step change in connectivity by an investment they can be less accurate. For example, the NETLIPSE work heard that the assessment of traffic demand for the Øresund bridge between Denmark and Sweden was based on the earlier Great Belt traffic experience which greatly eased long distance journeys within Denmark. In the event, on the Øresund bridge there was much less leisure traffic but, encouraged by lower living costs in Sweden, very much more use by people travelling to and from work. The traffic projections overall turned out to be nearly accurate but for wholly the wrong reasons!

The choice of options to select to take forward can be very much aided by the use of numerate assessment work on economic cases, but, of course, the ‘is it affordable’ question of the 5 cases in the model always came into play. Often, you can identify a better solution in economic terms, but simply have to choose a good, but cheaper option to fit the budget.

Across the many European projects which have been studied in the NETLIPSE programme over the 10 years (research and IPAT assessments), there is a very mixed use of the business case model. In most countries, there is a strong driving force for the particular investment, but this can vary significantly from the highly political projects, to those with strong economic assessment to those which prove that the price or deliverability were greatly under estimated.

My prediction is that the use of systematic analysis and assessment will have to increase in the future as there becomes more constraints on the use of land, the environment will matter even more and that dominant factor, money, becomes scarcer.

Stuart Baker
prioritisation in order to strive to the maximum value for money, these underlying key figures need to be consistent, which is not always the case.

In relation to this subject, it is still a challenge to define a clear set of appraisal guidelines for the evaluation of projects for effective comparisons of different project initiatives. These projects could be the “baby” of a certain politician or political party, as the research in 2008 mentioned. We think that the appraisal of guidelines can still be an important tool to deal with this. Our challenge for the upcoming years is to improve these guidelines and indicators to develop and review business cases.

3.5 Organisation and Management

Because of the one-off character of projects, a project delivery organisation (PDO) needs to be set up specifically for a particular project. A PDO has its own organisational structure, culture and need for human resource development. Organisation and Management is about how these organisational aspects are managed by the project – in relation to the structure of the Client/Sponsor, how they implement and execute project processes, how the roles of the client/sponsor and PDO are defined and executed and how they deal with the people in their projects.

In the 2006 – 2008 NETLIPSE research, the best practices on the topic of client/sponsor and PDO roles were:
- The roles of the client/sponsor and PDO need to be clearly defined and the interfaces between them correctly managed;
- Tight arrangements should be in place for scope management and control;
- There needs to be an informed and aware client organisation in place, with sufficient authority, resources and capability to lead the project;
- The client needs to be consistent and effective and should create the right framework for identifying and resolving issues.

Riggert Anderson

When speaking on behalf of the Slovak Republic – the main challenge is a „sustainable“ financing of the large infrastructure projects. At this moment (up to 2020) the financing via EU funds is ensured (up to 85%), but the reality and changes in EU membership (new members, potential UK exit and/or influence of political changes inside the country or on EU level) could endanger the financing and even the objectives of the large infrastructure projects (LIP) which have a EU dimension. Use of PPP still has a question mark because of the lack of general political consensus - but it is possible that new financing instruments incl. PPP would be necessary.

Ľuboš Šurňa
The findings on the topic of implementation and project processes with respect to project roles and responsibilities were:

- Communication and stakeholder management should not be regarded as a separate function but should be fully integrated in the tasks of key project team members;
- The PDO should be tailored to meet the particular needs of the phase of the project;
- Project management is more than a technical construction process. Interface management should be a key part of mature project management;
- The project team should be aware of new threats, opportunities and changes during the implementation and delivery phases of the project when there is a natural tendency to be internally focused.

The findings on the topic project Human Resource Management cover the themes:

- Neglecting of the internal stakeholders, managing the project team, no linking of investor and contractors workforces, little consideration of employee satisfaction;
- Lack of suitable training for sponsors and project teams for large projects;
- Challenge of human resource retention near project completion.

3.5.1 What’s different in 2016?
Most of the best practices recognised in the 2006 – 2008 NETLIPSE research within the management and organisation theme focusing on the roles of the client/sponsor and PDO as well as project HRM are still recognised as good practices and relevant findings today.

3.5.2 Expectations and challenges for the next 10 years
It seems that the challenges for client organisations in the next 10 years in terms of roles, HRM and project processes lies very much in finding and keeping the necessary expertise to be able to execute large infrastructure projects effectively. The client organisations are facing new roles and theories on areas as servant leadership are slowly being introduced. Let the specialists do the specialists’ work is the new creed. Something that is easier said than done.

Other activities that are deemed to be undervalued in terms of organisation & management and that remain challenges of the client and project organisations in the coming years are:

- The soft skills and taking time for discussing together what is happening (principles of High Reliability Organisations);
- Even though there are enough tools in place for scope, financial, risk, permits and quality management; the organisational aspects of managing team members is difficult in a project organisation that is operating under a line organisation that has been given a 20% redundancy target and forbids the contracting of external specialists. It is also challenging to form a team when team members all work part time on the project
- In line with the point above, the reorganisation of client organisations and the effects on projects;
- The management of large infrastructure projects is often managed by technicians. We believe that one part that is undervalued is the organisation and the people within the organisation and how they are managed;
- Too little emphasis is given to the management of staff and people, their development and reward. In particular, in the UK civil service, staying with a project from start to end can be career limiting;
- The biggest challenge for the future is managing projects cooperating in new structures with other public governments.

With respect to defining the roles of the Project Delivery Organisation, sponsor and funder, the role of sponsor - particularly in Italy - is often linked to the construction companies which are seeking to maximise their revenues. As a result, this is likely to lead to higher costs for the construction phase since it represents the most revenue-generating one for the sponsors.

Therefore, in these cases the Project Delivery Organisation should also take into account the economic interests of the stakeholders in the project and eventually auditing with more emphasis the cost breakdown of the construction phase.

Some of the project studied in the 2006 – 2008 NETLIPSE research were part of longer distance corridors, sometimes between countries or across several countries. In Italy, the infrastructure projects including the cross-border sections are very challenging particularly for the role of the project management facing different project scheduling issues and the difficulties on programming the construction phases consistently in the two countries.

Some possible solutions could be the following European best practices:

- By creating partnerships/consortia ad hoc such as in the case of TELT (Tunnel Euralpin Lyon Turin) which is entitled to manage the construction of the Lyon-Turin tunnel infrastructure investment following all the activities in both countries in terms of consistency and time;
- Also, the operating agreement between the Swiss and Italian governments focused on the development of the rail infrastructure in Italy but generating benefits to society for both countries.

Massimo Corradi
With respect to Project Human Resource Management, all findings are still relevant. The topic has raised importance and can be framed more comprehensively. Distinct but overlapping to this is the topic Project Leadership, which I do not see explicitly as a topic in the list of findings.

What have we learned with respect to the topic in the past 10 years?
Academics (in cooperation with practice) have done research on the topic of Project Human Resource Management. Some developments, I am aware of in projects are:

There is a distinction made between HRM in a project and HRM in a permanent organisation. While many organisations are aware of HRM processes in the permanent organisations, there is less awareness that there are HRM processes in projects too. Especially in large infrastructure projects they are observable. HR processes in projects include (Huemann 2015):
- Assigning personnel to projects;
- Managing performance on projects;
- Developing;
- Appraising;
- Rewarding;
- Dispersing personnel from projects.

Challenges arise regarding how these processes in temporary projects are related to the HRM processes in a permanent organisation, to support the careers and development of the Project Manager and project personnel.

The HRM roles in project-oriented/based organisations are very distributed including line managers, project managers, project owners, project portfolio groups, PMO, and of course the HRM department, which will continue to set policies. However the HR department needs to work more closely together with PM experts (PMO or similar) and the projects have to improve their support for the needs of project personnel.

In practice, the strategy “bring the training to the project” can be observed. By that, the transfer gap between classroom training and application in practice is reduced. And the project team members can learn together and draw conclusions for their very specific issues they need to solve in the project.

There have been developments to nominate the role of the project owner/spons-
In 2003, the client/sponsor set a clear strategic decision in a letter of intent (LOI) to carry out the Vienna Main Station project. The LOI was signed by the Ministry of Transport, the City Council of Vienna and the Austrian Federal Railways (ÖBB). The City of Vienna’s responsibility was to construct the necessary urban infrastructure, the ÖBB was responsible for the construction of the Main Station and the necessary rail-infrastructure. The area which wasn’t necessary anymore for railway operations was to be sold by ÖBB to private and public investors, the revenue used to finance parts of the railway project. Furthermore, the City of Vienna granted a zoning to ÖBB, which allowed an economic feasible selling of the real estate.

As the roles of the client/sponsor side was clear, an adequate “strategic” overall project delivery organisation (PDO) was set up to manage the project scope and control the interfaces especially between the different stakeholders mentioned above, as well as in practice.

What are new challenges for the successful delivery of large infrastructure projects?
The new challenges are the old ones, but they will come in new clothes. The main challenge will continue to be to get the right people on the project and to provide them with an environment in which they can develop their talents. Again I would argue for the need for a new mind-set, that there are (almost) no pure construction/infrastructure projects anymore, but construction/infrastructure is just a part of a more comprehensive development project/program. From a HR perspective, it is the challenge to support this paradigm shift and equip the project personnel with competences that fit the situation, which includes for me the most important competence project managers and project personnel requires, which is dealing with contradictions and considering these as a source of innovation rather than threat.

Martina Huemann

Some relevant literature

In 2003, the client/sponsor set a clear strategic decision in a letter of intent (LOI) to carry out the Vienna Main Station project. The LOI was signed by the Ministry of Transport, the City Council of Vienna and the Austrian Federal Railways (ÖBB). The City of Vienna's responsibility was to construct the necessary urban infrastructure, the ÖBB was responsible for the construction of the Main Station and the necessary rail-infrastructure. The area which wasn’t necessary anymore for railway operations was to be sold by ÖBB to private and public investors, the revenue used to finance parts of the railway project. Furthermore, the City of Vienna granted a zoning to ÖBB, which allowed an economic feasible selling of the real estate.

As the roles of the client/sponsor side was clear, an adequate “strategic” overall project delivery organisation (PDO) was set up to manage the project scope and control the interfaces especially between the different stakeholders mentioned above, as well as the functional parts of project organisation. All levels of the PDO were provided the authority, resources and capabilities to carry out the project in an adequate way. This contributed to our project success.

Karl-Johann Hartig

A challenge for the future is to be able to learn as a project organisation. Not only as a project itself but especially in relation to other involved parties (the market, environment etc.). In short, we need to choose a more holistic approach. The challenge in that will be to be able to reflect more on our own operations and to bring more balance between efficiency and effectiveness of the client organisation.

Hans Ruijter

The challenges in the next 10 years with respect to organisation and management of large infrastructure projects are as follows. The living and dealing with contradictions in projects will become more important as a key competence for project personnel, this includes dealing with a conflict culture. Even higher demands for social competences as the basis for leadership will be required. Leadership will become increasingly a shared task of the Project Management team and Project sponsor teams (which will in partnership/alliances include representatives from different home organisations). Employee-wellbeing, mindfulness will become an increasingly important topic to attract and retain the best talents for project work (infrastructure projects). The topic of horizontal leadership or also called “distributed leadership”, the leadership by a group/team will receive more attention and importance as a research topic, as well as in practice.

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Some relevant literature
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Martina Huemann

With respect to the client/sponsor and PDO roles, in the last ten years I believe very little has changed. Basically one can conclude that the roles are fundamentally the same even if the environment for the respective organisations has changed in many aspects.

However, the expectations on client/sponsors and PDOs professionalism and results have increased. Our challenges today and in the future are based on some of the on-going and continuing trends in our business as I see them:

- Larger and more complex projects, internationalisation, automation of the transport sector;
- Less acceptance for cost overruns and time delays;
- Less frequency of cost overruns and time delays due to better scope management, risk management and cost control;
- The complexity of the organisational management and mandates when the project scope is widened to include integration of advanced systems for traffic control, monitoring, road tolls, signalling, automation etc.;
- Client/Sponsor and PDOs are facing and will face challenges to recruit and keep professional and experienced people in their organisations;
- Client/Sponsor and PDOs will meet a new task: to reduce the carbon footprint of the implementation of LIPs;
- More cooperation/partnering/alliances with contractors, a necessity for increased probability for project success and as well alternative financing opportunities;
- More ambitious, transparent and respectful stakeholder management;
- The on-going introduction of BIM in the construction sector is changing the working procedures dramatically including the handing-over to the owner.

Per Rydberg

What is the benefit of NETLIPSE for you?
Learning through the NETLIPSE client-based network is an important part of improving my project management skills. Meeting with professionals from other organisations and countries, that have similar questions to deal with, is a real benefit.

What are challenges you face in your projects?
In most large infrastructure projects in Sweden there are many stakeholders with different kinds of interests. How we interact with the stakeholders is a key factor to achieve our project goals. This is team work. My job is to get the best out of the project team.

What are the challenges for NETLIPSE in the future?
Project Managers are busy people. The NETLIPSE activities must therefore always be on a high professional level to attract interest. Our Programme Director in NETLIPSE, is a key person for the Network. Generally I think that members have to put more time in NETLIPSE but we still need to have key persons in place to manage it.
In my opinion the main findings on the client/sponsor and PDO roles are to a large extent still more than relevant for the successful delivery of large infrastructure projects today. There are still lessons to be learned. In Germany we are discussing a lot about the quality and about delivering projects in time and within budget. Many of the best practices defined in the 2006 – 2008 NETLIPSE research are really important and helpful to reach the mentioned goals.

The challenges for the next 10 years will be to bring forward a large number of major projects by increasing the involvement of the private sector without losing the ability to remain a competent client / sponsor.

In future there will also be a strong focus on the preservation and addition to capacity of our existing road infrastructure without heavy negative influence on the traffic flow during works. That’s why we have to implement new technologies like BIM (Building Information Modelling) or QMB (quick movable barrier systems for traffic routing during construction works) in order to accelerate processes and to minimise traffic disturbance on our highly stressed road network. And we have to be prepared for autonomous driving. It might happen earlier than we can imagine at the moment.

3.6 Risk Management (and opportunities)

The theme Risk Management (and opportunities) more or less focuses on dealing with uncertainty. How to handle uncertainty in large infrastructure projects? The defined best practices from ten years ago mainly focused on structure, in order to find a way to define and manage these uncertainties. The importance of risk management as a project management tool in infrastructure projects has increased enormously over the last ten years.

The following best practices were defined ten years ago:

1. Position the responsibility for risk analysis within an independent group;
2. Do not forget to identify opportunities;
3. Share risk analyses with contractors and before tendering;
4. Include risks and risk reservations in cost estimations;
5. Use a risk database;
6. Rank and prioritise risks;
7. Make risk management part of regular management routines.

3.6.1 What’s different in 2016

As indicated before, risk management is becoming more important in our projects. Mainly because of the fact that cost overruns – in most cases – cannot be explained without mentioning past uncertainties. Past uncertainties, which transfer to events that have taken place, are the main reason for project setbacks or failure. Looking back at the lessons of 2008, in today’s projects risk registration and the application of risk databases seems to be quite common. Still, the use of risk data seems to differ greatly per project. Discussing and analysing risks requires a clear definitions of the terms used, because uncertainties are a very abstract subject to talk about. Discussions about risks are mostly based on unclear definitions (see input Paul Fishwick).

Estimation of risk valuation remains an interesting topic. Risk valuation usually implies many assumptions, which need continuous attention and challenge by the project team. Risk valuation could serve mainly two goals:

1. Estimation of the total risk reserve;
2. Support for decision-making for proper risk measures.

Forgetting the first one results in a lack of communication about the expected financial consequences of risks and forgetting number two results in lack of focus to actually prevent these possible unwanted events from happening.

As stated in the 2006-2008 research: a cross discipline thinking and action are needed in order to tackle risks during your project.

The Benefits of Netlipse

I am a strong believer in the concept of NETLIPSE. It is very important and almost an obligation for public entities to learn from each other about best practices, lessons learnt and the errors of others to prevent making the same mistakes over and over again. Only by doing so we can improve the project management skills, improve the delivery of our projects and programs and therefore being able to achieve more with the same amount of tax payers money. And the more organisations join NetLipse the more benefits we will achieve.

Peter Dijk
I think there is a danger that project sponsors and governance processes can become too focused on whether something in a project is a risk, issue, threat or opportunity. Experience at the UK Department for Transport has shown that risks that had become realised (i.e. issues) had not been reported to the relevant Governance level because those managing the governance process (often a central function removed from the project teams) applied a very strict definition of what constituted a risk or issue. As a result, a multimillion pound cost overrun had not been reported and came as a surprise.

Recent experience in this organisation has prioritised a focus on reporting risk themes to the Board. This failed to provide senior managers with any sense of risk importance or criticality. We are now looking at reporting by importance, for example does a risk materially affect the organisations ability to deliver passenger services?

Risk is an increasingly important management tool. We have therefore instituted a properly staffed Programme Office headed by someone with suitable qualifications (the post holder has an MBA) and experience. The PMO is therefore able to challenge risks and their rating. Recent history in our organisation showed that the PMO function and risk management had become an afterthought. The new PMO is helping to put this right.

One of my supplier’s risk register is very simple and can therefore be used with much more ease as a management tool. The risk register we use is over complicated and not used as well as it could be. It is not user friendly.

The PMO has found that different Project Sponsors have a different view to risk. Some tend to be more pessimistic than others. We therefore have a project board featuring all sponsors that assesses the scoring and criticality of risks across all projects in the portfolio. The PMO also needs to be nimble and intelligent enough to look at cross programme risks and interdependencies. How these are managed can ultimately shape organisational design

How risks are allocated between parties can vary during the life and maturity of project. In an electrification scheme, we were asked by the supplier to assume some significant risks at an early stage of the project. The legal advice at the time was very wary about exposing the UK taxpayer to potential costs and liabilities that it did not have control over or could not foresee with any real level of confidence. However, given that only Government can assume and plan for societal risks, it should not try and allocate these to parties that cannot manage them.

Paul Fishwick

Risk-arrangements have been clearly defined among the stakeholders especially between the two most important project sponsors ÖBB and City of Vienna. A specific focus has been set on the cascading risks at specific levels of the project. There is a defined standardized risk-management guideline for ÖBB-projects: allocated risks have to rest at the operational level of the project, where it can be managed, minimised and solved. All these risks, its possible effects and solutions have been recorded in a “database” (Excel-sheet). Every risk has been evaluated on a cost- and time-base, as both risks were always regarded as directly connected. At the half yearly meetings with the client/sponsors (steering committee) only the weighted consequences of risks influencing the overall project have been discussed. The results are shown in an easily understandable graphical matrix indicating the changes at first glance (probability of occurrence vs. consequences on a time- and cost-base). This allows a well-grounded discussion of the possible consequences, especially where it’s not definitely clear in which stakeholders “sphere” the risks should be allocated, and gives way to an accepted solution by all clients/sponsors.

Karl-Johann Hartig

In 2009, the Danish Road Directorate adopted a new budgeting system with a special focus on risk management, and where "early warning" is not only essential, but closely linked to the budget process and reporting. A risk register follows the project economy in its total lifetime, and is an integrated part of the project management.

Erik Stig Jørgensen
3.6.2 Expectations and challenges for the next 10 years

The development in risk management, i.e. collecting risk information is clearly visible in most project organisations. The challenge for the nearby future is handling this data in order to transfer risk data to decision-making in project management. Risk management should support the decision-making process at different levels within the organisation, suggesting it would be smart to consider different levels of risk analysis. More high level risks require a different approach than the more operational risks.

Application of more integrated contract forms forces a stronger relation between the themes of risk management and contracting. Risk allocation will become more relevant, which adds the topic of adequate risk valuation and financing towards to the required skillset of the project organisation.

Managing opportunities will still not be a standard process in the project management of LIPs. One of the lessons learnt in the last years is to treat opportunities separate and different than risks. Detecting and analysing opportunities require a more open minded approach. In contrast to risk identification, opportunity identification requires a more optimistic view of the project.

In contrast to risk identification, opportunity identification requires a more optimistic view of the project. Tom Kremers

Competent and experienced engineers and managers on the client as well on the contractor’s side have been aware of risks in large projects. What we observe actually and what we could state during the evaluation of the NETLIPSE project is a change towards a more and more professional structured and standardised risk management as a crucial element of the project management of LIPS. This includes risk buffers within project budgets.

As science and practical work dispose already of the necessary instruments for a structured risk management it remains often a question of culture in the involved organisations, mainly in the client organisations. Risk awareness and risk identification need an open communication and an open culture and this is part of an ongoing change process within client and contractor organisations all over Europe and all over the world. The results of the first NETLIPSE phase as well as the discussions in the following meetings show this clearly. In Germany the national government has taken an important decision in December 2015 concerning the intensification of risk management and collaborative working in large construction projects.

Fair risk allocations and risk arrangements become more and more relevant in contracts and this results increasingly in open hearings and negotiations in the tendering phase of LIPS. Even more, it becomes often a decisive element for clients. This evolution has to be strengthened in national and international projects and could be an important condition for the TEN funding by the EU.

Fair risk allocations and common risk management in projects is also a central element of cooperative project work for clients and contractors and has been identified as an important success factor for large projects. So the push of partnering approaches will also strengthen the application of standardised risk management and cooperative risk management in LIPS.

Konrad Spang

3.7 Contracting

A LIP is delivered with the involvement of private companies (such as contractors, consultants, engineers and operators). The theme “Contracting” is about how these external parties are contracted and how such contracts are managed by the project delivery organisation.

The best practices defined in the 2006 – 2008 NETLIPSE research with respect to contracting were:

- Effective budgeting needs to be linked to robust contract management;
- Contract and commercial interfaces need to be well managed in order to be able to understand where there are potential interactions and sources of delay;
- Whatever the format of the contract (DB, DBFM, Alliance), care must be taken with the contract arrangement themselves and in managing the execution of the work through the contract to avoid soaring costs and delivery progress delays;
The size and scope of contracts needs to be carefully considered so that they may be manageable and deliverable via the market and can attract appropriate competition, financial resources and specialists;

- Prize should not be the key basis of awarding contracts. It is important that pre-defined and communicated criteria including capability and quality are part of the contract award process.
- Contract Managers should have adequate technical expertise for the management of the design of physical elements of project delivery;
- The PDO should be aware of currency exchange risks (if project contract prices or finances are based on different currencies) and interest rates where external funding is used to provide project financing. Price indexation arrangements should be clearly defined.

One of the areas NETLIPSE delegates consider to still be a challenge is the manageability of contracts in terms of size and scope. They feel that the skills, knowledge and capability of the Project Manager are still the key influencers in the success of a contract.

3.7.1 What’s different in 2016?

When evaluating these best practices today, NETLIPSE delegates indicate that some of the practices have become a normal part of their everyday project management approaches and some are still a challenge.

Effective budgeting and managing contract and commercial interfaces are examples of activities that have become regular project management practice, although interface management does seem to be deemed a challenge still by some delegates. As one delegate mentioned: contract incentives are now built into the contracts, helping to manage the contract better. Designing a contract approach or format to suit the project type is also now deemed normal. Prize is no longer the only basis on which contracts are awarded in LIPs and currency exchange risks and interest rate issues seem to be under control.

Many of the statements included in this topic are basic and incontestable: that contract size and type should be suited to the project at hand and also to the market conditions, that too much emphasis on price in procurement entails risks, that Contract Managers should have adequate technical expertise and the project delivery organisation be tailored to the particular needs of the phase of the project, and that interface management is an important aspect of project management.

These recommendations essentially refer to an organisational capacity to select the contracts, project organisations and processes that fit the needs of a specific situation. Their relevance has certainly not diminished over the last ten years. Although it is hard to judge whether projects in general have improved or not over this period, the trend in several countries to cut back client functions raises some concern. For such lean client organisations to become professional or intelligent rather than simply insufficient, new supportive functions and systems are required.

Thus, an important challenge for the future is to identify and implement structures and policies that enable more efficient experience-based learning between projects. More generally, this implies that the division of responsibility between the different levels of client project managers, sponsor organisations, government and industry has to be reconsidered. Recent developments in several countries point at an increased focus on this interface between major projects and the permanent governance structures: stage gate processes, systems for maturity assessment and project management academies are established, often on a national level. Research on infrastructure project management, accordingly, should increasingly consider the mutual relationships between project processes and such overarching meta-systems.

Anna Kadefors
Management of contractual and commercial interfaces is a part of the Danish Road Directorate (DRD) procurement strategic process as well as an important task during project execution. With respect to different contract mechanisms: in 2013/2014 DRD implemented a light version of their procurement documents and special guidelines on how to procure smaller less complex/critical projects. In addition, DRD agrees with the practice that size and scope of contracts need to be carefully considered so that they may be manageable and deliverable via the market and can attract appropriate competition, financial resources and specialists.

DRD has in two complex projects used “early procurement” with partnering/alli-ancing, including shared risk and incentives. In both cases it was a success, and it supports the findings in the NETLIPSE research results.

In addition, in Denmark, large projects are usually divided into smaller tenders where considerations like market capacity, bidding interest according to scope (size), project characteristics, project complexity are considered. Project characteristics relate to interfaces, environment, traffic handling, etc. In 2012 DRD strengthened their market approach to stimulate market interest by more intensive use of market dialogue, ad hoc market analysis and made it an integrated part of the project procurement strategy procedure.

With respect to the criteria used for awarding contracts, the dilemma of lowest prices versus EMAT is also one faced by DRD. DRD uses EMAT in larger, more complex projects, if they see qualitative elements, they can influence by using EMAT. However, in many cases it can be difficult to find enough “freedom” in projects, to justify EMAT, because DRD design seldom allows this space for the tenderer.

DRD uses EMAT when tendering design work, in Design Build contracts, and sometimes also in more complex smaller projects. In operation and maintenance it’s usually lowest price that selection takes place on. DRD’s aim is to use EMAT more (i.e. more focus on quality) and by this we want to ensure more freedom (space) in design, so that we bring the tenderers skills more in focus. Whether lowest price may cause problems later with quality or and in timescales is another issue, and we (DRD) do not see a clear link. We have contracts tendered as lowest price, where we in fact see very good performance – even in cases where the lowest offered price was so low that suspicion of an abnormal low tender (ALT) could be considered. We have made a study of a number of tenders to verify if there is a link between low prices, and the proportionate amount of extra work (claims), and we have not been able to prove a correlation.

We only experienced, that works containing more complexity/risk/uncertainty (ex. earthworks and foundation works) in some cases showed proportionally more extra work – which was also expected. However, a further study on the mechanisms that comes into force when using EMAT versus lowest price could be a very interesting subject for the future. Here we might gain more knowledge about when we should choose EMAT and when not. Maybe a good topic for a study project among a few members of NETLIPSE?

Erik Stig Jørgensen

3.7.2 Expectations and challenges for the next 10 years

In discussions during NETLIPSE Network Meetings, often the topic of how to be a better client was discussed. Dealing with contractors that operate internationally, requires a client organisation that looks beyond its own geographical borders and benefits from experiences of other client organisations. First, to not repeat mistakes that colleagues have made before and to take their lessons and translate them to the projects’ own context. The focus for the coming years will be on how to professionalise the client organisation further with respect to contracting issue. Perhaps even going so far as to reach more uniformity in the way large infrastructure projects are managed and the result achieved.

With respect to the criteria used to award contracts, the expectation is that in the coming years, uniform and univer-
The biggest challenge in the future for management of large infrastructure projects is maintaining freedom of choice (for contractors) and optimization (in design / value engineering) in the later phases of large infrastructure projects. Or not giving that freedom away in the early phases for legal reasons or because all those involved think they already know (best) what the solution of the underlying problem(s) is (are).

Another area that will need attention in the future in the new partnering approaches between client organisations and contractors is making sure contractors are aware of the challenges public organisations have, especially with respect to the interaction with stakeholders. Client organisations contract contractors not only for making a structure. But to what extent do we need to help them understand client challenges?

Gilbert Peiker

Planning and contracting procedures are becoming more and more difficult because of changing legal and procurement requirements in Germany. Nature protection, driven by European legislation, has taken over a leading role in the decision making process and is influencing the project delivery to a high degree. This will be a challenge for the future.

With respect to contract forms, we had to get used to new forms (e.g. PPP in road infrastructure started about ten years ago in Germany). In addition, we have to deal with more transparency and more involvement of the public and NGO’s having consultation processes in nearly every project phase.

For me the most important benefit of NETLIPSE is the discovery that there are so many interesting commonalities in the challenges faced in managing our large infrastructure projects, irrespective of whether it is a road, rail, waterway, harbour or airport project. Discussing these challenges and ways they are dealt with, provides opportunities for creative solutions. Perhaps even out of the box solutions.

NETLIPSE is an active network that has endured economic challenges faced by many governments. Governments that also seem to face similar challenges of doing more with less: dealing with challenging infrastructure ambitions and loss of expertise at the same time. Along with the challenge of long and complex internal decision-making processes that I encounter in my projects, I feel as client organisations we can all benefit from more out of the box approaches. Inspired by the experiences of others.

Wim Gideonse

In addition, it is quite difficult to change a client organisation that has been executing projects and providing the specialist knowledge for many years. The new partnering contract approaches, require the role of the client organisation to change from providing the specialist services themselves to managing the specialist services provided by the contractor. Discussions today seem to focus on ‘style and taste’ issues rather than on if the products provided by the contractor are fit for purpose. This is a learning process that many client organisations are facing in line with the idea that specialist services should be carried out by the specialists as well as the need for more efficient (and reduced in size) client organisations.

Our organisation has been involved in NETLIPSE since its start in 2006. From the initial research period on, more than twenty of our colleagues have actively participated in the design of the research protocol, coordination and execution of the research and management of the network activities. A service that we are still very proud to be providing today.

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Wim Gideonse

The cross-border infrastructure projects are very challenging particularly for the different laws in place, particularly at a local level. It is of relevant importance that the parties are aware at the outset of the project if a country’s domestic law prohibits some aspects or substantially differs from the other party’s law. As an example, the legal differences often resulted in differences in the formulation of environmental criteria.

To this respect, the lessons learned of the past ten years are the creation of ad-hoc consortia setting up a legal framework in compliance defining rules and behaviours in the market thus avoiding any emerging risks (e.g. TELT – Tunnel Euralpin Lyon Turin – entitled to manage the construction of the Lyon-Turin tunnel infrastructure investment following all the activities in both countries).

Massimo Corradi
3.8 Legal Consents

Legal consents are conditional for the successful realisation of a LIP. The way of managing legal procedures is crucial for Project Managers and application of these procedures varies across Europe. This makes the construction of LIPs across borders even more complex. This complexity is illustrated by the following main findings from the 2006-2008 NETLIPSE research:

- In cross-border projects it is essential to realise you are dealing with sometimes incompatible laws and regulations and the importance of understanding the differences in culture, institutions, laws and ways of working;
- It is important not to drive the project delivery too far ahead of obtaining full legal consents to progress the project;
- The project team needs to identify and manage the risk of changes in ecological or environmental regulations and/or legislation to avoid long planning delays;
- Land acquisition regulations especially in Eastern Europe need to be made more effective to make the planning and delivery of major projects more efficient.

Best practices defined at that time were:
1. Link legal procedures and stakeholder management;
2. Map procedures and keep them updated;
3. Ensure legal expertise is available;
4. Communicate with authorities proactively;
5. Coordinate the consents and tenders planning.

3.8.1 What’s different in 2016?
The main findings of the 2006 – 2008 research in terms of permitting and getting and managing legal consents focussed very much on the challenges encountered by the projects researched. Most of these challenges are still actual today. Dealing with different countries and different legislation (types and timing), the risk of not obtaining full legal consents versus the wish not to delay project realisation, managing changes in legislation during the project realisation phase and land acquisition challenges. These are the important issues that (cross-border) LIPs need to deal with today.

Recommendation 5 of the Action Plan for the development of project financing (the Christophersen-Bodewig-Secchi report) contains the following:

“Member States should streamline and thus simplify their permitting procedures in order to facilitate and accelerate the implementation of projects, notably for cross-border projects in cooperation with the European Commission.”

Permitting procedures have a historical background and have arisen out of the need to safeguard interests from those people who will affected by the actions of others. Technical knowledge has made everybody aware of the large, and geographically extended influence of e.g. building activities. The law on property safeguards the essential value of the citizens to own property and to be protected against governments undermining property rights. These rules might stand in the way of those who want to act, who want to build.

It is also a known fact that a developed infrastructure, making it physically possible to move around and trade, increases the welfare of citizens and nations. Freedom of movement is one of the essential freedoms of the European Union. This freedom requires a developed cross-border infrastructure. Given the basic agreement on issues like property rights and safeguarding the interests of those affected by the actions of others in Europe it is high time that legally trained people with a good understanding of the ratio of the law come together and help in the process of streamlining and simplifying permitting procedures. This process should lead to facilitate cross-border activities.

On the project level this process should take into consideration that the permitting route must be governed by the insight that risks should be borne by those who can influence the risk. If a risk cannot be influenced, it should be borne by the government agencies who took the initiative for the activities. Recommendation 5 should be taken seriously by the European Union and an action plan should start as soon as possible.

Monika Chao-Duvis
Stakeholder wishes need to be communicated and analysed timely in order to get the final consent on time. Therefore, obtaining legal consents in each step should follow the following procedure:

a. Scoping;
b. Preparing the documents;
c. Verification of the completeness of the documents;
d. Public consultation;
e. Decision;
f. Appeal and litigation.

LIPs risks are arising from legal procedures. One of the most frequent risks is the public opposition to the project, which can be caused when public consultation is not carefully implemented. Since LIPs are planned and prepared during longer periods of time, changing legislation or uncertainty about future legislation and incompatibility of the project with environmental regulations is a very important risk for the success of large infrastructure projects.

Complexity of permitting procedures is different in every country in Europe. In Spain, for example, the permitting procedure encompasses three different processes, one for the Environmental Impact Assessment, one for the Construction Permit and one for the Operation Permit. In Hungary, the permitting procedure consists of six different processes: one each for obtaining the Agricultural Field Permit, the Environmental Permit, the Theoretical Permit, the Preparatory Work Permit, the Construction Permit and the Operation Permit. By contrast, in some countries only one process has to be followed, leading to a single permit which covers all of these aspects. In Italy, for large energy transmission or transport projects, the Ministry for Economic Development is responsible for handling the process and involving other stakeholders, including other competent authorities. The complexity of the procedure is therefore low, as no interfaces between responsible authorities need to be handled between processes.

Ivana Burcar Dunović
3.8.2 Expectations and challenges for the next 10 years

With a greater focus of the European Commission on cross-border projects, the need to be aware of and plan for differences in legislation and permitting procedures is ever increasing. This will be a challenge for all cross-border projects, which need to take into account the variations in the planning of these permits in their overall schedule.

In projects on a national scale, the increased stakeholder involvement (voice) in projects will need to be taken into account in terms of obtaining permits in time. For planning purposes, and in terms of risk mitigation, it is safer to assume you will be going to court at every decision making moment, than to assume you will not.

As Massimo Corradi states, the use of a single language in contract documents, could be a way forward. This may also help the cooperation between client/sponsor and project management organisations and help to create a common understanding of the steps to be taken and time necessary to do so. But, as NETLIPSE delegates agree, the different planning approaches as described by Ivana Burcar-Dunovic, are not activities that will likely be changed quickly.

3.9 Knowledge Management and Technology

Despite the uniqueness of large infrastructure projects, lessons can be learnt from other projects: moreover, the realisation of large infrastructure projects takes many years, thus transferring knowledge within a project team is crucial. Knowledge management is about how the PDO manages internal and external knowledge transfer.

Within the sphere of influence of the project delivery organisation, two things are noteworthy. First, once the general planning consent (for instance - in Dutch - "Tracébesluit") has been given to a project delivery organisation, the standing practice is that responsibility for obtaining the relevant (building)permits is transferred to the building contractor once the tender phase is completed. Especially for the large and complex infrastructure projects however, the risk due to changes in legislation turned out to be too big for the contractors. A recent development is that project delivery organisations are going to share this responsibility with the building contractors.

Second, the link between the legal procedures and stakeholder management, is one of the best practices that receives a lot of attention within the project delivery organisations. It is exemplary to note that some projects apply the word "shareholder" rather than "stakeholder".

Willem de Graaf

In the next 10 years, and according to the recent Christophersen-Bodewig-Secchi report published in June 2015 by the EU, "...more self-executing guidelines to be applied off-the-shelves could significantly simplify, reduce uncertainties, and reduce time-to-market of cross-border projects". Also, "...a simplifying feature could be the use of a single language in contracting documents."

Massimo Corradi

Two findings on legal consents relate to the complex and delicate matter of obtaining legal consent for a project. It was found that projects should incorporate in their planning process the risks associated with such things as regulations and legislation (including changes along the way) and local impact. As a result, these processes have become time consuming.

In the Netherlands, a few developments have taken place seen since, both on the side of the governmental organisations giving the (legal) consents, as well as within the project delivery organisations. First, the need to shorten these procedures was expressed at the highest political level ("Elverding-Committee") in Parliament in 2008. Planning durations of 8 to 12 years were considered unacceptable. The committee focused attention to (amongst others) improvement in decision making at the various governmental levels, consistency in their approach towards projects, and less complicated legislation and regulations.

Secondly, the Dutch Ministry of Infrastructure and Environment took actions to simplify the existing array of environmental laws and regulations in order to introduce a more transparent, predictable and affordable planning procedure for projects. The goal is to integrate 26 existing laws in the field of building, environment, water management, conservation of monuments and area planning into a new law, that will come into force in 2018. The expectations are promising, but it will still be some years before results are visible.

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Willem de Graaf
The 2006 – 2008 NETLIPSE research results in terms of knowledge management were simple:
• There is little interest in learning from projects at a more advanced stage of completion or in passing on knowledge to other projects at earlier stages of development. Project teams relish the challenge in tackling problems which are new to their experience, rather than researching solutions from elsewhere;
• Gains in cost, efficiency and delivery could be obtained from sharing experiences and knowledge;
• An understanding of how to translate another experience into the context of a different project is a key requirement.

In terms of technology, most important lesson was:
• If new technology or innovation is implemented in the project, manage it as a separate project within the project.

3.9.1 What’s different in 2016?
NETLIPSE delegates have found that these lessons are still a challenge today. The challenge for researchers lies in “cross-fertilising” activities between project teams and communities (practitioners and academics) to improve research participation in project completion (lessons learnt). There is a strong need for knowledge management platforms. Recent research from Kees Gerlings at Delft University of Technology shows that inter-project learning is in a very early stage of development. The top five barriers for this:
• Too much time pressure to make an effort to share knowledge;
• Using and transferring knowledge from and to other projects is not part of the project scope;
• False modesty about any innovations;
• Absence of a bird’s eye view over multiple projects with steering on inter-project learning;
• Difficulties in bringing people together.

In addition, in order to be able to exchange experiences, there needs to be some level of trust between organisations doing so. In some countries, other organisational issues (downsizing, etc.) may hamper the open environment needed to discuss project challenges and solutions between teams, between departments or between organisations.

The topics of knowledge management and technology are undervalued in project organisations for the following reasons:
• People in this sector find it hard to learn from each other and tend to reinvent everything all over again when starting a new project;
• In particular the choice of materials, innovation in solutions or in problem analysis;
• Knowledge and new technology (processes and technics) should be handled as a gift from a project to the client/mother organisation. Time and benefit to anchor these “presents” are mostly secondary targets in the organisation;
• Knowledge management and technology are both under- and overvalued.

In the latter case some people have illogical faith in new technologies.

3.9.2 Expectations and challenges for the next 10 years
Only in exceptional cases have we seen project organisations dedicate a part of their project budget to knowledge management activities as assignment from their client/sponsor organisations. The reason the European Commission (EC) first sponsored the NETLIPSE initiative in 2006 is the fact that there was not enough knowledge sharing across the geographical borders of large infrastructure project experiences, and certainly not on a client level. The EC was seeing client organisations struggling with the same challenges and instead of benefitting from the lessons of others, repeating the same mistakes. This has and continues to be the basis for the NETLIPSE network. Sharing good practices in the management and organisation of LIPs in Europe in order to improve the delivery of LIPs.

From a scientific perspective, the challenge for the future is how to develop cross-fertilising activities between the professional and academic communities. Improving research participation in projects’ implementation.

In the future there will also be a strong focus on the preservation and addition to capacity of our existing road infrastructure without heavy negative influence on the traffic flow during works. That’s why we have to implement new technologies like BIM (Building Information Modelling) or QMB (quick movable barrier systems for traffic routing during construction works) in order to accelerate processes and to minimise traffic disturbance on our highly stressed road network. And we have to be prepared for autonomous driving. It might happen earlier than we can imagine at the moment.

Gilbert Peiker
In the past decennium, Rijkswaterstaat has achieved much in terms of knowledge management, mostly by putting efforts in efficient reuse of earlier experiences. Examples of this efficient available knowledge are the D&C and DBFM contract standards which were developed and which can be used by other government client organisations in the Netherlands. In improving contracts further, we also learn from other European colleagues and share our knowledge and experiences with others.

Infrastructure projects in the Netherlands have become larger and more complex in the last few years. In order to be able to manage such a complex project in a good way, you need more than theoretical knowledge: you need to be able to understand what the project is about, have the necessary abilities: the combination of knowledge, experience and abilities need to be the basis of your actions. By applying the right knowledge and experience you must develop the ability to translate information into qualitative good decisions. Self-knowledge is an important issue here: you need to be aware of your way of thinking, your emotions and feelings.

In order to be able to execute a complex infrastructure project in a good manner, it is also important that you are aware of the culture of the country in which the project is being realised. How do you involve local city councils, provinces and bodies of surveyors of the dikes in the project and how do you ensure that these organisations feel partly responsible for the project result? The same applies to how you engage with the market: are you used to realising a project together or do you transfer all responsibilities and manage the project in a contractual/judicial manner?

For the coming years, in terms of knowledge management, Rijkswaterstaat will focus less on realising efficiency – the largest gains in this area have already been achieved – but will focus more in realising a change-over and evaluate the effectivity of the application of knowledge. Are we doing the right things and which goals are we focussing on? The NETLIPSE network can contribute to this by helping to sit back from the daily job from time to time and asking the question “are we still doing the right things?” More than today, the coming years should focus on sharing experiences besides sharing “hard” project information.

Using public money efficiently is a strict requirement in a society where money is limited and infrastructure investments compete with other urgent demands.

We simply cannot afford not learning from other projects. This has been recognized since long and should not be too difficult. Reality, however, shows that it often doesn’t work. Why?

One reason is probably that members of the project management teams are so busy and focused on delivering their project. They don’t find the time to share their experiences or don’t see it as a prioritised issue. Thus important experiences stay within the project management instead of being passed on to other similar projects. The consequences: earlier mistakes may be repeated; successful experiences will not be passed on etc.

The challenge is to find an efficient and useful format for experience feedback. In a large organisation handling many projects this should be a management responsibility.

Comprehensive final reports and/or gathering of experiences in more or less complicated databases don’t seem to be ideal ways of experiencing feedback. Instead, more informal seminars on a high professional level within the client organisation have proven to be more effective. Here main findings and experiences can be presented and discussed between project managers. In a less formal environment it should also be easier to present and discuss failures experienced in the project.

A proposal is that it should be mandatory for the project management of a large project to arrange qualified feedback seminars during and after the execution of the project. This is only the case in very few countries. As the European construction market is becoming more international, the need for international experience feedback and discussions is also becoming more important. The bi-annual NETLIPSE network meetings provide an excellent arena for this.

Per-Olov Karlsson

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With the Swedish colleagues from Trafikverket, Rijkswaterstaat has formalised and made concrete agreements. The next two years the two organisations will intensively share knowledge and experiences in the areas of project management (learning and talent development, dealing with the unexpected, learning beyond project borders, cooperation with other parties and dealing with media and politics, governance of projects and management of contracts (early contractor involvement, client contractor cooperation).

Per-Olov Karlsson
The number of LIPs in each and every country is normally few and the implementation period mostly quite long. Project Managers for LIPs may not finish more than one or two such projects in their lifetime.

In addition, large infrastructure projects tend to be larger and larger and more complex which leads to more need for project managers to deal with issues like a variety of financial setups, organisational models and contracting alliances rather than traditional project management issues. The increased speed and number of modes for communication with stakeholders and media e.g. social media is another environment for PDOs to respond to. Globalisation, harmonisation of European and international standards in the construction industry as well as the increased use of ICT in the road and rail infrastructure is another challenge now and in the future.

In this context the importance of networking with PDOs from other countries will be more and more invaluable for knowledge transfer, exchange of experiences and future cooperation needs. The NETLIPSE organisation has proven to be very successful to provide for exchange of knowledge between PDOs from a number of European countries and it has proven to be an arena even for bilateral cooperation initiatives. Most LIP’s have the same kind of challenges but rather linked to leadership and cultural issues rather than to methodology and technical matters. We have the tools but how do we apply them in various environments? And there is no good book which you can learn from which means we have to learn from each other.

The Swedish Transport Administration (STA) have been part of the NETLIPSE organisation since it started and in recent years the networking has led to the forming of an agreement of a more in-depth cooperation programme between STA and the Dutch Rijkswaterstaat (RWS), ProRail and Neerlands Diep. Within this agreement the RWS and STA have worked out a detailed exchange programme for the next two years including a number of subjects we have in common, mostly related to leadership and training of senior project managers.

Per Rydberg
1. How did NETLIPSE start?

The ambition was to establish a network for the management of large infrastructure projects in Europe. Every country only has a limited number of these projects. For knowledge exchange building an international network was needed. This knowledge exchange was needed – and still is – because too many projects have a poor performance. From initial contacts with Switzerland, France, Germany and Italy (2002-2004) we experienced that this could be very fruitful. First we searched if there was such a network, but we couldn’t find it. The networks we found had a focus on technological issues. So, Leendert Bouter and I decided to start the network by ourselves.

Crucial in this ambition was the development of a maturity model to assess and improve projects, later called the Infrastructure Project Assessment Tool (IPAT). Crucial also was the EC FP6-call to which we submitted a proposal in December 2004, and carried out research from Spring 2006 until Spring 2008. This call had a focus on dissemination. That is why we chose to focus on best practices and lessons learnt that could be disseminated, as well as further develop the network. In a second stage, we could use these best practices and lessons learnt to develop the maturity model. In fact this was the main output of the second EC funding period.

All of this would not have been possible without the efforts of many, of whom I like to mention in particular friends from the early days: Pau Lian Staal, Mirjam Cauvern, Eddy Westerveld, Stuart Baker, Geert Teisman, Hansruedi Schalcher, António Lemonde de Macedo, Andrzej Urbanik and Han Kok.

2. Of which aspects of NETLIPSE are you most proud?

That we succeeded to create this NETLIPSE network with clients, project managers and scientists. And that almost every country in Europe has participated in some way, and that it is still active today! That we have developed the IPAT. And most of all: that people enjoy participating.

3. Expectations for the future?

To continue the fruitful NETLIPSE network and the knowledge exchange between clients, project managers and scientists. The knowledge itself is the fuel of the network. For this, I think there is enthusiasm to discuss certain topics in more depth, such as inter-project learning, HRM in projects, sustainability and stakeholder alignment. From science we can stimulate this with our research, which has an orientation on practise and practitioners. And of course the further development of the IPAT is interesting, and what we can learn from previous assessments.
Trends in Project Management

Success
Over the past four decades there has been an evolution of our understanding of project success. Before the mid-1980s, most of the research in the field of Project Management was into the tools and techniques used to plan and manage projects, and particularly into critical path analysis. In the 1980s, researchers started to say that we needed to first define the success factors on projects. We need to know the key factors that will influence the achievement of project success before we can say what tools and techniques we want to use. The most widely used list of success factors was developed by Jeffrey Pinto and Dennis Slevin, based on Jeffrey Pinto’s PhD. Then in the 1990s, the focus widened again to include success criteria. John Wateridge in his PhD said that you needed to identify the criteria by which you were going to judge the project to be successful before you could choose the appropriate success factors. He also began to suggest that different stakeholders could focus on different success criteria. The sponsor wants the project to deliver value; the users want the project’s output to perform well; the designers want a good design; and the project manager wants to finish on time, to cost and quality.

In the early 2000s, Terry Cooke-Davies took that concept and suggested we can differentiate between project success and project management success. Project management success is that the project’s output is delivered to time, cost and quality. Project success is that the business objectives are achieved and the project’s sponsor and investors are satisfied.

In early 2015, Pedro Serrador and I published a paper in which we showed the correlation between project success and project management success is 60%. 60% of the time when the project’s output is delivered to time and cost, the desired outcome and impact will be achieved and satisfy the stakeholders. But 40% of the time it won’t.

The focus on project success is now that different stakeholders have different opinions about the success criteria, and therefore different opinions about the success factors. All stakeholders are focusing on different things. The result is that they have different sets of success factors they focus on. This can result in the different stakeholders pulling in different directions, to the detriment of the project. We need to recognise the different stakeholders have different concerns, but that they ultimately all have the same desire that the project should achieve its business objectives. So we need to work on them getting to pool their ideas to work together towards project success.

Benefits realisation
Related to the issue of project success is benefits realisation. In order for the project to achieve its business objectives, it is important that the desired benefits should be realised. Before the project, the desired benefits should be clearly defined. As part of the project’s feasibility study, you need to clearly define what the desired benefits are, how the project outcome will be used to achieve the benefits, and how the output will be operated to achieve the desired outcome. You need to show that it is possible to use the output to deliver the benefit and the output to deliver the benefit. Some negotiation and messaging may be necessary.

Post-project that process is then used to ensure the benefits are achieved. Using the output to deliver the outcome and the outcome to deliver the benefits requires some work. The process developed during the feasibility stage to ensure that the achievement of the benefits is feasible, can be used post-project as the control mechanism to ensure the benefits are actually achieved. Benefits realisation management is now thought to be an essential part of project management.

Governance
The coordination of success and benefits requires effective governance. There has been a growing interest in the governance of projects and project management. There has almost been a move away from project management to project governance. In my work I talk about governance at three levels: the project-based organisation; the project context; and the individual project. Some people call governance of the project-based organisation the governance of project management. It is necessary to define the coordination of projects, programmes, portfolios and networks of projects. Governance at the project level is project governance. Governance of the context defines how programmes and portfolios are used to ensure projects will deliver the organisation’s strategic objectives, and to develop within the organisation the competencies required to deliver projects, programmes and portfolios. Research into project governance defines the processes and roles and responsibilities for governance at the three levels. I adopt the definition of the OECD to define the objectives of governance which are to define the objectives of the organisation, how those objectives will be delivered, and how their achievement will be monitored and controlled.

NETLIPSE through its work could improve our understanding in all three of these areas: achieving greater commonality in the understanding of the stakeholders into the benefits expected from the project, and how those can be achieved, and creating governance structures to work towards the focus on benefits realisation management, and building a common focus amongst the stakeholders.
4 The IPAT

The IPAT© (Infrastructure Project Assessment Tool) was developed by the NETLIPSE network as a result of the 2006-2008 research into best practices in the management and organisation of large infrastructure projects in Europe. The IPAT can help assess, monitor, benchmark and evaluate transport projects, before, during and after implementation in a complete and uniform manner. The IPAT measures the capability of a project at all stages of its development and delivery. The results give an independent peer assessment of the project organisation, identifying strengths but also any areas for improvement that need to be addressed to ensure success.

4.1 Basic Assumptions of the IPAT

One of the main challenges in a LIP is its context. For every project this context is unique. The success of a project (delivering within budget and time according to quality requirements, taking into account stakeholder satisfaction) depends on many contextual factors, both endogenous (relations with the client/sponsor (C/S) and the parent organisation) and exogenous (such as stakeholders plus economic, legal and political changes). The IPAT does not guarantee project success itself. However, when the quality of the management of a LIP is high, the chance of project success increases significantly.

The relationship between the organisation (or management) of a project, its context and the results are presented in figure 3. The direct link between a (project) organisation and results symbolises the organisational skills and competences to control project implementation and results. The link between the context of the organisation and the project, plus the project organisation and results symbolises the need for adaptive competences. A successful project organisation does not necessarily guarantee successful project results (as the project context cannot be controlled by the project organisation). However, the way the project organisation controls the project implementation and deals with (changes in) its context are key to achieving good results.

Though the IPAT consists of twelve main themes to assess the project management of a project, each project has to be examined in the light of its unique context and the success (or likely future success) of its approach. This is based on what the project organisation has actually achieved with respect to specific themes, as well as how this was/is executed. It is up to the assessors
to provide a professional and thorough basis for each score and final analysis of the project organisation.

The primary elements of study that the IPAT assessment focusses on are the Project Delivery Organisation (PDO) and Client/Sponsor (C/S). The C/S takes the strategic decision to undertake the project and defines the purpose and outputs of the project. The PDO is the organisation that has the responsibility to plan and execute the task. It is essential that the roles of the PDO and C/S are clearly defined and the interfaces between them are correctly managed.

In the assessment process the PDO and the C/S are considered to form a unit. Together they are responsible for the successful organisation of the project. Some responsibilities are specifically the responsibility of the PDO or the C/S, but others are shared between the two parties.

LIPs are frequently public projects executed under ministerial responsibility. Therefore the PDO and the C/S operate in a democratic and political context. Having political consensus about the purpose and expected outcome of a project is often crucial in the management of these projects. The political context is treated as a separate theme in the assessment process.

4.2 The IPAT Tool Explained

The IPAT addresses how the PDO and C/S manage and plan to manage all relevant aspects of a LIP. The objective of the IPAT is:

To assess the totality of management quality relating to the project, including plans to reach the agreed objectives and to implement the outputs (not just the physical construction).

By doing so, the IPAT highlights weaknesses and strengths in the management and the realism of the project delivery plan for the whole project and specifically for the next project phase. The IPAT covers all relevant management aspects of LIPs. These management aspects are categorised into twelve management themes (see figure 4). These themes can be divided into four groups:

- Internal context: C/S’s prime responsibility;
  - Theme 1: Political context;
  - Theme 2: Objectives, Purpose and Business Case (Value);
  - Theme 3: Functional Specifications.
- Internal context: PDO’s prime responsibility;
  - Theme 6: Finances;
  - Theme 12: Risks (Threats and Opportunities).
- External dynamics: Shared responsibility PDO/C/S;
  - Theme 4: Interfaces;
  - Theme 5: Stakeholders;
  - Theme 11: Contracting.

The IPAT has evolved into a model that helps assess twelve project management themes, deemed important for project success.

4.2.1 IPAT Themes

The political context is about the level of political consensus on the purpose and outcomes of the project and the way the relation with politics is managed (primarily by the C/S).
2: Objectives, Purpose and Business Case (Value)
How the objectives and the business case are defined, managed and updated by the C/S.

3: Functional Specifications
How the project objectives are translated into clear functional specifications and communicated by the C/S to the PDO and then agreed by the PDO.

4: Interfaces
The IPAT considers a physical project that needs to be executed according to availability and requirements of finance, time and scope. However, a project is often part of a much bigger transport link and other projects also need to be executed in order to have a fully operational transport system. Theme 4 is about how the (operational) interfaces with other organisations, as well as interfaces with other infrastructure construction projects are managed from the outset and integrated into the project management of the whole project by the C/S and the PDO.

5: Stakeholders
Project organisations never act in complete autonomy. They often have strong links to external parties, such as parent organisations and other stakeholders, for example, local communities, non-governmental organisations (NGOs) and interest groups, all of whom can influence the project organisation. Theme 5 is about how all these stakeholders are dealt with by the C/S and the PDO.

6: Finances
Theme 6 is about funding arrangements by the C/S and cost control by the PDO. This area covers how the client provides the funding for the project, as well as how the PDO plans and controls costs.

7: Legal Procedures
Legal consents are conditional for a successful realisation of a project. Theme 7 is about how the legal procedures are managed by the PDO.

8: Technology
In Large Infrastructure Projects PDOs often face technological challenges and/or how technological/sustainability innovations are achieved. Theme 8 is about how PDOs deal with technological innovations and associated uncertainties.

9: Knowledge
Despite the uniqueness of Large Infrastructure Projects lessons can be learnt from other projects; moreover, the execution of Large Infrastructure Projects take many years, thus transferring knowledge within a project team is crucial. Theme 9 is about how the PDO manages internal and external knowledge transfer.

10: Organisation and Management
Because of the one-off character of projects, a PDO needs to be set up specifically for a particular project. A PDO has its own organisational structure, culture and need for human resource development. Theme 10 is about how these organisational aspects are managed by the PDO – in relation to the structure of the C/S.

11: Contracting
A Large Infrastructure Project is delivered with the involvement of private companies (such as contractors, advisors and operators). Theme 11 is about how these external parties are contracted and how such contracts are managed.

12: Risks (Threats and Opportunities)
Theme 12 is about how the PDO manages risks (uncertainties that can be translated into both threats as well as opportunities) in their project and how they communicate about them to the C/S.

Looking to the near future, the IPAT tool will most likely be evaluated and improved after more IPAT assessments have been carried out. In line with the development in project management theory and quality norms such as ISO 21500, IPMA Project Excellence Baseline and EFQM, and on the basis of what the network is focussing on in their LIPs, it can be expected that topics such as safety and sustainability will need to receive a more prominent position in the tool.

4.2.2 IPAT Applicability
The IPAT can help to assess the current and future performance of a PDO and C/S. Therefore, the IPAT is applicable from initiation of a project until after its completion. The IPAT distinguishes seven project phases that are defined in terms of Milestones (M) that mark the start of the next project phase. Around these milestones the IPAT is to be applied in order to receive an indication to what extent the assessment team – usually made up of experienced NETLIPSE project representatives – thinks the project is ready to enter the next project phase. The assessment will result in strong points and areas for improvement per theme.

The project phases recognized in the IPAT are:

M1: Initiation of the project:
Identification of a strategic need, but at this stage without a defined solution although with a preliminary understanding of societal and transport benefits. This phase results in the definition of objectives, purpose and a business case.

M2: Funding assembly:
Project justification (scope, costs and benefits for society), support, confirmation that it is affordable and knowledge of how it is funded, delivery and contract strategy, start of interaction with stakeholders for feedback, support and consents. This phase results in the granting of funding.
M3: Planning application, as a basis of land acquisition:
Functional specifications and consents, preliminary design (by PDO), this includes the choice of a preferred design. Ultimate decision to build. This phase is closed after the official approval by the planning authorities.

M4: Tender:
Detail design up to the construction, tender of the project and preparation for start of operations and ongoing asset management. The end of this phase marks the start of execution.

M5: Execution:
Physical execution of the functional specifications. Future operators and maintainers established ending in the physical completion of the project.

M6: Test operations:
Approvals for operation, defined maintenance and operations. After successful commissioning the operations can start.

M7: Operation:
Post Project Review: (1) the results itself (versus scope), (2) how the results have been achieved and (3) how project experiences have been passed on. This evaluation may be done approximately five years after start of operations.

Another way of applying the IPAT can be at more general project phases:
• At moments of go/no go-decisions” by sponsors: ex ante evaluation or a ‘Gate Review’. Gate Reviews can indicate weaknesses and strengths in the organisation and management in advance;
• During the project execution: monitoring. The ‘in between’ assessments can indicate the ability of management to execute planning and their abilities to adapt towards changes taking place during implementation;
• After delivery of the project: ex post evaluation, in order to expand knowledge about vital forms of organisation and management approaches towards project planning and implementation. Ex post evaluation generates a comparative perspective on weaknesses and strengths on different implementation strategies;
• As a benchmark against other projects within an organisation’s project portfolio.

These four functionalities focus on “measurement” of the project organisation before, during and after execution in a uniform manner. By doing so lessons can be defined to improve the overall project management level.

The IPAT can be used as “improvement” tool, to help define strong areas and areas for improvement in the project management of a project. In this manner the tool could be applied by the project organisation itself. All functionalities are visualised in the next scheme (Figure 5).
4.3 Experiences with the IPAT
Trained members of the NETLIPSE network have been carrying out IPAT assessments in various projects during the years. In 2015 for example, The New Stockholm Metro and A6 Almere Highway Expansion project were assessed. In this part, their experiences are described by the responsible Project Manager.

IPAT assessment New Metro Stockholm 2015
The new Metro Stockholm expansion is an assignment that started as a result of an agreement between six parties. The agreement was signed in February 2014. The intention of the Metro expansion is to extend the existing system with 19 km new track tunnels, a new depot and rolling stock. The total value is estimated to be € 3 billion. The agreement states that the construction starts in 2016 and ends in 2025.

The organisation of the new Metro extension started off at a very small scale and has, during the first year, developed into a big and fast growing organisation. During this phase the leaders of the organisation found that it would be valuable to have an independent assessment carried out by a party working with and experiences in major projects.
An IPAT assessment was performed in 2015 and we found the following experiences:

- The IPAT involves the whole project management process and the understands the driving forces in major projects;
- The IPAT helps make the assessed organisation aware of the importance of the overall aim with the actual task at hand – the importance of a business case;
- The IPAT focuses on the relationships between different processes within a major project.
- The discussions with the assessors during the IPAT assessment are very valuable and sometimes even mind opening;
- The assessment tool tends to be very technically orientated which could be a source of development for the future;
- We found the IPAT assessment to be a very interesting and valuable experience for the organisation.

Riggert Anderson

IPAT Assessment A6 Almere Highway Expansion Project 2015
Applying the NETLIPSE project assessment tool (IPAT) has helped the project team in preparations for the tender phase. We have enjoyed a good experience with the NETLIPSE IPAT tool, when we carried out the assessment in the transition period from the planning towards the tender phase. The team sessions to prepare for the IPAT, the interviews during the IPAT and the feedback from the assessors helped us to focus on the subjects which needed a bit more attention. It helped the project team to evaluate the complete project scope and her environment in order to focus on the main topics which will make the project succeed.

The A6 Almere highway expansion project is an important link in the total traffic system of the Schiphol-Amsterdam-Almere corridor. Due to the expected growth of the Almere municipality and the expected increase of traffic intensity on the road section Almere-Amsterdam, the capacity of the existing infrastructure must be expanded. In addition, an important goal is to improve livability in the vicinity of the A6. The project scope includes the municipal infrastructure of the Weerwater development area. In this area the A6 will be lowered, so that the new highway will be less of a barrier. In the same area the Floriade 2022, a world horticultural expo, will be held. The expanded A6 highway will cut through the exhibition area. Therefore the road will need to be available in time for the Floriade which will take place in 2022. The main challenges are to maintain the current traffic flow level during construction and to design and build the new highway as a zero-energy road.

The IPAT is a mature tool, well defined and easy to use. The approach is to gather the relevant information through interviews while receiving direct feedback. The assessors are highly qualified project managers from the same field with loads of relevant experience. The conversations were lively and interactive which helped to enjoy the feedback. It did not feel as an audit at all. IPAT has provided us with added value on topics like; political context, client support and innovative techniques. These topics are often a bit undervalued in our regular audit system but critical for project success.

Looking back it was a great teambuilding experience especially since this was new for our organisation. It appeared to be a great rehearsal for our tender phase. IPAT will definitely add value to any phase of large infrastructural projects.

Ingeborg Lijtenberg
5 Concluding

5.1 Introduction
This chapter marks the end of this anniversary publication and contains the personal perspectives by the original writing team involved in the NETLIPSE 2006-2008 research and publication of the book “NETLIPSE: Managing Large Infrastructure Projects”. The result of the two-year research into best practices and lessons learnt in the management and organisation of fifteen large infrastructure projects in Europe.

The purpose of this chapter is to provide a personal overall perspective on both the quantitative and qualitative input provided in Chapters 2 and 3. Not only looking back at what were the best practices defined in 2008 but also looking forward into what are future challenges that NETLIPSE should focus its activities on.

5.2 You Get What You Put In
Stuart Baker

NETLIPSE has been a great thing for me and my development and understanding of huge projects. The 10 years seems to have flown by but also we seem to have done and achieved so much. It seems very much to have been the best example I have ever known of the simple English maxim: ‘you get out of something as much as you put in’.

In 2004, I was first approached by a group of enthusiastic Dutch people who worked in projects and had the sound idea that there would be great advantages in sharing learning about major projects with others. Of course I was sceptical at first. After all, there is nothing a Project Director likes more than getting into a huge mess with a project and then digging himself out so that it all ends well! Why would anyone want to spoil the fun by learning from others’ successes and failures? It would spoil all the fun!

They (primarily Leendert Bouter and Marcel Hertogh) rapidly convinced me of the soundness of their plan and since I was not a ‘project person’ but mainly a commercial and operational railwayman I felt it would be great to learn more about this world of projects. On reflection, I did not take much persuading, since I had just been appointed Project Director of the rescue of the failed West Coast Main Line upgrade. At £13.5bn, the project had just imploded and caused the administration of the private infrastructure company, Railtrack. I knew
that I needed to learn fast and here were people with experience and skills which I needed and they were willing to freely share them.

I rapidly became enthusiastic for the network and hosted the inaugural meeting in May 2006 in London. In strong defence of the British climate, for those few days, the temperature in London was higher than anywhere else in the whole of Europe which enabled us to relax outside in the evening and discuss and debate what the network should both do and be.

We soon got into the crux of studying what were the critical success factors in projects through qualitative research by looking at 15 projects across Europe, including my own West Coast one which was now stable at a reduced cost (£9.9bn) and actually starting to deliver. This was followed by quantitative work, looking at whether it was possible to calibrate a model to assess projects more scientifically. The outcome of this research was the Infrastructure project Assessment Tool, or IPAT, which was tested and has since been used successfully across Europe.

This was a fascinating time for us all in Netlipse – imagine how new it all was, studying the Øresund bridge project between Denmark and Sweden, the new Betuwe line in the Netherlands and even the Bratislava Ring Road. While it felt a bit like being thrown in at the deep end of a swimming pool, we rapidly started to understand that everything was so different and yet so alike and that international lessons could soon be drawn out. Good lessons were learnt (don’t incentivise the contractors on their contracts but on the end game – the bridge opening date, in the case of the Øresund). Little had I thought that I would learn a highly transferable lesson from Bratislava. This was a Japanese PFI and the proud Japanese had never considered that the mighty Yen would fall in value against the Slovak Crown but it had done and there was not enough money to fund the project on completion! This lesson was immediately transferred to my own InterCity Express Project, a £4.5bn, 27 year PFI funded mainly by Japanese banks!

I learnt hugely from others, just by conversations and lectures. Often it was not the formal but also the informal parts of NETLIPSE which hit home the hardest. Issues with both the Øresund and the North South High Speed line in the Netherlands showed me how critical it is that one integrates the infrastructure, the trains and the signalling/traffic control in a rail project.

The 10 years have both been hard work (Paul Lian Staal in the Netherlands and I in York had several long nights completing the 2008 Netlipse book with emails flying back and forth right up to 02:30 in the morning) and they have been fun.

Strange events have happened – I have appeared on live Italian television on two separate occasions, explaining our work but also being asked to comment on an Italian General Election result and whether it would affect the massive Lyon – Turin project. I politely commented that huge projects last longer that governments and equally politely refrained for adding ‘especially in Italy’ at the end of the sentence.

I could not have wished to meet, work, talk, eat and drink with such a great group of people who have so much solid experience. I have been so privileged to soak up the learning and share experiences with so many others. I have enjoyed both learning and passing on learning to others – there simply are no training courses to get to know how to sponsor and manage projects on this huge scale. I thoroughly commend NETLIPSE to others. Here’s to the next 10 years!

5.3 Ten years of NETLIPSE: Looking Backward and Forward
Eddy Westerveld

NETLIPSE has been an interesting journey for me personally so it is an honour to reflect on the results of ten years of network and knowledge development. Several trends can be observed amongst the contribution in the previous chapters, submitted by different European representatives. I will highlight a few that I find most striking.

First of all, it is noteworthy that almost all of the best practices formulated ten years ago are still broadly recognized in practices today. This might seem an obvious conclusion but is still a relevant one since it means that although the world around us has changed considerably, best practices seem to be rather stable over this period of time. The challenge is maybe not so much to define new best practices but rather to implement those best practices that we are already aware of. Which in turn makes it relevant to answer the question why we, more often we than we would like, do no succeed in implementing these best practices in our projects? From my point of view the answer to this question...
lies somewhere in between the following main reasons.

- **Best practices always need to fit the specific goals and context of a particular project.** Carbon copying of solutions is never a recipe for success.
- **Learning from experience.** Knowing best practices theoretically and on paper based on analysis is useful but certainly not the same as having lived the experience of a project that has been successfully executed or not.
- **Incorporating change is done with and by people.** The dynamics of organisational change are tricky and blueprints for implementing best practices top down based on theoretical knowledge is rarely a success.

While reading the above might make us somewhat pessimistic about implementing best practices, the descriptions in Chapter three also show some promising results. Not all in the land of organisational change is messy and bound to fail! Most noteworthy I find the incorporation and use of the best practices related to stakeholder management and risk management. In both fields the contributions show major improvements in practice. Stakeholder management is now broadly recognised as an important success factor and we have developed the insight that rather than ‘managing stakeholders’ we need to focus on proper ‘stakeholder participation’. For risk management we see that it has become common practice all over Europe to use this approach as one of the prime steering mechanisms for our projects.

When we look further into the future, some interesting views emerge from the contributions. While best practices might remain somewhat stable, the complexity of the projects we undertake is still growing. Complexity is growing because:

- **Greenfield to Brownfield.** Especially in Western Europe, we see a change of focus from building new infrastructure to a focus on adapting, upgrading, renovating and changing existing infrastructure. This increases complexity because we need to keep the existing assets operational while executing our project.
- **Increased dependence on IT solutions.** The scope of LIPs is more and more including IT solutions in meeting demands. IT solutions leave less tolerance for failure than civil engineering design. IT solutions have multiple interfaces which are not tacit. Hence dependence on IT solutions and technology increases complexity.
- **Function combination.** The goals of projects have become broader. Instead of building just the hard infrastructure, the projects of the future combine this ambition with realising functionality to fulfil needs in terms of nature development, housing, business and sustainability.

Today, LIPs already have challenges with managing their complexities. Future trends indicate that these challenges are growing. NETLIPSE can be a knowledge developing vehicle to address these challenges the coming years by looking for and discussing fitting management strategies such as dynamic and adaptive management.

### 5.4 Major Challenges for the Future

**Marcel Hertogh**

The eight themes of the NETLIPSE book (2008) are still a firm basis to examine the state of the art of the management of large infrastructure projects. Ten years ago severe problems with the track record of projects in terms of cost overruns, time delays and stakeholder opposition, marked the need to improve the management of the projects themselves.

And also in the forthcoming ten years, this will remain a challenge! However, the world has changed, and nowadays our view has been further broadened, as also shown by the contributions in this anniversary book. Stimulated by these contributions I will discuss seven major challenges and illustrate these with some examples.

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1. **Project focus - Network focus and asset management**

Mega projects are important parts of the network, but for example a DBFM contract is often optimised for the project itself, and can be contra productive for the network as a whole. In some organisations the ‘power’ is shifting from the new project department towards the asset management department.

2. **Infrastructure bottlenecks - Sustainable development**

In city areas, new infrastructure developments can support the transformation towards more liveable, sustainable cities. An example is the new tunnel for the highway in the city of Maastricht in the Netherlands. The result is not only a tunnel, but more importantly a reconnection between the two city areas west and east of the highway, and new city development on top and next to the tunnel (real estate, green area).

3. **Budget oriented - Value driven**

Do we need to avoid cost overruns of the original project idea in any case? No, not necessarily, if at the same time enough extra value is created. The focus of current projects is more and more on generating this value. Although Societal Cost Benefit Analysis (SCBA) needs to be developed further, its increasing attention is a good illustration. And in assessing project success, don’t jump to conclusions too quickly. The Øresund project was not assessed as very suc-
cessful the first years after opening, but nowadays it certainly is considered a success in terms of value for society on both sides of the crossing.

4. Control - Adaptive management
Society changes and so do the requirements to our assets. For over a decade we have tried to adapt to changes during the early stages of a project (i.e. feasibility and design), but how can we be adaptive during the lifetime of our assets? Examples are dynamic contracting to find ways to adapt to changes (for instance at DBFM), and adaptive structures (a wharf that is prepared for the deepening of the harbour).

5. Management as an isolated process - Integrated approach
A theme that needs to be stressed is the design process. At Delft University of Technology we try to connect the design process with the management and decision-making processes, which are not always aligned. For instance contracting and stakeholder engagement have strong relationship with the integrated design; BIM can support this.

6. Specialists - T-shape professionals
Feedback from organisations in the sector, indicated that there are only a few project managers who are able to think and act in an integrated manner, and have the open attitude and competences to initiate long term partnerships between clients, contractors and stakeholders. The education systems and functions in the industry still focus on specialists, while current challenges need professionals with a broader, integral focus: T-shaped professionals! Professionals with a deep content knowledge (depth) who has the ability to act successfully in different situations (breadth). Of course the T-shape is needed for those who are attracted to contribute and manage current societal challenges, but also for specialists, because they will contribute in teams, need to better understand other specialists and to get a feeling of the broader picture.

7. Ad hoc learning - Structured learning
Although NETLIPSE serves as a best practice, knowledge exchange is still scarce within and between projects, and towards parent organisations. Also the scientific effort towards learning needs to be strengthened. Therefore structured learning from past experiences is one of the key focus areas for research in the field of project management at Delft University of Technology for the next years.

5.5 The Need for NETLIPSE and Sharing Good Practices

Pau Lian Staal-Ong

For me, NETLIPSE has been an exciting project, even programme in itself. A network that has adapted to changing circumstances and changing requirements from its sponsors throughout the ten years of its existence. What is surprising in the reflections so kindly provided by so many different project directors and managers, project sponsors and researchers representing the organisations and countries involved in the NETLIPSE network, is that only some of the best practices defined in 2008 are now common project management approaches. And these common approaches seem highly focussed on hard project management skills such as risk management, contracting and legal permits. Even after ten years, some of the challenges defined in 2008 are still challenges today and sometimes even more a challenge today than they were back then.

Stakeholder management is such a topic. Adapting the title to “stakeholder participation and communication” was the result of one of the first in-depth discussions that took place in the special interest group dedicated to that topic in 2010. Since then, at many Network Meetings, changes in stakeholder issues and approaches have been discussed. The principle that you cannot manage stakeholders, but should create an active dialogue and participation through transparent communications, is still valid and has proven to lead to positive results, such as in Amsterdam (North South Metro Line) and Stockholm (Metro Extension project).

Trends for the future indicate that the idea of ‘partnering’ is becoming more and more acceptable. Not only between client organisations and market partners via the contract forms set by some governments, but also between client organisations and stakeholders directly affected (or feeling to be affected) by the project and between the project and adjacent projects. Partnering is the future way forward as proven by a wonderful initiative – party due to NETLIPSE – in the form of the partner agreement signed by Rijkswaterstaat (NL) and Trafikverket (SE) in 2014 focussing on knowledge and people exchange. Rijkswaterstaat launched a ‘Market vision’ end of 2015 describing their activities to become better partners with the chain of organisations involved in the realisation of the large infrastructure projects.

Since co-writing the NETLIPSE book in 2008, I’ve learned to question whether we can really define a ‘best practice’. As Eddy indicated before, the context of a
A project requires an individual approach. What works in one country doesn’t necessarily transfer easily. For the future, I propose that NETLIPSE continues focusing on gathering, discussing and developing ‘good practices’. These good practices can be used as inspiration by client organisations wanting to improve their project management. I think for the coming years, these good practices should address the issues that are challenging today: contracting and procurement, partnering, stakeholder engagement, HRM: finding the right people to do the work and funding.

Also NETLIPSE should focus on new challenging topics in our project management approaches such as sustainability and safety. The IPMA Project Excellence Baseline refers to the ten UN Principles of Global Compact necessary for project sustainability, including the areas of human rights, labour, environment and anti-corruption. Already preliminary presentations and discussions have shown that there is much variation in the way client organisations address these topics in their projects. And their good practices will be interesting to discuss and research in the future.

Although in some countries, such as the Netherlands, the focus of new project realisation and strategies is shifting towards project maintenance, upgrades and asset management, the infrastructure (road, rail and water) projects investment programmes and challenges are still huge in many of the NETLIPSE partner countries. There are countries, such as Ireland and Portugal, that have come through their economic crises and are starting up projects that were put on hold. It is good to see these countries getting their infrastructure programmes back on track.

I look forward to continuing the discussions on how to improve the delivery of our projects and finding effective ways of sharing good practices in future NETLIPSE events. And hope you will join us there.

APPENDIX A: List of Contributors

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<td>Chair of Council</td>
<td>International Project Management Association (IPMA)</td>
<td>Croatia</td>
</tr>
<tr>
<td>Hans Ruitter</td>
<td>Programme Director</td>
<td>Schiphol-Amsterdam-Almere, Rijkswaterstaat Ministry of Infrastructure and</td>
<td>Netherlands</td>
</tr>
<tr>
<td>Ben Stafford</td>
<td>Programme Sponsor</td>
<td>Department for Transport</td>
<td>United Kingdom</td>
</tr>
<tr>
<td>Eric Smulders</td>
<td>Project Manager</td>
<td>Ministry of Infrastructure and the Environment -</td>
<td>Netherlands</td>
</tr>
<tr>
<td>Prof. Dr.-Ing. Konrad</td>
<td>Head of Project Management</td>
<td>Department, Institute for Ergonomics and Process Management</td>
<td>Universität Kassel, Germany</td>
</tr>
<tr>
<td>Spang, (IF)</td>
<td>Programme Director</td>
<td>NETLIPSE, AT Osborne</td>
<td>Netherlands</td>
</tr>
<tr>
<td>Pau Lian Staal-Ong</td>
<td>Programme Director, Senior</td>
<td>Consultant, NETLIPSE</td>
<td>Netherland</td>
</tr>
<tr>
<td>Jasper Tils</td>
<td>Project Manager</td>
<td>Rijkswaterstaat Ministry of Infrastructure and the Environment -</td>
<td>Netherland</td>
</tr>
<tr>
<td>Prof. Rodney Turner</td>
<td>Professor of Project</td>
<td>Management Department, Professor of Project Management, High-end Foreign</td>
<td>SKEMA Business School, Politecnico di Milano, Shanghai University, China</td>
</tr>
<tr>
<td></td>
<td>Management</td>
<td>Editor-in-Chief, International Journal of Project Management</td>
<td>China</td>
</tr>
<tr>
<td>Lars Westermark</td>
<td>Project leader</td>
<td>Liikennevraatio, Finnish Transport Agency</td>
<td>Finland</td>
</tr>
<tr>
<td>Dr. Eddy Westerveld</td>
<td>Managing consultant</td>
<td>Audits &amp; Evaluations Research Coordinator, AT Osborne</td>
<td>Netherland</td>
</tr>
<tr>
<td>Janne Wikström</td>
<td>Project Manager</td>
<td>Liikennevraatio, Finnish Transport Agency</td>
<td>Finland</td>
</tr>
<tr>
<td>Jacco Zwemmer</td>
<td>Project Manager</td>
<td>Rijkswaterstaat Ministry of Infrastructure and the Environment</td>
<td>Netherland</td>
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APPENDIX B: Results of the Quantitative Analysis

### Scope & Objectives

<table>
<thead>
<tr>
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<th>Delta</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The objectives are agreed with the principal in a documented manner.</td>
<td>9,7</td>
<td>8,8</td>
</tr>
<tr>
<td>2</td>
<td>The project scope is determined with other stakeholders (partners).</td>
<td>6,3</td>
<td>8,6</td>
</tr>
<tr>
<td>3</td>
<td>Project employees are aware of the objectives.</td>
<td>8,7</td>
<td>9,0</td>
</tr>
<tr>
<td>4</td>
<td>The project objectives have been translated into work packages and milestones.</td>
<td>8,3</td>
<td>8,6</td>
</tr>
<tr>
<td>5</td>
<td>Work packages and milestones have been divided over the members of the project organisation.</td>
<td>6,7</td>
<td>8,1</td>
</tr>
<tr>
<td>6</td>
<td>The project has a specific change register for scope changes.</td>
<td>9,0</td>
<td>7,1</td>
</tr>
<tr>
<td>7</td>
<td>The project scope was frozen at a specific point in time</td>
<td>6,7</td>
<td>6,2</td>
</tr>
<tr>
<td><strong>Average theme</strong></td>
<td><strong>7,9</strong></td>
<td><strong>8,1</strong></td>
<td><strong>0,2</strong></td>
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### Risk management

<table>
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<th>Delta</th>
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</thead>
<tbody>
<tr>
<td>26</td>
<td>The project organisation periodically performs / updates a risk analysis</td>
<td>7,7</td>
<td>9,0</td>
</tr>
<tr>
<td>27</td>
<td>In the analysis opportunities for the project are also collected and analysed</td>
<td>5,4</td>
<td>5,7</td>
</tr>
<tr>
<td>28</td>
<td>Risks are prioritised and dealt with accordingly</td>
<td>8,6</td>
<td>8,8</td>
</tr>
<tr>
<td>29</td>
<td>Risks and opportunities are administered and monitored using a database</td>
<td>6,9</td>
<td>7,6</td>
</tr>
<tr>
<td>30</td>
<td>Risk management is periodically evaluated</td>
<td>8,1</td>
<td>7,6</td>
</tr>
<tr>
<td>31</td>
<td>A financial reservation is made to cover the occurrence of risks</td>
<td>7,7</td>
<td>9,0</td>
</tr>
<tr>
<td>32</td>
<td>All project employees are aware of risks and opportunities</td>
<td>5,8</td>
<td>6,9</td>
</tr>
<tr>
<td>33</td>
<td>Effective procedures are in place for the quick escalation in case main risks occur in any part of the organisation</td>
<td>6,8</td>
<td>7,9</td>
</tr>
<tr>
<td><strong>Average theme</strong></td>
<td><strong>7,1</strong></td>
<td><strong>7,8</strong></td>
<td><strong>0,7</strong></td>
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### Contracting

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<th>2016</th>
<th>Delta</th>
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<tbody>
<tr>
<td>34</td>
<td>A contracting policy exists for all parts of the project.</td>
<td>9,0</td>
<td>8,8</td>
</tr>
<tr>
<td>35</td>
<td>The project organisation is open to new ways of contracting.</td>
<td>4,7</td>
<td>7,4</td>
</tr>
<tr>
<td>36</td>
<td>Contracting is performed in accordance with European laws and regulations.</td>
<td>10,0</td>
<td>9,8</td>
</tr>
<tr>
<td>37</td>
<td>The contract model can be chosen in accordance with the characteristics of the contract.</td>
<td>6,9</td>
<td>8,1</td>
</tr>
<tr>
<td>38</td>
<td>Contracts have the possibility of optimisations.</td>
<td>5,0</td>
<td>6,7</td>
</tr>
<tr>
<td>39</td>
<td>The co-operation with contractors is one of mutual understanding.</td>
<td>6,3</td>
<td>7,8</td>
</tr>
<tr>
<td>40</td>
<td>Contracting and contract management are periodically evaluated.</td>
<td>7,7</td>
<td>6,8</td>
</tr>
<tr>
<td><strong>Average theme</strong></td>
<td><strong>7,1</strong></td>
<td><strong>7,9</strong></td>
<td><strong>0,8</strong></td>
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### Legal consents

<table>
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<th>2016</th>
<th>Delta</th>
</tr>
</thead>
<tbody>
<tr>
<td>41</td>
<td>The project organisation has made a coherent analysis of all legal procedures.</td>
<td>9,3</td>
<td>8,6</td>
</tr>
<tr>
<td>42</td>
<td>An overview of all permits and permissions that need to be collected is present and updated.</td>
<td>9,3</td>
<td>9,3</td>
</tr>
<tr>
<td>43</td>
<td>The project organisation knows about new developments and changes in actual procedures.</td>
<td>9,0</td>
<td>7,9</td>
</tr>
<tr>
<td>44</td>
<td>The project organisation is eager in co-operation with stakeholders to optimise the procedure time.</td>
<td>8,0</td>
<td>7,1</td>
</tr>
<tr>
<td>45</td>
<td>The procedure planning is related to the planning of design &amp; contracting and of decision making processes.</td>
<td>6,7</td>
<td>7,6</td>
</tr>
<tr>
<td>46</td>
<td>The management of procedures is evaluated periodically.</td>
<td>7,7</td>
<td>6,0</td>
</tr>
<tr>
<td><strong>Average theme</strong></td>
<td><strong>8,3</strong></td>
<td><strong>7,8</strong></td>
<td><strong>-0,5</strong></td>
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### Stakeholders

<table>
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<th>2016</th>
<th>Delta</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>The project organisation has identified all relevant stakeholders with specific interests and attitude (stakeholder analysis)</td>
<td>8,3</td>
<td>9,0</td>
</tr>
<tr>
<td>9</td>
<td>The stakeholder analysis is updated.</td>
<td>6,3</td>
<td>7,1</td>
</tr>
<tr>
<td>10</td>
<td>The project has set up a strategy for structured contact with stakeholders (communication plan).</td>
<td>7,0</td>
<td>7,9</td>
</tr>
<tr>
<td>11</td>
<td>The communication plan is operational.</td>
<td>6,9</td>
<td>8,6</td>
</tr>
<tr>
<td>12</td>
<td>The project organisation is open towards co-operation with stakeholders.</td>
<td>8,0</td>
<td>9,0</td>
</tr>
<tr>
<td>13</td>
<td>Satisfaction of stakeholders is measured periodically.</td>
<td>3,0</td>
<td>5,0</td>
</tr>
<tr>
<td>14</td>
<td>Stakeholder management is evaluated periodically.</td>
<td>3,3</td>
<td>5,7</td>
</tr>
<tr>
<td><strong>Average theme</strong></td>
<td><strong>6,1</strong></td>
<td><strong>7,5</strong></td>
<td><strong>1,4</strong></td>
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### Finance

<table>
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<th>Delta</th>
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<tbody>
<tr>
<td>15</td>
<td>The project uses a finance plan</td>
<td>9,3</td>
<td>9,5</td>
</tr>
<tr>
<td>16</td>
<td>A business case for the project is present</td>
<td>6,4</td>
<td>7,1</td>
</tr>
<tr>
<td>17</td>
<td>A process for budget control is used.</td>
<td>9,6</td>
<td>9,7</td>
</tr>
<tr>
<td>18</td>
<td>Processes are used for payment and handing out assignments</td>
<td>10,0</td>
<td>9,1</td>
</tr>
<tr>
<td>19</td>
<td>The financial reports presents as well information for accountability (history) as for management (decisions you have to make)?</td>
<td>9,2</td>
<td>9,1</td>
</tr>
<tr>
<td><strong>Average theme</strong></td>
<td><strong>8,9</strong></td>
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### Organisation & Management

<table>
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<th>2006</th>
<th>2016</th>
<th>Delta</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>Strategy, Organisation are documented and updated. Processes are documented and updated.</td>
<td>8,6</td>
<td>8,4</td>
</tr>
<tr>
<td>21</td>
<td>There is regular contact between the principal and the project manager</td>
<td>9,0</td>
<td>9,1</td>
</tr>
<tr>
<td>22</td>
<td>The project organisation has an open culture.</td>
<td>6,4</td>
<td>8,6</td>
</tr>
<tr>
<td>23</td>
<td>The project organisation has an active HRM policy.</td>
<td>6,4</td>
<td>5,5</td>
</tr>
<tr>
<td>24</td>
<td>The satisfaction of employees is periodically measured.</td>
<td>5,7</td>
<td>5,0</td>
</tr>
<tr>
<td>25</td>
<td>The project organisation has an active knowledge exchange with the parent organisation.</td>
<td>6,8</td>
<td>6,7</td>
</tr>
<tr>
<td><strong>Average theme</strong></td>
<td><strong>7,2</strong></td>
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### Knowledge & Technology

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<th>2016</th>
<th>Delta</th>
</tr>
</thead>
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<tr>
<td>47</td>
<td>There is a knowledge management policy</td>
<td>6,0</td>
<td>6,2</td>
</tr>
<tr>
<td>48</td>
<td>The project organisation uses new technologies to make the project better</td>
<td>5,3</td>
<td>6,4</td>
</tr>
<tr>
<td>49</td>
<td>The project uses research to improve the project</td>
<td>5,0</td>
<td>4,7</td>
</tr>
<tr>
<td>50</td>
<td>The project organisation has an active knowledge exchange with other projects and organisations</td>
<td>6,3</td>
<td>7,6</td>
</tr>
<tr>
<td><strong>Average theme</strong></td>
<td><strong>5,7</strong></td>
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