Early Warning of NEC3 ECC, A Solution for Dutch Design and Build Construction Problem Solving?

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Preface

The thesis is for partial fulfillment of the requirements for the Degree of *Master of Science in Construction Management and Engineering* at the Delft University of Technology in the Netherlands. With this thesis, I am finalizing my Master's study.

I began my research in February 2017 at the company Witteveen+Bos in The Hague, the Netherlands. As I still remember, I had a very difficult start for searching for an interesting research topic. At that moment, I was challenged to come up with an idea, which could benefit the Dutch contract management practices from an international perspective. With the help from Monica and Leon, together with the company Witteveen+Bos, we came up with the research topic of the current thesis, and the proposal was formally kicked off in April 2014.

For the past six months, I have been dedicated to the thesis, during which I have learned a lot of things not only concerning professional knowledge, but also about Dutch culture. Nevertheless, the process was not always easy. For this, I have to thank my people. First of all, I have to thank all the members (Monica, Leon, Louis, Rob, and Jelmer) in my graduation committee for your time, guide, and encouragement. Besides, I need to thank all the twelve interviewees for your time, hospitality, and your willingness for sharing knowledge with me. I would also like to thank my colleagues from Witteveen+Bos and my friend in life for their help and moral support.

In the end, I would like to thank my parents in China for their endless love and care, even if I am thousands miles away.

Yu Gao

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Executive Summary

The integrated contract UAV-GC 2005 is gaining popularities in Dutch construction industry, which is meant to bring added value to the employer. Nevertheless, due to embedded culture and other social factors, people are still strongly influenced by the 'old way of working'. For instance, project problems between employer and contractor are often settled too late, which leads to excessive amount of costs. As a result, parties begin to blame each other, and vicious cycle starts. From a legal point of view, it is deemed that the duty to warn obligation of UAV-GC 2005 does not necessarily play its role in facilitating problem solving between the employer and the contractor. While in an international level, the early warning of NEC3 ECC originated from U.K. construction industry is catching increasingly attention all over the world, which is known as its 'proactive risk management' approach in dealing with project problems. Under early warning obligation, parties are obliged to inform each other of any matter which could affect costs, completion, progress or quality of the project. It is even praised as 'jewel in the crown' by many. Therefore, it is inspired that whether the duty to warn of UAV-GC 2005 can be "substituted" by the early warning of NEC3 ECC, so as to improve problem solving on Dutch Design and build construction projects. Nevertheless, the NEC3 ECC contract has not been extensively applied in the Dutch construction industry, so that it is both legally and culturally alien to the "Dutch approach". Therefore, problem in this respect is twofold, which is the deficiencies of the duty to warn of UAV-GC 2005 on one hand while the unfamiliarity of the early warning of NEC3 ECC to the Dutch construction industry on the other. Accordingly, the primary research objective of this dissertation is to investigate the deficiencies of duty to warn of UAV-GC 2005 and the added value of early warning of NEC3 ECC in terms of facilitating construction problem solving between the employer and the contractor. The secondary objective is to probe into the requirements for early warning to function with its genuine intention, from both contractual and cultural perspectives.

In order to pursue the research objectives, the main research question is therefore proposed as:

"Can Early warning of NEC3 ECC be expected to function properly under UAV-GC 2005, with the aim of improving Dutch Design and Build construction problem solving?

Early warning in project management

The early warning in project management is investigated in chapter 3. By conducting literature review with respect to early warning in project management, the definition of early warning proposed by (Nikander, 2002, p. 48) is adopted in this research so as to clarify early warning in project management:

> *"Early warning is an observation, a signal, a message or some other item that is or can be seen as an expression, an indication, a proof, or a sign of the existence of some future or incipient positive or negative issue. It is a signal, omen, or indication of future developments."*

Besides, the influence of early warning on project problem solving is theoretically explained by the concept of 'time available' (Nikander, 2002, p. 86). The time available is the amount of time available before problem signified by the early warning reaches its full impact. Therefore, the idea of early

warning is to exploit the period of time so as to reduce potential consequences which might be caused by the problem.

Construction problem solving

The construction problem solving is studied by consulting project management literatures. The result of the literature review implies that, unlike some subjects such as risk management, project planning, and project control etc., construction problem solving has not crossed the threshold to become a mature theme in project management. Hence, there is not a widely acknowledged definition for this concept. It characterizes much of construction management practices (Li & Love, 1998, p. 721). Furthermore, literatures suggest that it is associated with many other subjects such as risk management, conflict management, team-building, and project manager's competencies and professional skills and so on.

Table 1 Construction problem solving dimensions, aspects (requirements), and evaluation criteria

Dimensions of Problem solving	Aspects (requirements)	Criteria
Culture Transition	Climate of mutual trust	*Reasonable behavior*
		Equal and balanced warning responsibility
	Working together (Integration)	*Joint problem solving process*
	Win-win attitude	*Win-win attitude*
Early Problem Intervention	Problem solving at the lowest possible authority level	*The presence of early warning*
	Problem solving as quickly as possible	
Avoidance of Problem Recurrence	Learning from problem solving	*Learning from problem solving*

In accordance with project management literatures, six aspects or requirements are identified as being relevant for evaluating construction problem solving, which are 'Climate of mutual trust', 'Working together', 'Win-win attitude', 'Problem solving at the lowest possible authority level', 'Problem solving as quickly as possible', and 'Learning from problem solving'. The six aspects are fall under three dimensions, which are Culture transition, Early problem intervention, and Avoidance of problem recurrence.

In order to be associated with the contract clauses, the aspects or requirements are further adapted to six criteria for evaluating problem solving of three standard contract forms. They are *'Reasonable behavior', 'Equal and balanced warning responsibility', 'Joint problem solving process', 'Win-win attitude', 'The presence of early warning', and 'Learning from problem solving'*.

Comparative analysis of three standard forms of contract

In line with the six criteria identified, contract clauses of three standard forms of contract are analyzed, so as to investigate to what extent three standard contract forms meet the assessment criteria in terms of facilitating construction problem solving and how.

Table 2 Comparison of three different contract forms

Dimensions of Problem solving	Aspects (requirements)	Criteria	UAV-GC 2005	NEC3 ECC	FIDIC YB
Culture Transition	Climate of mutual trust	Reasonable behavior	**+/-**	√	X
		Equal and balanced warning responsibility	X	√ (EW)	X
	Working together (Integration)	Joint problem solving process	X	√ (EW)	X
	Win-win attitude	Win-win attitude	**+/-**	√ (EW)	X
Early Problem Intervention	Problem solving at the lowest possible authority level	The presence of early warning	**+/- (DTW)**	√ (EW)	**+/- (EWP)**
	Problem solving as quickly as possible				
Avoidance of Problem Recurrence	Learning from problem solving	Learning from problem solving	X	X	X

The result of the comparative analysis reveals that the NEC3 ECC is the optimal contract which fully addresses all the criteria except for the *'learning from problem solving'*. In this process, the early warning obligation (clause 16 of ECC) plays an irreplaceable role in addressing all the rest of the criteria except for the *'Reasonable behavior'*. While the FIDIC Yellow Book is the worst in terms of meeting the criteria, which only partially addresses the *'The presence of early warning'*. The UAV-GC 2005 stands in between those two contract forms with respect to facilitating problem solving. Alike FIDIC YB, the UAV-GC 2005 only partially addresses the 'The presence of early warning' through duty to warn obligation (clause 4-7). The overall result of the comparative analysis illustrates in which aspects the duty to warn is insufficient in terms of facilitating construction problem solving, and what are the added value of early warning obligation of ECC.

Main findings from the interviews

To investigate what role do early warning and duty to warn play in practice, it implies a switch from theories to empiricism. Therefore, expert interview was conducted to obtain the empirical knowledge. The interview questions are constructed on the basis of the literature review and the comparative analysis. Then, the interview questions were asked to in total twelve interviewees who have experience

of contract management either with the employer or with the contractor. Among all the interviewees, only two have experience with NEC3 ECC, because of the only one project in the Netherlands executed under such contract which is the International Criminal Court (ICC) project in The Hague.

The main findings from the interviews can be described from three perspectives, which are the Dutch construction culture, the deficiencies of duty to warn of UAV-GC 2005 in terms of facilitating problem solving, and the added value of early warning of NEC3 ECC.

First and foremost, the results of the interviews reveal that most of the characteristics of Dutch construction culture are in line with global literatures regarding 'traditional blame culture' except for one feature, which is 'win-lose (disputes often end up in court)' (Larson, 1997; Slater, 1998; Walker & Hampson, 2008). This is mainly attributed to the principle of good faith (the principle of reasonableness and fairness) in the Dutch Civil Code (DCC), under which disputes between parties tend to be settled "amicably" through negotiation rather than ending up in court. This is typical to the Dutch construction culture, and it is also addressed as a 'give and take' culture. But then again, the Dutch construction culture is still characterized as a 'traditional blame culture', due to a lack of trust between public employers and contractors. Under such culture, the contractor is more interested in being compensated after consequences are observed, than giving an early warning before problem occurs.

Table 3 Comparison of duty to warn of UAV-GC 2005 and early warning of NEC3 ECC

Deficiencies of Duty to warn of UAV-GC 2005	**Added Value of Early Warning of NEC3 ECC**
Collaboration is not described	Project management instrument
Warning is not incentivized	Warning is incentivized by linking to 'Compensation event' (active control), and by trust building (passive control)
Duty to warn is not highlighted	Early warning as an independent and essential article
Less equal and balanced warning responsibility	More equal and balanced warning responsibility
'Obvious error' originated with the employer	'Any matter' which could affect project outcomes

Furthermore, the deficiencies of duty to warn of UAV-GC 2005 in terms of facilitating problem solving and the added value of early warning of NEC3 ECC are identified and summarized in table above. The most important added value of the early warning of NEC3 ECC to the duty to warn obligation of UAV-GC 2005 is the project management instrument (clause 16.2-16.4) which could be used by parties to 'follow up' the warning, and to discuss and seek solutions together. Besides, the pitfall of 'obvious error' of the duty to warn of UAV-GC 2005 is avoided by referring to 'any matter' which could affect project outcomes in the early warning of NEC3 ECC.

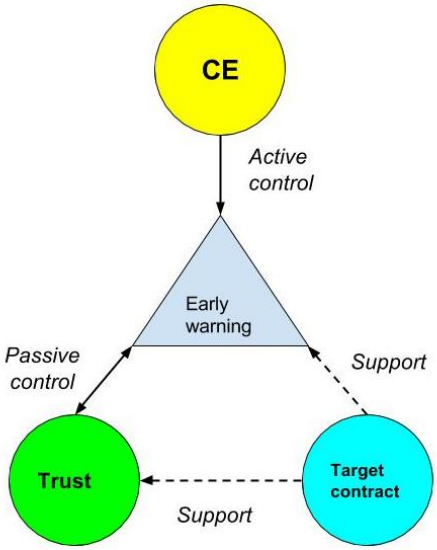

Figure 1 Early warning mechanism of NEC3 ECC (CE- Compensation Event)

In addition to all the foregoing, two conditions are identified as critical to the proper functioning of early warning, which are the compensation event and trust (see figure 1). On one hand, by linking early warning to the compensation event, the contractor's compensation is evaluated as if the contractor had given an early warning. Therefore, the contractor is incentivized to give early warning so as to be entitled to the compensation event. On the other hand, early warning can be stimulated by building trust between parties. From a contractual point of view, this is necessarily supported by sharing pricing mechanism, which is the 'target priced contract' of NEC3 ECC. What is also worth mentioning is that the relationship between trust and early warning is reciprocal. Trust is essential to early warning, while early warning can promote 'the spirit of trust and cooperation' (clause 10.1 of ECC).

Is Early warning a solution to Dutch Design and Build problem solving?

It is concluded that the early warning will not be a solution for Dutch Design and Build construction problem solving, unless the two conditions mentioned above are met. As for the current UAV-GC 2005, the duty to warn obligation and the compensation and/ or extension of time is isolated. In addition, there is no contractual mechanism such as 'target priced contract' in the current UAV-GC 2005, which could support the trust building between parties. More importantly, a lack of trust in the Dutch construction culture would be the biggest challenge for the proper functioning of early warning. Nevertheless, every coin has two sides. The trust is not only a threat, but also an opportunity for early warning. The early warning can be used as the starting point for parties to build trust, which in turn facilitates early warning. That is where the virtuous cycle starts.

Limitation and recommendation for further research

The research in this dissertation has made a start with exploring the opportunities to apply early warning obligation of NEC3 ECC in the Dutch Design and Build construction projects. Therefore, the research is of exploratory nature. The biggest limitation of this research is the limited case projects executed under

NEC3 ECC in the Netherlands, which makes it difficult to conduct case-based research (you cannot compare an apple with a pear). Instead of case study approach, expert interview had to be adopted so as to collect the empirical data. By conducting interview, questions asked to interviewees were 'generic'. As a result, project specific characteristics such as project type (infrastructure or residential), client type (public or private, and international or national), and project scale (large, medium, or small) and so on could not be taken into account in this case. Therefore, the result of the research is not typical to a specific scenario of design and build project.

In light of the limitation of this research, it is suggested to further research early warning in a case-based approach, so as to testify whether early warning can be solution for a certain scenario of Dutch design and build construction project. For instance, large infrastructure projects initiated by the public employer in the Netherlands.

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Chapter 1 Introduction

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1. Introduction

1.1 Background of the research subject

The integrated project delivery methods are gaining popularities in Dutch construction market, which primarily consist of Design& Build (D&B), Design-Build-Finance-Maintenance-Operate (DBFMO), and the Build-Operate-Transfer (BOT) etc. Among all of the methods, D&B delivery method (also refers to Design& Construct in the Netherlands) is used most frequently in Dutch construction industry nowadays (PIANOo, 2014). For procuring this type of projects, the largest employer in the Netherlands- Rijkswaterstaat (Rijkswaterstaat, 2016) developed the standard contract form which is the Uniform Administrative Conditions for Integrated Contracts 2005 known as UAV-GC 2005. The standardization of the procurement document not only benefits public sectors as the buyer, but also market suppliers as they are getting increasingly familiar with the procurement standards. Irrespective of many advantages of such procurement methods(de Ridder, 2009), there are some drawbacks. For example, one of the disadvantages is that, under a complex environment, problems as regard to design will occur if the project context and objective are not clear to project participants (PIANOo, 2014).

Having said that in the Netherlands public sector use standard forms of contract to procure design and build construction projects, which is the UAV-GC 2005. In an international level, comparable standard contract forms are the FIDIC (Fédération Internationale des Ingénieurs-Conseils, 1999) Yellow book and NEC3 ECC (New Engineering Contract, 2013) . However, they are distinct in nature with respect to solving project problems as the philosophy behind them are quite different. The FIDIC is more focusing on liability of issue once it happens, which view project problems as natural instead of taking initiatives to prevent them from happening(Gerrard, 2014). While NEC3 ECC is characterized by proactive management rather than reactive management, in which the early warning clause obliged parties to notify each other of any matter that could affect the project performances in terms of time, costs, and quality (Broome, 1999). The importance of early warning has been recognized by many scholars and practitioners, and it has been complemented as the “jewel in the crown ” (Forward, 2002; Gerrard, 2005, 2014).

1.2 Outline of this dissertation

The dissertation is demarcated into four parts and in total nine chapters.

In Part I, the chapter 1 introduces the subject of this research. The technical design of the research is explained in chapter 2, which includes problem definition, the current state-of-the-art of the research topic and knowledge gap, the research objectives and research questions, and the selection of research strategies for performing the research project.

The Part II concerns about the theoretical background of this research. It starts with a literature review regarding early warning in chapter 3, with the purpose of investigating what is early warning and how does it influence construction problem solving from the perspective of project management theories. In chapter 4, what is construction problem solving is explored by consulting literatures so that a set of assessment criteria are generated for assessing three standard contract forms, in the aspect of facilitating

construction problem solving. The assessment of three standard contract forms is performed in chapter 5. The Part II lays a foundation for performing empirical research in part III.

In Part III, the research shifts from theories to empiricism, in which the theoretical knowledge generated from Part II are further confronted with empirical knowledge. In chapter 6, set-up of the interviews is explained, while the results of the interviews are presented. The results of the interviews are further discussed in light of literatures and theories in chapter 7.

At the end, the whole dissertation is concluded in chapter 8, in which every sub-question together with the main research question are answered. In chapter 9, recommendations are firstly given to the company Witteveen+Bos who is interested in applying early warning obligation of NEC3 ECC in the Dutch D&B construction project, with the purpose of improving collaboration and facilitating problem solving. Afterwards, suggestions are given to the CROW who is on the outlook for updating the current UAV-GC 2005 so as to better meet the market demands. Last but not least, the limitation of this research is clarified as well as recommendation for further recommendation.

2. Research design

In this chapter, the conceptual design of the research is explained. The chapter starts with the definition of problem. With the formulated problem, a critical literature review with respect to the research topic is performed, and the knowledge gaps are observed. In order to pursue the research objective, a set of research questions are formulated. Subsequently, research strategies adopted in this research are explained at the last section.

2.1 Problem Definition

Before the appearance of more innovative procurement route and project delivery approach, the public sector in the Netherlands stuck to the 'lowest-bid' competitive procurement method, which caused a series of problem in the Dutch construction industry such as collusive behavior, cartel, and bid rigging etc. (Van De Rijt, Hompes, & Santema, 2010). Such practices finally lead to the outburst of the biggest collusion scandal in the Dutch construction history in 2002, which permanently damaged the trust and bilateral relationship between the public sector and the private market (Dorée, 2004).

Driven by "value for money", the public sector begun to seek changes in current Dutch construction industry. However, due to embedded culture and other social problems, the promotion of innovative procurement route and project delivery methods is still in its infancy (Van De Rijt et al., 2010). People's attitude and behavior are still strongly influenced by the 'old way of working'. For instance, under current UAV-GC 2005, project problems are often dealt too late which leads to plenty of unnecessary costs. As a result, vicious cycle starts and parties begin to blame each other, which makes it even harder to restore the damaged trusts. From the perspective of contract management, it is sensed by many scholars and practitioners that the current duty to warn obligation of UAV-GC 2005 does not necessarily play its role in identifying and solving project problems between parties. Therefore, it is deemed as insufficient with respect to facilitating problem solving between both the employer and the contractor. In contrast, the early warning obligation of NEC3 ECC originated from U.K. construction industry contributes to many success of NEC Contracts, while promoting the 'spirit of mutual trust and cooperation' between parties (Patterson & Trebes, 2015). Some even call it "jewel in the crown". Therefore, an initial idea came across that whether duty to warn of UAV-GC 2005 can be substituted by early warning of NEC3 ECC, so as to improve problem solving between the employer and the contractor. Nevertheless, the early warning obligation of NEC3 ECC is alien to Dutch construction industry. Thus, whether it can be used as what it is intended to be used by both parties, with the aim of improving problem solving in Dutch D&B construction projects, remains unknown.

Therefore, the problem is twofold. First and foremost, the duty to warn obligation of UAV-GC 2005 is insufficient in facilitating problem solving between parties. Secondly, whether early warning obligation is compatible with the UAV-GC 2005 contract and the current Dutch construction culture is unknown.

2.2 State-of-the-art & Knowledge Gap

In 2015, (Silva, 2015) conducted a systematic review on the topic of foresight in leading project management literatures, in which 16 journals were searched from leading academic journals on project

management by using searching terms such as “foresight”, “early warning”, “weak signals”, and “uncertainties” etc. Although the result of the literature review shows that there is an explicit relationship between “foresight” and project management, the link between them is still loose and yet not robust due to limited studies. Areas of interaction between foresight and project management are identified by the author to be risk management, project monitoring, portfolio build, decision-making and learning, project success factors, and project management competencies(Silva, 2015, p. 797). The author concluded that the study of foresight in project management is still in its infancy which indicates a strong demand for further research. Nevertheless, it shed light on the research of the present author. Among all of the 16 journal papers reviewed by(Silva, 2015, p. 796), six were further selected and two others were supplemented as the initial study material to gain insight into the topic of early warning in project management. Their basic information is summarized in table 4. All significant literatures regarding early warning briefed in this section will be substantiated in detail in Chapter 3.

Table 4 Selected studies

First Author	Year	Type	Title
Nikander, I. O.	2001	Journal paper	Project Management by Early Warnings
Nikander, I. O.	2002	Doctoral thesis	Early Warnings- A phenomenon in project management
Williams, T.	2012	Journal paper	Identifying and Acting on Early Warning Signs in Complex Projects
Haji-Kazemi, S.	2015	Journal paper	Barriers against effective responses to early warning signs in projects
Haji-Kazemi, S.	2013	Journal paper	A review on possible approaches for detecting early warning signs in projects
Nikander, I. O.	1997	Journal paper	Preliminary signals and early warnings in industrial investment projects
Williams, T.	2010	Journal paper	Early warning signs in complex projects
Meng, X.	2014	Journal paper	Is early warning effective for the improvement of problem solving and project performance?

According to current vision, (Nikander & Eloranta, 1997) and (Nikander & Eloranta, 2001) are the only two scientific papers specific to early warning in construction and engineering projects. In 1997, (Nikander & Eloranta, 1997) kicked off the research of early warning in project management and first of all confirmed the existence of early warning signal in a project environment. In their later research in 2001, (Nikander & Eloranta, 2001) further explained the nature of the early warning phenomenon and how it relates to project problem, problem cause, and response. Thereby, (Nikander, 2002, p. 48) came up with the definition of early warning in project management later in his doctoral thesis. In addition, lists of project problems and their related early warnings were provided based on their empirical research(I O Nikander & Eloranta, 2001, pp. 387-391). Furthermore, the authors argued that the human factor should never be ignored as this phenomenon is strongly connected to people and human behavior(Nikander & Eloranta, 2001, pp. 397–398). In the end, the authors expected this research could add an element to the contemporary project management theories(Nikander & Eloranta, 2001, p. 398). This element is the project control by using imprecise information.

Based on their research , (Haji-Kazemi, Andersen, & Klakegg, 2015; Haji-kazemi, Bjørn, & Krane, 2013; Klakegg, Williams, Walker, Andersen, & Magnussen, 2010; Williams, Jonny Klakegg, Walker, Andersen, & Morten Magnussen, 2012) investigated the methods for identifying early warning signs and the barriers against effective identification and response to early warning signs on projects. From an overview, methods for detecting early warning can be categorized into two groups. On one hand, it is connected to the formal approaches such as risk analysis, performance measurements, and project assessments etc.(Haji-Kazemi, Andersen, & Krane, 2013; Williams et al., 2012). While on the other, identification of early warning is more relying on the informal 'gut feeling' once the project situation becomes more complex. This is in line with the finding of (I O Nikander & Eloranta, 2001, pp. 397-398) that the human factor plays a paramount role in the phenomenon of early warning. Therefore, complexity, uncertainties, time pressure, tendency to optimism, level of openness, poor management, and political pressure are identified as the barriers against effective identification and response to early warnings in project(Haji-Kazemi et al., 2015; Williams et al., 2012).

Last but not least, (Meng, 2014) investigated the effect of early warning on improving problem solving and project performance based on empirical research, in which he concluded that early warning has significate and positive impact on improving problem solving and project performances. What's worth noting is that Meng (2014) compared early warnings under different standard forms of contract in U.K. construction industry (JCT, PPC2000, NEC, and bespoke) with the English common law as the background, in which he found that although the use of early warning is not entirely dependent on the selection of contract form, the effectiveness of early warning under different contract forms varies. The main reason argued by the author is because the early warning requires a collaborative working environment that encourages parties to work together to address various project problems.

Given this critical literature review of early warning in construction project management, three knowledge gaps are identified. First of all, early warning in project management has not been extensively studied, and there is little knowledge about early warning as a management tool specifically used in design and build construction projects. Then, early warning as a contractual obligation is originated from NEC3 ECC. Therefore, there is no discussion about the utilization of such obligation under the Dutch standard design and build contract form UAV-GC 2005. Moreover, early warning obligation of NEC3 ECC is familiar with English common law. Nevertheless, how does it react to the Dutch civil law legislative system remains unknown. Last but not least, there are plenty of literatures about the three standard forms of contract, but there is not much knowledge regarding to what extent they are different from each other in terms of facilitating construction problem solving.

2.3 Research Objectives & Research Questions

The primary research objective of this dissertation is to investigate the deficiencies of duty to warn of UAV-GC 2005 and the added value of early warning of NEC3 ECC, in terms of facilitating construction problem solving between the employer and the contractor. The secondary objective is to probe into the requirements for early warning to function with its genuine intention, from both contractual and cultural perspectives.

In order to pursue the research objectives, a main research question is thus defined which is further demarcated into five sub-questions.

Main research question:

"Can Early warning of NEC3 ECC be expected to function properly under UAV-GC 2005, with the aim of improving Dutch Design and Build construction problem solving?

Q 1 "What is Early warning in project management, and how does it influence project problem solving?"
Q 2 "What does construction problem solving entail in light of project management theories, and what criteria are relevant for evaluating construction problem solving?"
Q 3 "What role does warning obligation of UAV-GC 2005, NEC3 ECC, and FIDIC YB play in facilitating construction problem solving respectively?
Q 4 "What do contract practitioners regard the Duty to warn of UAV-GC 2005 and the Early warning obligation of NEC3 ECC?"
Q 5 "What conditions are required for early warning to function properly on Dutch D&B construction projects?"

2.4 Selection of Research Strategies

The technical research design is made up of the decisions regarding *when*, *where*, and *how* this research is going to be carried out in order to answer the set of research questions (Verschuren & Doorewaard, 2010, p. 17). In this section, the *how* part of the technical design is explained, which is mainly about choosing the right research strategies.

Prior to the selection of research strategies, core questions need to be answered whether the research is focusing on depth or breadth, whether it is conducted by using a qualitative approach or a quantitative approach, and whether theoretical or empirical knowledge will be exploited (Verschuren & Doorewaard, 2010). In accordance with the research objective and research questions, this research is in nature a practice-oriented research. It is meant to provide knowledge and information which can contribute to a successful intervention that is aiming at solving a practical problem. Therefore, it is of utmost significance to gain insight into people's perception of the 'real world' (Fellows & Liu, 2008, p. 27).

The research demands a qualitative approach which is focusing on depth instead of breadth. Besides, both theoretical and empirical knowledge need to be collected. Correspondingly, two research strategies will be adopted which are the *Desk Research* and *Expert Interview*.

2.3.1 Desk Research

By conducting desk research, the researcher opts for using material that is produced entirely by others (Verschuren & Doorewaard, 2010, p. 194). The desk research in this research consists of two major parts which are the literature review and the comparative analysis. Initially, existing specialist literatures as regard to the early warning in project management and the construction problem solving will be studied so as to answer the sub-questions 1 and 2. Subsequently, the answer for the sub-question 2 can serve as the stepping stone for the following comparative analysis, in which three different standard contract

forms are studied by using the assessment framework generated from sub-question 2., in order to answer the sub-question 3. The table 5 shows the research material which was used to carry out the desk research.

Table 5 Research strategy and research material

Research strategy	Research perspective	Research object	Research material	Corresponding RQ
Literature review	Project management	Early warning	Scientific papers, articles, and conference proceedings etc.	Sub-question 1.
		Construction problem solving		Sub-question 2.
Comparative analysis	Legal	UAV-GC 2005	Standard contract forms, contract guide books, journals, and conference papers etc.	Sub-question 3.
		NEC3 ECC		
		FIDIC YB		

The most important advantage of desk research is that a large amount of data produced by others can be used quickly to gain a thorough understanding into a certain subject, which means the researcher does not need to collect data on his own. Nevertheless, a disadvantage of this method is that the biased perspectives from the original researchers cannot be easily eliminated, which might not be suitable for the researcher to ask his or her own research question (Verschuren & Doorewaard, 2010).

2.3.2 Expert Interview

The sub-question 4. *"What do contract practitioners regard the Duty to warn of UAV-GC 2005 and the Early warning obligation of NEC3 ECC?"* implies a switch to empirical knowledge. Once it is identified what role does warning obligations of three standard contract forms play in facilitating construction problem solving from a pure theoretical perspective, the perspective can be further confronted with empirical knowledge obtained from contract practitioners.

At a first glance, case study might be the most suitable approach to gain such empirical knowledge. Nevertheless, except for UAV-GC 2005 contract, NEC3 ECC and FIDIC YB have never been extensively implemented in the Dutch construction industry. To the knowledge of the author and further parties involved in this research, the 'International Criminal Court (ICC)' is the only project in the Netherlands which was performed by using NEC3 ECC contract. Besides, not even a single project in the Netherlands was executed under FIDIC contract. The limited case projects make it difficult to conduct case studies. Therefore, the author opted for interview approach to gain the empirical knowledge.

The aim of interviewing is to study other persons' 'worlds' (their views and behaviors etc.) and to share his or her subjective opinions (Fellows & Liu, 2008, p. 156). An interview with an 'expert' person is a special case of interviewing which focuses on a particular type of interviewee (Marshall & Rossman, 2006, p. 105). Those expert individuals are considered to be influential, experienced, and/or well informed within an organization or community.

The difficulty with the interview method is to main objectivity and to try to represent the person's view fairly and to describe it as consistent with his or her meanings (Fellows & Liu, 2008, p. 156). To overcome this difficulty, the results of the interviews is sent back to the interviewees for validation.

Part II Theoretical Background

Chapter 3 Early warning in project management

Chapter 4 Construction problem solving

Chapter 5 Comparative analysis of standard contract forms

3. Early warning in project management

In this chapter, literatures regarding early warning in project management are reviewed. The investigation deals with the first sub-question: *"What is Early Warning, and how does it influence project problem solving?"*. The objective of this sub-question is to study early warning from the perspective of project management theories so as to identify what role does early warning play in facilitating construction problem solving from a theoretical point of view.

3.1 Early waring in project environment

In 1975, the business economist Ansoff (1975, pp. 22–23) contended that a company has two options to deal with surprising future events in the turbulent business world. The first is to develop a swift *after-the-fact* responsiveness to the surprising events. While the other one is to prepare for the event *before-the-fact* and to minimize its probability of occurrence. In order to explain the nature of the strategic surprises, (Ansoff, 1975) developed the theory of weak signals which read as:

> *"Weak signals are Imprecise early indication about impending impactful event".*

(Ansoff, 1975) argued that weak signals can be used to forecast future surprising events, and by giving enough warning the company would be able to deal with those events (Ansoff, 1975, p. 22). In the meanwhile, he doubted *"whether such signals exist in a project environment?"*

Decades later, this questions was answer by (Nikander & Eloranta, 1997) in their research on early warning in project management. The existence of early warning signals in the project environment was thus confirmed. According to the information and communication theories, signals are decrypted into information when they are received and interpreted by human observers. In light of the weak signal theory, (Nikander, 2002, p. 48) defined early warning in project management as:

> *"An early warning is an observation, a signal, a message or some other item that is or can be seen as an expression, an indication, a proof, or a sign of the existence of some future or incipient positive or negative issue. It is a signal, omen, or indication of future developments."*

Although there are many similar terms such as symptoms, early indicators, pre-signals, and uncertainties etc. in project management literatures, basically all of them express the same idea with early warning (Nikander & Eloranta, 2001; Silva, 2015). In light of the definition of early warning proposed by (Nikander, 2002, p. 48), early warning gives information that something might come to pass in the future, and It is tied up with human observations. The definition is adopted throughout the whole research, as it is well recognized by many in the study of early warning in project management (Haji-Kazemi et al., 2015; Klakegg et al., 2010; Meng, 2014).

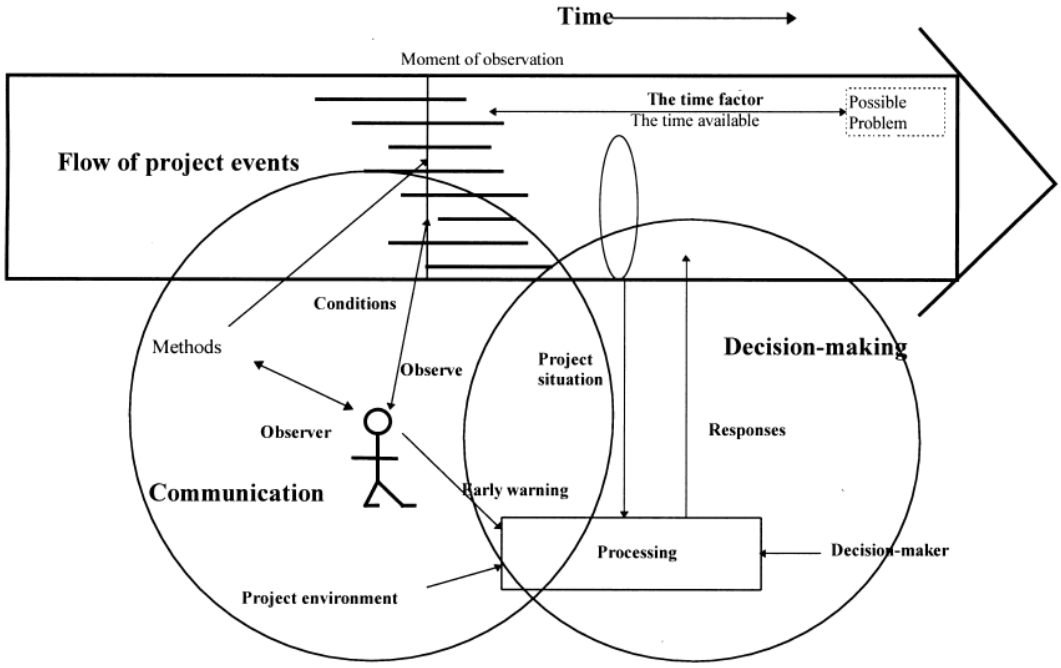

Figure 2 The early warning as a time, human, and information bounded event (Nikander & Eloranta, 2001, p. 389)

The nature of the early warning phenomenon is graphically illustrated in Figure 2, in which a project is described as a time-bounded flow of events. During the project, information regarding potential problem is received, interpreted, and processed by human observers, based on which decision is made and actions are taken so as to tackle the problem (Nikander & Eloranta, 2001, pp. 388–389).

3.2 Examples of early warning signs

Early warnings exist in project environment in the form of signals, which are vague and their state of knowledge varies (Ansoff, 1975). Those signals evolve into information when it was received and interpreted. The amount of information increases as more signals are received and interpreted. Therefore, warnings of potential problems become clearer.

An example of early warning is provided in the project management literature of (Kerzner, 2009, p. 244):

> *"There may suddenly appear an exponential grow in the flow of paperwork, and everyone is writing 'protection memos'. Previously, everything was verbal."*

In this example, a change of people's behavior indicates that something has already happened which changes the atmosphere on the project. It cannot be inferred what problem has occurred from the example, but it gives an early warning that leadership issues might be in trouble which could endanger the final result of the project.

Another excellent example can be understood as early warning event is given by (Cleland & Ireland, 1994, p.462), which is read as:

> *"I can walk onto any project site anywhere in the world and within a short time tell you if that project is going to be a winner. It's easy: I just look at the people. If the people on the project look determined, confident, enthusiastic, and busy, it's a good bet that you have got a winner team. If people respect each other, help each other and things seem to be getting done with a minimum amount of confusion, then you can be fairly certain that they have their act together and they will pull it off without much strain."*

This example does not directly discuss anything about early warning signals, it reveals that humans are sensitive to their environment and others' behavior, which unveiled the healthiness of the project. It provided a method with which early warnings can be detected (just look at people...).

The two examples extracted from general project management literatures are in the opinion of (Nikander, 2002) early warnings, who held "gut feeling", non-verbal information, personnel's behavior change, miscommunication and misdocumentation, and mismatch of organizational cultures as the main sources of early warning signals. In the empirical research of (Nikander & Eloranta, 2001, p. 388), 68 basic early warnings were identified and grouped into 11 main types. Also based on empirical research by conducting interviews and case studies, extensive lists of early warnings have been provided by (Williams et al., 2012). Both of them are summarized in Appendix 1.

When analyzing early warning in project management, (Nikander & Eloranta, 1997, pp. 373–374, 2001, pp. 386–389) argued that signals cannot be detached from project environments where they appear. In a project activity environment, variables such as project parties (employer, contractor, supplier, consultant etc.), project phases (planning, engineering, procurement, delivery, and on site etc.), sources (individuals, groups, companies, documents, and situations etc.), and forms (verbal, non-verbal, in writing, and events) need to be taken into consideration. Findings in the research of (Nikander & Eloranta, 1997) indicated that the employer and the consultant are most concerned with early warning signs in engineering phase, while the supplier and the contractor the early warning signs occurred on site.

3.3 Identification of and responses to early warning signs

Prior to the clarify the identification of early warnings in project environments, the difference between lagging indicators and leading indicators have to be explained. The lagging indicator and the leading indicator are explained by (Lannon, 2014)as :

> *"Lagging indicators are used to measure performance and allow to track how things are going. Lagging indicators are backward-focused or "trailing" as they measure performance data already captured."*

> *"Leading indicators come before a trend, which change quickly and are generally seen as a precursor to the direction something is going."*

The conventional project management method such as bar chart (Gantt Chart), which was developed at the beginning of the 20th century, are focusing on detecting lagging indicators (Nikander, 2002, p. 8). They are based on fact and historical information about the consequences of certain activities and events (Williams et al., 2012, p. 38). The classic project management methods are based on the principle of so-called deviation management(Nikander & Eloranta, 2001, p. 386). Although some of them are still widely used today, they are often too late as problems already exist. Experiences told us it is only getting worse if the project manager decides to do something after observing large deviation such as delay and cost-overrun.

Conversely, early warning is dedicated to identifying leading indicators, which encourages parties to bring a potential problem up to the surface instead of letting it grow into a major problem (Williams et al., 2012). Therefore, picking up early warning requires proactive project management method.

According to (Nikander, 2002), very little literatures deal explicitly with the issue of early warnings in project activity environment. Nevertheless, some terms and statements found in project management literatures can be recognized as early warnings. With the aim of reviewing possible approaches for detecting early warning in project activity environment, (Haji-kazemi et al., 2013) summarized the early warning detection methods directly mentioned in project management literatures which are the risk management, early value management, and project assessments. First of all, because of the early warning refers to a problem that might come to pass in the future, the relation between early warning and risk management is rather clear. The only difference between two of them is the early warning does not deal with the probability of the materialization of potential problem(Nikander, 2002). Besides, early value management was used for enhancing proactive problem solving by predicting early warning signals. In addition, project assessment methods such as project review, project health checks, benchmarking, post-project evaluation, and project audits are approaches to identify early warnings. Different project assessment methods are summarized in table 6 (Williams et al., 2012, p. 40).

Table 6 Summary of main types of project assessment methods(Williams et al., 2012, p. 40)

Assessment methods	Description	Project phase
Project review	Often conducted in combination with stage-gate approach	During and after project
Project health checks	For example, by using checklists and key performance indicator (KPI)	During the project
Benchmarking	Systematic comparison of two or more projects	Tender phase, or after project completion
Pose-project evaluation	With the aim of extracting lessons learnt	After the project
Project audits	Formal assessment checking between what is done and regulations, decisions, or systems.	During the project

The utilization of project assessments for detecting early warnings has been explicitly studied in the research of (Williams et al., 2012). Nevertheless, the authors argued that formal project assessments are

limited in use for identifying early warnings. For example, it turns “blind eyes” to issues related to organizational culture and human behavior. As project complexity such as uncertainties, interpersonal complexity, technology, and interfaces complexity increases, detecting early warning is strongly dependent on informal ‘gut feeling’. Therefore, the observer’s knowledge, experience, and communicative skills play a paramount role in a complex situation. Furthermore, (Williams et al., 2012, p. 47) argued that we human beings are in general not good at picking up early warning sings. In addition to complexity, challenges of identifying and acting upon early warnings are, for example, lack of time, lack of external review, over optimize benefits and underestimate problems (level of optimism), and an overemphasis that every project is unique etc. Additional issues are organizational culture, level of openness, political pressure, and power effects etc.(Haji-kazemi et al., 2013; Williams et al., 2012). In the end, (Williams et al., 2012, p. 47) conclude that the main challenges of detecting and acting upon early warnings seem to be identified within people’s minds. This is in conformity with the statement drawn by (I O Nikander & Eloranta, 2001, p. 398) that the phenomenon of early warning is strongly connected to people and human behavior as human actions are the basis of all of the early warning groups.

3.4 The concept of “time available”

With the aim of gaining insight into the effect of early warning on project problem solving, the concept of ‘time available’ proposed by (Nikander, 2002, p. 86) is clarified. The “time available” is defined as “the amount of time available before the problem indicated by the warning reaches its full impact on the project”. Therefore, the duration of the time available consists of sub-periods such as the decision time, the planning and negotiation time, the mobilization of the implementation time, and the rest of time for the implementation of response. These are shown in Figure 3.

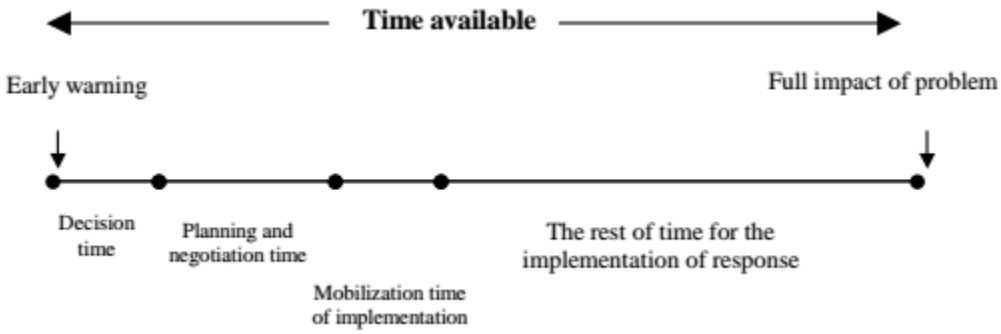

Figure 3 The composition of ‘time available’ (Nikander, 2002, p. 86)

In accordance with (Nikander, 2002, p. 106), the time available indicates that at the time of identification of an early warning, problems are potential future problems. Therefore, the time available can be interpreted in two different ways(Nikander, 2002, p. 87). Firstly, the time available can be understood as how soon the problem indicated by the warning can affect the project, which is focusing on the duration before the problem is materialized. From the other perspective, time available is considered as whether the potential matter requires immediate response, which put the emphasis on the emergency of the

potential problem. Besides, the author has pointed out that the time available varies significantly between projects and between different types of project problem.

In a nutshell, the concept of time available explains the significance of early warning in problem solving from a theoretical perspective. It indicates that the early warning can be used to exploit the time available before problem is materialized, so that effective countermeasures can be taken to timely reduce the damages of potential problems.

4. Construction problem solving

This chapter deals with the second research question: *"What does construction problem solving entail in light of project management theories, and what criteria are relevant for evaluating construction problem solving?"* The objective of this question is to understand what does problem solving literally entail from the perspective of construction project management. Prior to addressing what is construction problem solving, the concept of project problem phenomena is clarified. Subsequently, project management literatures regarding construction problem solving are consulted, and various dimensions and aspects are observed which are deemed as critical for facilitating construction problem solving. Based on that, criteria which are of legal relevance for evaluating standard contract forms are generated.

4.1 Project problem phenomena

Before investigating early warning in project management, it is of great significance to analyze what kind of project problems those early warnings relate to (Nikander, 2002; Nikander & Eloranta, 1997, 2001). In 2002, (Nikander, 2002, p. 54) defined the term 'project problem' in his doctoral research as:

> *"A phenomenon that interfere with the final result of a project, which usually bring about immediate concerns for the project management."*

It has to be mentioned that (Nikander, 2002) clarified that problem may only become real in the future. Therefore, it will be deemed as a potential problem if it is identified at present.

Table 7 Project problems (Nikander, 2002, pp. 84–86; Nikander & Eloranta, 2001, p. 390)

PROJECT PROBLEMS	
Schedule problems, delay, time	Project manager as a person
Cost-related problem	Organization/Staff
Performance related problems	Total project planning
Delivery of equipment	Communication
Management problems	Design and engineering
Project environment, consultant	Financial matters
Ambiguous objectives	Other problems
The employer with no CEO support	
Differences in project culture	

The project success is commonly defined as achievements of planning, costs, and performances objectives (Kerzner, 2009, pp. 3–8). Correspondingly, there are problems that interfere with achieving those objectives of a project, which are defined as schedule/ time related problems, costs-related problems, and performance-related problems. First of all, the schedule/ time related problems are those which delay the planned delivery or interfere with meeting a Key Date. Secondly, problems which will lead to the costs-overrun of a project is deemed as costs-related problems. Performance problems are those related to meeting the expected functional, quality, and profit objectives of a project. In light of (Nikander, 2002, pp. 85–86), some of the remaining groups of project problem are described in table 8.

Table 8 Descriptions of main groups of project problems

Problem groups	Descriptions
Ambiguous objectives	Problems occur when the project objectives are not equally to all the project participants.
Management	Problems occur in both management and leadership
Communication	All problems related to the transfer of information
Design and engineering	Technical and engineering problems
Differences in organizational culture	Problems resulted from the mismatch of parties' organizational culture
project environment	problems caused by external circumstances to a project.
Project manager as a person	problems related to the selection of project manager and his competencies
Organization/Staff	Problems related to personnel in general. For example, problems in choosing personnel, problems caused by unproductive personnel, and problems with teamwork etc.

Based on various project problems summarized from project management literatures together with their empirical research, (Nikander & Eloranta, 2001, p. 390) identified that the most common problems are those which related to *time schedule, management, technical design (engineering) and delivery of equipment*.

4.2 Defining construction problem solving

In 1978, (Ackoff, 1978, p. 19) defined the problem solving in a broad sense as

> *"Problem solving involves the selection of one or more courses action (means) in pursuit of one or more desired outcomes."*

In this definition, the problem solving is described as the selection of actions with the purpose of achieving the desired outcomes.

Within the context of construction industry, research in problem solving has neither yet crossed the threshold to become a mature discipline, nor has a universally accepted theory developed for construction problem solving research(Li & Love, 1998, p. 721). Thus, there is not a widely accepted definition for construction problem solving in this aspect. Nevertheless, the only definition found abstractly describes construction problem solving as a "one shot" realization process of a complex civil engineering system (de Ridder, 1994, p. 21), in which the problem is defined as

> *"The gap between actual situation and desired situation of a project and the problem solving is the realization process driven by the dissatisfied need of stakeholders".*

It describes the whole project realization process as a problem which in principle does not fit in this respect. However, it can also be used for the project problems defined as the phenomena that interfere with the final result of a project.

Therefore, project management literatures suggest that construction problem solving has not cross the threshold to become a mature subject in project management, it characterizes much of construction management practices (Li & Love, 1998, p. 721). Thus, it appears in project management literatures in different forms. For instance, problem solving is interrelated with risk management (Walker & Hampson, 2008, pp. 103-122; Winch, 2010, p. 365) and conflict management (Project Management Institute, 2008, pp. 239-241). Besides, problem solving is identified as one of the essential elements of team-building (Nicholas & Steyn, 2012, p. 530; Project Management Institute, 2008, p.229). Furthermore, problem solving in some literatures is addressed as project manager's professional skill and required competencies. (Edum-Fotwe & McCaffer, 2000; Winch, 2010, p. 440).

With the aim of studying the effect of early warning on improving problem solving and project performance under different contract forms, (Meng, 2014, p. 148) came up with a comparison framework for evaluating problem solving, which consists of in total six indicators. The six indicators are '*Abandonment of blame culture'*, *'Joint effort for problem solving'*, '*Problem solving to mutual satisfaction*', '*Problem solving as quickly as possible'*, '*Problem solving at the lowest possible level'*, and '*Avoidance of problem recurrence'*. This framework is thus adopted as the prototype for identifying necessary elements so as to build an assessment model for assessing three standard contract forms. The six indicators are categorized into three dimensions which include Culture transition, Early problem intervention, and Avoidance of problem recurrence. The three dimensions together with the six indicators are elaborated at the following three sections.

4.3 Culture transition

The culture is a collective phenomenon, which consists of unwritten rules of the social game. It is defined as:

> "The collective programming of the mind that distinguishes the members of one group or category of people from others" *(Hofstede et al., 2010, p. 21).*

In construction industry, the traditional blame culture has been criticized by many scholars due to the natural conflict of interest between project owner' costs and construction contractor's profits(Larson, 1997; Slater, 1998; Walker & Hampson, 2008). (Larson, 1997, p. 188) describes the relationship between owner and contractor under the this culture as "suspicions of the motives and actions of each other ", "ineffective problem solving", and "disputes often end up in court" etc. For example, due to suspicions, the owner frequently monitors the contractor's performance and challenge him by frequently ordering variations. While the contractor often reacts by strategically taking advantages of loopholes in the contract and withholding and manipulating information. This is in conformity with(Walker & Hampson, 2008, p. 109) who argued that, under the culture of blame, it is often the case that parties hide the problem at the first place where it occurs, rather than communicating to people who can better deal with it, which create the breeding ground for small issues to grow into major problems. Furthermore, once a

problem rises to the surface, the process of allocating responsibility to deal with it is itself a problematic process with considerable potential for rising blames. The common response for such action is to deny them, ironically often using the complexity of contract as a weapon, which. Afterwards, lack of agreement over the proposed solution will finally lead to major problems between both parties(Walker & Hampson, 2008, p. 109).

Moore and Dainty (1999, 2001) in their research declared that the traditional blame cultures and roles led to the emphasis on reactive problem solving instead of proactive problem avoidance. It has the potential to impair team integration and hinder project success. Therefore, there is in nature a call for cultural change (D. Moore & Dainty, 1999; D. R. Moore & Dainty, 2001).

With the aim of removing barriers to a successful partnering implementation in Hong Kong construction industry. Chan, Chan, and Ho in their research suggested the construction culture should be changed to trust, open communication and joint commitment, and establishment of "win-win" attitude to problem solving(Chan, Chan, & Ho, 2003). In 2006, Baiden, Price, and Dainty investigated the extent of team integration within nine successfully completed construction projects, in which they found out all projects had equitable relationship and no blame culture at the early stage of the project, which removed the barriers to mutual trust between parties, and therefore laid the foundation to work jointly towards problem resolution(Baiden, Price, & Dainty, 2006, p. 20).

Table 9 A comparison of main characteristic of 'traditional blame culture' and 'no blame culture'

TRADITIONAL BLAME CULTURE	SOLUTION BASED/ PROBLEM SOLVING CULTURE
Suspicion of each other	Climate of mutual trust
'Working alone' (Fragmentation)	'Working together' (Integration)
'Win-lose' situation (dispute often end up in court)	'Win-win' situation

Such culture will encourage trust within the team and contribute to solving more issues at the most appropriate level, it is recognized as a 'solution-based' culture (Thomas & Thomas, 2005, p. 98) or "problem solving culture"(Khalfan, McDermott, & Swan, 2007, p. 390). Based on the literature review mentioned above, a comparison of main characteristics of traditional blame culture and no blame culture is shown in table 9.

The abandonment of blame culture generally serves as the first step for joint working and effective problem solving. The three main elements of the problem solving culture 'climate of mutual trust', 'working together' and 'win-win attitude' are elaborated in the following sections.

4.3.1. Climate of mutual trust

According to the current vision, there is not a commonly accepted academic definition of trust, as trust is a complex issue and it is influenced by many other factors. It depends on which discipline, which level and abstraction, and which aspect the trust is focused (Lousberg & Noorderhaven, 2007, p. 2). However, there is a general consensus that trust is critical in many ways. For example, it stimulates cooperation, reduces conflicts and promote effective response to crisis, and promote network relations etc.(Rousseau, Sitkin,

Burt, & Camerer, 1998, p. 394). By consulting a collection of contemporary and cross-disciplinary literatures, (Rousseau et al., 1998, p. 395) suggested a widely held definition of trust irrespective of the many variances, which is read as:

> *"Trust is a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another"*

The author argued that trust can arise under two conditions, which are risk and interdependence. Risk is the perceived probability of loss by the decision maker. Such uncertainty creates opportunities for trust to appear and leads to risk taking action. Therefore, trust is not needed if there is no such uncertainty and risks. Besides, interdependence entails that objectives of one party cannot be achieved without relying on other parties. For example, you have to trust other people when you expect they will get the things done as you expected. In the other way around, suspicion emerges when your expectations are not met (Khalfan et al., 2007, p. 386). On the basis of these conditions and definition, trust is interpreted as an underlying psychological state to be vulnerable to others under the conditions of risk and interdependence. It is neither a behavior nor a decision, and it is not equivalent to cooperation (Kadefors, 2004, p. 176; Rousseau et al., 1998). Trust can induce cooperation but not the other way around, as coercion can also bring about cooperation.

Trust is not an issue of "either/ or" but the qualitative degree one trusts another varies. Five such degrees of trust are depicted by (Dietz & Den Hartog, 2006, pp. 563–564) which is shown in Figure 4. The degrees of trust increases from deterrence-based to identification- based. The threshold of real trust is in somewhere between the calculus- based trust and knowledge based trust. Below the threshold, there is little trust as the expectation of guaranteed compliance is secured either through contractual sanctions for breach of trust (deterrence-based trust) or economic incentives for cooperation (calculus-based trust), in which suspicion of the other still remains (Kadefors, 2004, pp. 176–177; Dietz & Den Hartog, 2006, pp. 563–564; Rousseau et al., 1998, pp. 398–399). Nonetheless, the threshold is crossed and the real trust starts when confident information is available about another party with respect to their capability, reliability, and motives (knowledge-based trust). Furthermore, a stronger degree of trust appears as time passing by and the quality of relationship between parties improved, which refers to the relational- based trust(Rousseau et al., 1998, p. 399). Finally, the identification-based trust represents parties trust each other with full confidence.

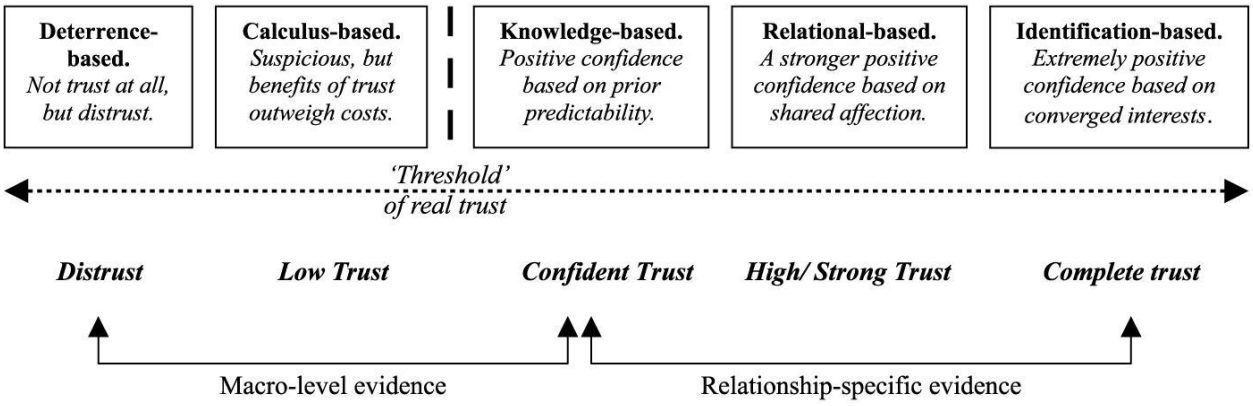

Figure 4 levels and types of trust (Dietz & Den Hartog, 2006, p. 563)

In terms of the relationship between trust and control over opportunism. Opportunism can appear in either passive(weak) or active (strong) form. The passive opportunism is recognized by a lack of commitment, while the active opportunism refers to the opposite of 'benevolence' or 'good will' which entails seeking with guile driven by self-interest. Correspondingly, control over opportunism can also be in a passive or active form. On one hand, passive control (weak control) is realized by instruments or conditions which include trust. On the other hand, active control (strict control) is in a strong sense which put the emphasis on power and deterrence to deal with opportunistic behavior. For instance, by establishing penalties and sanctions (Woolthuis, Hillebrand, & Nooteboom, 2005, p. 814). However, (Rousseau et al., 1998, p. 399) argued that trust is not a control mechanism but a substitute for control, which reflects a positive attitude towards another's motives. Control only comes into play when the amount of trust is insufficient. Besides, strict control and trust is incompatible, which indicates the absence of trust and therefore hampers its emergence. (Kadefors, 2004) echoed that, from a calculus based perspective, strong control such as detailed specification, close monitoring of performance, and strong sanctions for non-compliance induces trustee's opportunistic behavior instead of facilitating the development of trust.

Last but not least, the relationship between trust and contract is rather ambiguous and controversial. From the perspective of theory of Transaction Economics Costs (TCE), contract is seen as a precondition for trust as it sanctions opportunistic behavior by establishing safeguarding clauses in the contract. Nevertheless, social scientists demonstrate that contract and trust are in conflict with each other, as contract itself serves as the origin of distrust. Active utilization of contract can bring about defensive behavior, opportunism, and conflict. However, those point of views are based on theoretical conceptualization. By investigating empirical evidence, (Woolthuis et al., 2005, p. 833) argued that trust in general precede contract and it is an crucial perquisite for contracts. Furthermore, trust and contracts can be both substitutes and complements, which is highly dependent on the intention of the contract. If contract is not interpreted as strict legal safeguard, trust and contract can complement each other. However, if parties do not trust each other, more emphasis is put on contract for safeguarding interests. Therefore, contract substitutes for trust. Another situation is when parties trust each other, there is no need for safeguarding clauses in the contract. Thereby, trust substitute contract. In a nut shell, Trust and

contract is not an “either/or” matter, empirical evidence tells us the relationship between trust and contract as formal control is mixed.

4.3.2. Working together

Project problems are inevitable, the impact of problem solving can be either productive or destructive, which is strongly dependent on the manner parties resolve the issue (Cheng, Li, & Love, 2000, p. 88). In the old way, problems are always “others’ problem but not mine”(Slater, 1998, p. 49). Such problem solving manner always lead to confrontation between parties, and ends up in a win-lose situation. However, the overall aim of issue resolution is to look for permanent solution and solve the problem swiftly without interrupting the normal production work, during which parties should focus on their own responsibilities toward the problem resolution, rather than trying to instruct others what they should do as it entails blame and hatches conflicts(Bennett & Peace, 2006, pp. 206&207).

Therefore, to facilitate collaboration and to secure the promise of long-term success, parties are encouraged to take a more productive problem solving strategy, which is the so-called ‘joint problem solving’ (working together). It is described by (Cheng et al., 2000, p. 88) as

> *“Collective decisions to create alternative solutions for problematic issues.”*

During joint problem solving, parties work together to find appropriate solutions to problems by discussing and exchanging opinions, and making decisions based on group consensus (Jin & Yng Ling, 2005, p. 1231). Moreover, parties are required to see problems as opportunities for searching best way of working together, which could further improve problem solving performance.

4.3.3. Win-win situation

Based on parties’ joint effort for problem solving, the next step is to seek solution which could benefit both parties. The problem solving to mutual satisfaction is also known as “Win-win situation”.(Slater, 1998, pp. 49–50) argued that the absence of win-win approach is the number one reason why construction projects are plagued by claims and litigations, as “win-lose thinking” damages the communication between parties and no positive solution is sought. Once parties think in this way, blame will play a major role in both judgement and final outcome. In the end, there is no real winner in this battle.

On the contrary, (Walker & Hampson, 2008, p. 111) argued that solution to problem should be collaboratively built rather than being dictated or negotiated. In contrast with “win-lose”, “win-win” is based on the idea that there are better ways of working than simply my way or your way, which provide everyone what they reasonably want (Bennett & Peace, 2006, pp. 15&66). (Lazar, 2000, p. 72) describes win-win situation as

> *“A result of a series of reciprocal and cooperative behavior which could benefit both parties.”*

Furthermore, (Walker & Hampson, 2008, p. 112) illustrate that positive evidence of experience between parties will promote problem solving by generating enthusiasm and commitment, while poor reliability experience will either trigger defensive problem solving routine or lead to solving problem by unreliable partner being ignored.

4.4 Early problem intervention

In 2011, (Meng, Sun, & Jones, 2011) developed a maturity model for evaluating supply chain relationship in construction, with the early warning as one of the sub-criteria for problem solving as the main criteria. It happens that there is a similar case, in which (Ellison & Miller, 1995, p. 46) developed a maturity model concerning partnering relationship. In this mode, early positive intervention is one of the main elements for parties to transfer from the traditional adversarial relationship towards a collaborative team oriented relationship. Early problem intervention can be described from two perspectives, which are problem solving at the lowest level and problem solving as soon as possible(Meng, 2014).

4.4.1. Problem solving at the lowest level

The problems on construction projects are never uncommon, it is critical to identify and resolve problems proactively at an appropriate level instead of allowing them to evolve into major issues (Thomas & Thomas, 2005, p. 93). A project problem often appears as a small issue, it becomes more difficult to solve if it is not treated timely and properly. Besides, the time available to solve a problem at the same level is always limited, it will have to be escalated to a higher authority level if it could not be solved within this timeframe. A measure of success of problem solving process is how few problems are escalated into the top level of authority. The problem should be resolved at the lowest possible level unless it cannot be solved at that level.

> *"Problem solving at the lowest level entails the problem should be solved by people directly involved who understand the issue and have all the information needed to find the optimal solution instead of referring to people in a higher authority who are unlikely to be in possession of all the facts at the time decision is required to settle the problem (Bennett & Peace, 2006, p. 207)."*

(Thomas & Thomas, 2005, p. 98) further argued that it is proved that it's less costly to resolve problems at the lower level than referring them to the senior management. Moreover, (Naaranoja & Uden, 2007, p. 856) argued that solving problems at the point of the problems is very important in building trust.

4.4.2. Problem solving as soon as possible

(Walker & Hampson, 2008, p. 106) clarified that

> *"Swift reaction to project problems is critical to limit potential damages."*

Problem solving should firstly focus on preventing potential problems before they arise. Nevertheless, it's nearly impossible to create a problem-free environment. Hence, problem solving should secondly focus on detecting problems as soon as possible after they have arisen.

4.5 Avoidance of Problem Recurrence

In contrast to traditional projects which are assumed to be fully specified, modern projects are often complex and cannot be completely specified which requires continuous learning over the whole life cycle (Koskinen, 2012, p. 308). Once a problem is solved, project participants should consider how to avoid the recurrence of the same or similar problems (Meng, 2014, p. 148). In order to do so, it is important to understand why problem occurs and how to deal with it.

Nowadays, increasing attentions have been attracted by the concept of learning organization. Nevertheless, it is still new to construction industry and there is not a common understanding about it (Chinowsky, Molenaar, & Realph, 2007, p. 28). (Koskinen, 2012, p. 308) argues that

> *"Learning takes place through identifying and solving problems during project execution."*

Besides, learning from past experience and lessons helps to understand the problem and to avoid problem recurrence.

4.6 Criteria for assessing problem solving

With the intention of studying three standard forms of contract, the six aspects are further adapted into six criteria which are of legal relevance.

For evaluating 'Climate of mutual trust'

On the basis of the research done by (Cheung, 2015, pp. 13–15), two components matter for building and maintaining mutual trust during project execution are relevant with this study:

Reasonable behavior: Reasonable behavior entails working fairly and professionally with people in the project team. It's worth mentioning that different people have different perceptions towards behaving reasonably (Khalfan et al., 2007, p. 388).

Equal and balanced warning responsibility: In terms of solving project problems, parties assume not one-sided but equitable warning responsibilities. From a legal point of view, it can be analyzed from two perspectives. First of all, the equity of parties' warning responsibilities. Secondly, the sanction against parties' non-compliance behavior.

For evaluating 'Working together'

Joint problem solving process: A problem was viewed as insoluble if there was no continued communication. The main approach to fixing the problem was considered to generate a forum for discussing it, rather than ignoring it (Khalfan et al., 2007, p. 388). Therefore, a robust issue resolution process is of utmost significance to ensure warnings are followed up by a series of actions for parties to jointly discuss and resolve the problem.

For evaluating 'Win-win' situation

Win-win attitude: The win-win situation put the emphasis on the outcome, which indicates that the solution for project problem needs to benefit both parties. However, this statement is not of legal relevance as it is impossible for parties to predict the outcome and write them down in the contract before the contract is awarded. Instead, win-win attitude is more focusing on the process, which indicates parties have to make their own effort to seek "win-win" solution. That is not to say the solution has to benefit both parties in case that "win-win" is not possible at all.

For evaluating 'Early problem intervention'

The presence of early warning: The presence of early warning entails that there is early warning provision in the contract which is line with the definition of early warning, and has the function to stimulate 'problem solving as quickly as possible' and 'problem solving at the lowest level'.

For evaluating 'Learning from problem solving'

Learning from problem solving: Learning takes place through identifying and solving project problems during project execution.

5. Comparative analysis of standard contract forms

In this chapter, the third research question: *"What role does warning obligation of UAV-GC 2005, NEC3 ECC, and FIDIC YB play in facilitating construction problem solving respectively?* is answered. The objective of this research question is to study how the three different contract forms differ in terms of facilitating construction problem solving. To answer this questions, firstly an assessment model is set up on the basis of the research results from chapter 4. Then, relevant contract clauses from the three different standard contract forms are analyzed respectively by means of this assessment model.

5.1 Set-up of assessment model

On the basis of the research findings from previous chapter, an assessment model is formed up which is shown in table 10. The principle behind this assessment model is a matrix-based qualitative data analysis method (Ritchie & Spencer, 2002). By means of this model, specific clauses or provisions in the standard contract forms are studied in line with the criteria.

Dimensions of Problem solving	Aspects (requirements)	Criteria	UAV-GC 2005	NEC3 ECC	FIDIC YB
Culture Transition	Climate of mutual trust	Reasonable behavior		Full support (√)	
		Equal and balanced warning responsibility			
	Working together (Integration)	Joint problem solving process			
	Win-win attitude	Win-win attitude			No support (X)
Early Problem Intervention	Problem solving at the lowest possible authority level	The presence of early warning	Partial support (+/-)		
	Problem solving as quickly as possible				
Avoidance of Problem Recurrence	Learning from problem solving	Learning from problem solving			

Table 10 Assessment model for problem solving

Rating scale

The assessment model is rated by using the rating scale shown below, examples of ratings are provided in the table 10.

√: The clause or provision is clearly laid down in the contract which fully address the criteria;

+/-: The clause is relevant with the criteria, but only partially address the criteria;

X: There is no relevant clause or provision in the contract which addresses the criteria.

5.2 UAV-GC 2005

In this section, the Dutch standard design and build contract form UAV-GC 2005 is analyzed by means of the assessment model. The section starts with a short introduction about the UAV-GC 2005 contract. Then, the assessment result of the UAV-GC 2005 contract is presented, in which the assessment form is filled out. The assessment result is thereby substantiated in detail in the last sub-section.

5.2.1. Introduction to UAV-GC 2005

The Dutch Uniform Administrative Conditions for Integrated contracts (UAV-GC 2005) represents a set of general terms and conditions introduced for situations, in which a contractor assumes (part of) the design responsibilities which were used to be taken by the employer under the traditional building contract. It is applicable for projects ranged from small and straightforward to large and complex.

The UAV-GC 2005 contract consists of three pieces in general, which are a Standard Basic Contract (SBC) with annexes, the Employer's Requirements(ER) and other contract documents, and a set of General Terms and Conditions. According to (Chao-Duivis, Koning, & Ubink, 2013, p. 101), the employer's design work can be provided in the ER which can comprise only of the Schedule of Requirements (SOR), but can also include the provisional design or even the final design. Unlike the specifications and drawings under the traditional building contract, the SOR is less clear and it can be decomposed into a set of performance requirements (variables) which represent the whole project (de Ridder, 2009, p. 61). The main purpose of SOR is to leave room for the contractor to come up with innovative solutions for an optimal design, which is also deemed as a major benefit of this type of contract (PIANOo, 2014).

Ever since the contractor assumes more responsibility than the employer, the employer's involvement in the project is therefore restricted. The employer's active involvement can only be realized either through *ordering variations*, or through *verification and acceptance* for the contractor's design, construction, and maintenance work (Chao-Duivis et al., 2013, pp. 102–103). As a consequence, the employer transfers responsibility back to himself which has financial implications. But again, it is not the idea of the UAV-GC 2005 to encourage employer's active involvement in the design and construction work, and the employer is not obliged to do so(Chao-Duivis et al., 2013, pp. 103&125).

For solving project problems, the UAV-GC 2005 imposes a duty to warn obligation on both the employer and the contractor. The contractor is responsible for warning 'obvious errors' in everything that is provided by the employer. Vice versa, the employer is obliged to do the same only under condition that he avail himself to the responsibility of *verification and acceptance*.

Last but not least, there are some criticisms about the current UAV-GC 2005 which mainly regard its *imbalanced risk allocation* and *unclear role and responsibility*. Nevertheless, CROW is currently on the outlook for improvements in the UAV-GC 2005. The aim of the review of current UAV-GC 2005 is to meet the market demands and to facilitate collaboration among project participants, in order to improve project performances. According to (CROW, 2017), an updated version of UAV-GC is expected to be released in 2018.

5.2.2. Assessment of UAV-GC 2005

The assessment result of UAV-GV 2005 is presented in table 11. It is not difficult to observe that three out of in total six criteria can be referred to the clauses of UAV-GC 2005 contract, which are 'Reasonable behavior', 'Win-win attitude', and 'The presence of early warning'. Nevertheless, the relevant clauses or provisions in the contract can only partially address the corresponding criteria.

Table 11 Assessment model of UAV-GC 2005

Dimensions of Problem solving	Aspects (requirements)	Criteria	UAV-GC 2005
Culture Transition	Climate of mutual trust	Reasonable behavior	**+/-**
		Equal and balanced warning responsibility	**X**
	Working together (Integration)	Joint problem solving process	**X**
	Win-win attitude	Win-win attitude	**+/-**
Early Problem Intervention	Problem solving at the lowest possible authority level	The presence of early warning	**+/-**
	Problem solving as quickly as possible		
Avoidance of Problem Recurrence	Learning from problem solving	Learning from problem solving	**X**

An overview of the analysis is shown in table 12, which reveals the specific contract clauses investigated in line with each criteria. The detailed analysis of specific clauses of the UAV-GC 2005 contract are organized in the following sub- section.

Table 12 Outline of the analysis of UAV-GC 2005

Criteria	Analysis outline
Reasonable behavior	1) The principle of good faith (Art. 6:2, Art. 6:248, Art. 3:11, and Art. 3:12) in the DCC; 2) The term 'good faith' is embedded in many clauses of UAV-GC 2005 (e.g. clause 4-5, 4-7, 14-6, and 44-1 etc.) 3) The UAV-GC 2005 does not refer to the principle of good faith in DCC directly
Equal and balanced warning responsibility	1) Clause 4-7 duty to warn for the contractor; 2) Clause 4-8 Sanction for the contractor's failure of giving a warning; 3) Clause 20-4, 21-10, & 22-3 duty to warn for the employer, but the employer is not obliged to warn; 4) Sanction for the employer's failure of giving a warning is not clear.
Joint problem solving process	1) Clause 3-1 the employer's general duty to cooperate 2) There is no other clauses which lays down how parties should cooperate so as to solving project problems

Win-win attitude	1) The principle of good faith (Art. 6:2, Art. 6:248, Art. 3:11, and Art. 3:12) in the DCC
The presence of early warning	1) Clause 4-7& 4-8 in UAV-GC 2005 (duty to warn for the contractor) 2) Clause 20-4, 21-10, & 22-3 in UAV-GC 2005(duty to warn for the employer) 3) It is of early warning nature as errors in the documents could lead to large unexpected consequences. 4) The early warning is not limited to 'obvious errors'.
Lessons learned	Not available in the current UAV-GC 2005

5.2.3. Analysis of UAV-GC 2005

Reasonable behavior

The principle of good faith in Dutch Civil Code

However, the clause 48(applicable law) of UAV-GC 2005 specifies that the contract shall be governed by Netherlands law. In the Dutch Civil Code(DCC), norms of good faith are clarified in Article 3:11, 3:12, 6:2, and 6:248. According to (Hesselink, 2004, p. 621), the good faith in DCC is basically a legal-ethical principle, which, on one hand, oblige parties to take each other's interests into account. While on the other hand it serves as the gateway, through which moral values enter the law.

Most Systems distinguish between subjective good faith and objective good faith. In most of the cases, subjective good faith is defined as a subjective state of mind, which is not based on a certain fact or event(Hesselink, 2004, p. 619). In contrast to subjective good faith, the objective good faith is identified as a norm for the conduct of contracting parties (Hesselink, 2004, p. 620). For instance, rules that oblige parties to act in accordance with or contrary to good faith. The objective good faith in the Dutch legal system is emphasized by using a different terminology which is named as the principle of reasonableness and fairness (*redelijkheid en billijkheid* in Dutch).

The subjective good in Dutch civil law is defined in article 3:11 as:

> *Article 3:11 'Good faith': A person has not acted in 'good faith' as a condition for a certain legal effect if he knew or in the circumstances reasonably ought to have known the facts or rights from which his good faith depends. The impossibility to conduct an inquiry does not prevent that a person, who had good reason to doubt, is regarded as someone who ought to have known the relevant facts or rights.*

It describes the relationship between one's good faith and a certain legal consequence if he knew or should have known the relevant facts or rights from which his good faith depends.

The objective good faith is norms for conduct of contracting parties, and it is regarded as a normative concept which contains an open norm(Hesselink, 2004, p. 620). Article 3:12 in the DCC states what ought to be considered when determining what the principle of good faith demands in a specific situation, which read as:

> *Article 3:12 The principle of 'reasonableness and fairness': At determining what the principle of 'reasonableness and fairness' demands in a specific situation, one has to take into account the general accepted legal principles, the fundamental conceptions of law in the Netherlands and the relevant social and personal interests which are involved in the given situation.*

Due to the open nature of this norm, it appears to be unclear at the first glance what does the principle actually entails. Nevertheless, (Hesselink, 2004, p. 621) argues that the objective good faith is meant to prevent injustice under specific circumstances so that no effort should be made to determine the exact content of the good faith in a general sense. (Chao-Duivis et al., 2013, p. 16) argues such circumstances include the degree of culpability and the nature and seriousness of the interests involved in the act, the nature and other content of the agreement, the relationship between the parties, and the social position of the parties etc.

Although it should remain an open norm so to play the role of making the law flexible(Hesselink, 2004, p. 624), the content of the norm can therefore be rationalized by distinguishing different functions and developing group of cases in which good faith has been previously applied. In the end, an 'inner system' is developed to determine the content of good faith. The principle of good faith is further explained in article 6:2 and 6:248 in the DCC, which read as:

> *Article 6:2 Reasonableness and fairness within the relationship between the creditor and debtor*
> *- 1. The creditor and debtor must behave themselves towards each other in accordance with the standards of reasonableness and fairness.*
> *- 2. A rule in force between a creditor and his debtor by virtue of law, common practice or a juridical act does not apply as far as this would be unacceptable, in the circumstances, by standards of reasonableness and fairness.6:248.*
>
> *Article 6:248 Legal effects arising from law, usage or the standards of reasonableness and fairness:*
> *- 1. An agreement not only has the legal effects which parties have agreed upon, but also those which, to the nature of the agreement, arise from law, usage (common practice) or the standards of reasonableness and fairness.*
> *- 2. A rule, to be observed by parties as a result of their agreement, is not applicable insofar this, given the circumstances, would be unacceptable to standards of reasonableness and fairness.*

The Dutch legal system mainly distinguish between two functions of the principle of good faith, which are the restrictive function (derogation function) and supplementary function (Chao-Duivis et al., 2013, pp. 2&3). On one hand, the restrictive function refers to the restricted effect of contract by using the standard of reasonableness and fairness (Chao-Duivis et al., 2013, p. 2), so as to for instance prohibit abuse of right (Hesselink, 2004, p. 627). While on the other hand, sometimes parties are tied by the supplementing

function of good faith especially when something is too obvious to write it down in the contract (Chao-Duivis et al., 2013, p. 3), For instance, parties' duty to be loyal, duty to cooperate, and duty to inform etc. (Hesselink, 2004, p. 627).

Good faith in the UAC-GC 2005

The UAV-GC 2005 contract form does not contain a general term which clearly point out that parties shall act in line with the principle of good faith. This is in conformity with the statement from (Hesselink, 2004, pp. 621&624) that no effort should be made to determine the content of the good faith in a more general term, as it is only meant to prevent injustice in a particular case and it should remain an open norm to keep the law flexible.

Nevertheless, the good faith is included in many clauses in UAV-GC 2005. For example, the good faith appears in the §4-7 of UAV-GC 2005, which lays down that the contractor would be in breach of the principle of good faith if he fails to warn the employer about any obvious errors found in the Employer's requirements, the appended annexes, the basic contract, the information, the land and/ or water or the goods, or a measure taken and a variation ordered by the employer. In this case, the principle of good faith has a supplementary function. Beside, §4-5 states the contractor obligation to perform all duties required by the principle of good faith, which also has a supplementary function. In contrast, the good faith in §14-6 is of a restrictive nature, which states the contractor is under no obligation to execute variations ordered by the employer should the variation is unacceptable considering the principle of good faith. Furthermore, the principle good faith is also included in clause 44-1 and 44-7 regarding contractor's compensation and extension of time, and 45-5 about settling the consequences of variations order by the employer.

Joint problem solving process

§3-1 sets out the employer's duty to cooperate in UAV-GC 2005, which oblige the employer to provide information, land and/ or water, and goods for the contractor to execute his work. The clause 3-1 is read as:

> *§3-1 The Employer shall ensure that the following are at the Contractor's disposal in good time: (a) all information in the possession of the Employer, in so far as the provision thereof is necessary in order to enable the Contractor to execute the Works and the Long-Term Maintenance in accordance with the Contract; (b) the land and/or the water described in the Employer's Requirements, on, in and/or under which the Works and the Long-Term Maintenance are to be executed; (c) all goods of which it is expressly stated in the Agreement that they shall be put at the Contractor's disposal by or on behalf of the Employer.*

The clause is explicit. Nevertheless, it does not say anything about how parties should work together with the purpose of solving project problems. Neither in other clauses of the UAV-GC 2005 is this requirement specified.

Win-win attitude

Based on the principle of good faith (principle of reasonableness and fairness) as stated in the article 6:2, and 6:248 in the Dutch Civil Code, one party has to take the other party's reasonable interests into consideration during a contractual relationship. Having mentioned that the contract is governed by the Netherland law as stated in the §48 of UAV-GC 2005, therefore the principle of good faith is applicable to the whole contract law (Hesselink, 2004, p. 634). What the reasonable interest's entails is not a 'black or white issue', it is up to the judge to determine what that demands in a particular situation taking into account the generally accepted legal principles, the fundamental conceptions of Dutch law, and the relevant social and personal interests as stated in the article 3:12 in the DCC.

As mentioned in the previous section, such principle of good faith is emphasized in some clauses of the UAV-GC 2005 contract. Among all of them, §4-5 of UAV-GC 2005 is the only general clause which states that the contractor shall perform all duties which by the nature of the contract are required by law, good faith or usage. Nevertheless, no general clauses are observed which emphasize such the principle for the employer's duties. Therefore, it is concluded that such win-win attitude is not favored by the UAV-GC 2005 contract itself but by the principle of good faith in the Dutch Civil Law.

The presence of early warning

Contractor's duty to warn obligation

The §3-1 of UAV-GC 2005 sets out the employer's obligation to provide information, land and/ or water, and goods for the contractor to execute his work. It is followed by a couple of other clauses (from §3-2 to §3-7), which hold the employer liable for the information, the variation, and the work etc. originated with himself. Although, this responsibility is qualified by the contractor's duty to warn obligation, which is stated in §4-7 of UAC-GC 2005:

> *§4-7 The Contractor shall warn the Employer in writing without delay if:*
>
> *(a) the Employer's Requirements; or (b) information provided to the Contractor by the Employer pursuant to clause 3 section 1 subsection a; or (c) the land and/or the water put at the Contractor's disposal by the Employer pursuant to clause 3 section 1 subsection b; or (d) goods put at the Contractor's disposal by the Employer pursuant to clause 3 section 1 subsection c; or (e) any measure taken by the Employer pursuant to clause 43 section 2; or (f) any Variation ordered by the Employer to the Contractor pursuant to clause 14 section 1;*
>
> *evidently contain or show such faults or defects that the Contractor would be in breach of the requirements of good faith if he were to continue work without issuing any warning about such faults or defects.*

According to §4-7, the contractor is obliged to warn the employer immediately in writing if he becomes aware, or should have become aware of any obvious errors in anything originated with the employer. It would be in breach of the requirements of reasonableness and fairness if the contractor should have

warned the employer, and he fails to do so. Such failure for the contractor to warn the employer would again be taken into account during the negotiation regarding the liability to pay compensation (Chao-Duivis, 2006, p. 453).

It is worth noting that the duty to warn as stated in §4-7 and §4-8 of UAV-GC 2005 have a great deal in common with the duty to warn obligation under traditional building contract as stated in §6(14) of the UAV 2012 (CROW, 2012, pp. 6–7). Due to the long history of the traditional building contract in the Netherlands, extensive case law has been developed on the contractor's duty to warn under such contract. Hence, (Chao-Duivis, 2006, p. 453) argues that it seems reasonable to also use such case law on the contractor's duty to warn obligation under integrated contract UAV-GC 2005. Nevertheless, she rightly argues that what the duty to warn means to the contractor is distinct in nature under the two different contracts. The explanatory notes to the UAV-GC 2005 demonstrate that a more active attitude from the contractor is required as he is the one who is responsible for proposing the general solution for the project, and it is far more than merely setting a price as the situation under the UAV 2012(Chao-Duivis, 2006, p. 455).

Although the UAV-GC 2005 contractor has greater obligation to detect errors in the documents provided by the employer than a traditional contactor, the wording "… evidently contain or show such faults or defects that…" in the §4-7 contradict with such intention as it implies that the contractor's duty to warn is limited to errors which can be detected by the contractor without too much difficulties considering the contractor as the expert (Chao-Duivis et al., 2013, pp. 62–63). In other words, such errors must be 'obvious' errors. It can be deemed as a balance to the employer's obligation to be responsible for anything that is originated with him. However, what can be deemed as 'obvious errors' is not specified in the UAV-GC 2005. (Chao-Duivis et al., 2013, p. 63) argues that two factors were relevant with the contractor's duty to warn obligation, which are the seriousness of the error and the difference between parties' expertise. Nevertheless, the contractor' duty to warn is no longer related to the employer's expertise based on the decision made by the Court of Arbitration due to the pressure in the case law (Chao-Duivis et al., 2013, p. 63). Instead, the employer's expertise becomes a factor in deciding whether he is liable for part of the consequences caused by his own fault as stated in the article 6:101 of DCC.

The sanction for the contractor's failure to perform his duty to warn obligation is laid down in the §4-8, which hold that *"the contractor is liable for any damaging consequences caused by his failure"*(CROW, 2000, p. 20). Unlike in §6(14) UAV 2012 (CROW, 2012, p. 7) which sets out that the contractor is fully liable for any prejudicial consequences if he fails to perform his duty to warn and the liability is not shared between the design and the contractor (Chao-Duivis et al., 2013, p. 63). In addition, the employer will only pay part of the compensation which he would have incurred anyway irrespective of the contractor's duty to warn. On the other hand, the UAV-GC 2005 does not explicitly deal with the consequences of failing to warn(Chao-Duivis, 2006, p. 455). It is uncertain whether the employer can hold the contractor fully responsible for the damaging consequences or not. Further, the liability issue under the situation that the damaging consequences are partly attributed to the employer's errors or mistakes, is not articulated in UAV-GC 2005.

Employer's duty to warn obligation

Unlike the contractor, there is no general duty to warn for the employer(Chao-Duivis, 2006, p. 462). Under UAV-GC 2005, the employer's duty to warn is specified in §20-4 verification of the design work, in §21-10 verification of the construction and maintenance work, and in §22-3 for the acknowledgment. All of three clauses have a very common wording which states the employer must warn the contractor if he actually discovers a failure on the part of the work by the contractor. Even though, the employer's duty to warn is not comparable to the contractor's duty to warn at all, as it is stated in the clauses that the employer is not obliged to exercise this authority to perform the verification pursuant to the clauses. But again, the clauses limit his freedom once if he decides to avail himself of such authority (Chao-Duivis et al., 2013, p. 126).

> *§ 20-4 The Employer shall be under no obligation whatsoever to use his authority to test pursuant to this clause. It shall be at the Employer's discretion to decide whether and how he uses such authority in the course of Design Work. Nevertheless, the Employer shall inform the Contractor in writing in due time if he actually discovers a failure by the Contractor or if he must have been aware of such a failure.*

Also unlike the contractor's duty to warn, there is no sanction in the UAV-GC 2005 dealt with the situations that the employer should have warned the contractor, and he fails to do so. Nevertheless, (Chao-Duivis et al., 2013, p. 127) argues that the contractor can hold the employer responsible for his failure with an argument that the employer should have informed such shortcoming, so as to avoid having to pay for the whole amount of the resulting damages.

5.3 NEC3 ECC

In this section, the English standard contract form NEC3 ECC is analyzed by using the assessment model. The section starts with a short introduction about the NEC3 ECC contract, which followed with the assessment result in the second sub-section. Afterwards, the assessment result is explained and elaborated in the last sub-section.

5.3.1. Introduction to NEC3 ECC

The New Engineering Contract (NEC) is a generic name for a family of standard contracts which are originated in the U.K. construction industry. In this research, only the Engineering and Construction Contract (ECC) is considered. The NEC3 ECC was designed with three main aims, which are clarity and simplicity, flexibility of use, and stimulus to good management(Broome, 1999, p. 4).

First of all, the ECC has greater clarity and simplicity compared with more traditional conditions of contract(Broome, 1999, p. 6). It is written in plain English without legal jargon so that it is easy to read and understand.

Secondly, the ECC offers considerable flexibility in the range of contract strategies and engineering disciplines for which is can be used(Broome, 1999, p. 32). For instance, by providing six different payment mechanisms (main options A-F) the employer could determine the risks allocated to the contractor. From

main option A (lump sum contract) to main option F (cost-reimbursable contract), the risk allocated to the contractor decreases. Furthermore, the ECC offers a set of secondary options which are used to further adjust the contract strategies. For example, the secondary option X12 could be used if the employer is willing to implement partnering with the contractor.

Last but not least, the ECC stimulate good management through a number of contract mechanism such as *early warning of potential problems*, *clear definition of roles and responsibilities*, *and proper and clear risk allocation* etc. Among all the mechanisms, early warning is one of the most important mechanisms which is praised as 'jewel in the crown' by many. It is aiming at pursuing the fundamental objective of ECC to minimize the incidence of disputes (Forward, 2002, p. 24).

5.3.2. Assessment of NEC3 ECC

The result of the assessment is presented in table 13. It can be easily observed that the ECC contract addresses all of the criteria except for the last one, which is the 'lessons learned' criteria.

Table 13 Assessment of NEC3 ECC

Dimensions of Problem solving	Aspects (requirements)	Criteria	NEC3 ECC
Culture Transition	Climate of mutual trust	Reasonable behavior	√
		Equal and balanced warning responsibility	√
	Working together (Integration)	Joint problem solving process	√
	Win-win attitude	Win-win attitude	√
Early Problem Intervention	Problem solving at the lowest possible authority level	The presence of early warning	√
	Problem solving as quickly as possible		
Avoidance of Problem Recurrence	Learning from problem solving	Learning from problem solving	X

An overview of the analysis is shown in table 14, which reveals the specific contract clauses investigated in line with each criteria. The detailed analysis of specific clauses of the NEC3 contract are organized in the following two sections.

Table 14 Outline of the analysis of NEC3 ECC

Criteria	Analysis outline
Reasonable behavior	1) Clause 10.1 'in a spirit of mutual trust and co-operation'

Equal and balanced warning responsibility	1) Clause 16 contractor and the project manager's duty to give early warning 2) Clause 61.5 &63.5 compensation event – sanction for the contractor's failure of give early warning 3) Clause 60.1 (18) – sanction for the employer's failure of giving early warning 4) The early warning of ECC is deemed as equal and balanced as both parties are obliged to warn, and sanctions for both parties are rather clear
Joint problem solving process	1) Clause 16.2 -16.4 as a project management instrument which facilitate problem solving between parties
Win-win attitude	1) Clause 10.1 good faith means take others reasonable interest into account 2) Clause 16.3 – 2)
The presence of early warning	1) Clause 16.1 2) The clause 16.1 is in line with the definition of early warning
Lessons learned	N.A.

5.3.3. Analysis of NEC3 ECC

Reasonable behavior

<u>The spirit of mutual trust and cooperation (Clause 10.1)</u>

The reasonable behavior is covered by clause 10.1 which *states "The employer, the contractor, the project manager, and the supervisor shall act as stated in this contract and in a spirit of mutual trust and co-operation."* The clause obliges parties to do everything which the contract states they do, and in a spirit of mutual trust and cooperation (nec3 guidance notes, 2005, p. 31).

Intuitively, contains two separate obligations. First comes the obligation for parties to act to follow the project management procedures set out in the contract in the way required and to the timescales imposed. The second obligation is to act in a spirit of mutual trust and cooperation. It is interpreted as it will always be the first one's priority if there are any conflicts between two of them(Rowlinson, 2011, pp. 19–22). However, it is not clear what the second part of this clause 'in a spirit of mutual trust and cooperation' represents and what its effect is. The debate revolves around its legal binding effect and enforceability. For example, (Heaphy, 2013, pp. 25–26) discovered what has always been controversial is the validity of this clause. It is uncertain about its legally binding effect and its enforceability. Analogously, (Barlow, 2011, p. 5) criticizes that clause 10.1 might give rise to legal uncertainty as it is not clear what is the content of this clause and how does it affect the meaning of other provisions. Besides, (Heaphy, 2013, p. 29) holds that ECC is extremely dependent on the compliance with the contract processes, but there are limited provisions to deal with the case in which parties fail to comply with them.

Irrespective of its legally uncertain nature, there is a consensus that it guarantees parties to act reasonably (Eggleston, 2006, pp. 82–85). (Heaphy, 2013, p. 26) argues that this clause put the moral obligation on both parties, and it has been quoted effectively in practice to make parties compromise or to change the way they used to deal with each other with positive attitude. Besides, the clause 10.1 might facilitate parties to solve problems amicably at a practicable level with a condition that amicable resolution of problems is still possible (Barlow, 2011, p. 5). Besides, (Heaphy, 2013, p. 29) states that neither parties have to fear as long as they follow the procedures set out in the contract. Furthermore, (Rowlinson, 2011,

pp. 19–22) further argues that there is far more in practice to the clause than just one sentence with 26 words. It is no doubt that the clause seeks to impose something which is absent in a more traditional style of construction contract and which is similar to the principle of good faith that is not recognized by the legal system in the UK but by other civil law based legislative systems. This is in light of (Lloyd, 2008, pp. 473–474), which holds that this clause bridges any 'gap' that might exist as a result of a common law jurisdiction not recognizing the principle of good faith. (Lloyd, 2008, pp. 473–474) argues that this obligation is tantamount to the principle of good faith. Good faith covers deciding whether someone behaved honestly or reasonably. Nevertheless, the phrase 'in a spirit of mutual trust and cooperation' is not limited to honesty and reasonableness, but encourage parties to do more than the contract calls for if the project is truly to be performed cooperatively. (Rowlinson, 2011, pp. 19–22) states that although the meaning of 'in a spirit of mutual trust and co-operation' is not clear, it does provide a standard by which parties were to conduct themselves and against which parties' behaviors were to be measured.

The debate on the proper legal construction of 10.1 will probably run until it is settled in the courts(Eggleston, 2006, pp. 82–85). But in answer to 'what on earth does this clause mean?', (Rowlinson, 2011, pp. 19–22) argues that it somehow gives certainty that parties behavior will affect the outcome of any disputes. Therefore, adhering to the spirit, but not at the expense of compliance with the project management procedures outlined in the contract, will benefit a party when the other party is acting in a different way.

In practice, parties sometime delete clause 10.1 from NEC3 contracts, as they consider that requirement could hinder their ability to enforce strict contractual entitlements. (Downing, Ramphul, & Healey, 2013, p. 450)

The presence of early warning

Early warning obligation (clause 16.1)

The early warning mechanism is introduced in the NEC3 contract as the clause 16.1, which states:

> *"16.1 The Contractor and the Project Manager give an early warning by notifying the other as soon as either becomes aware of any matter which could 1) Increase the total of the Prices; 2) Delay Completion; 3) Delay meeting a Key Date or 4) Impair the performance of the works in use.*

The Contractor may give an early warning by notifying the Project Manager of any other matter which could increase his total cost. The Project Manager enters early warning matters in the Risk Register. Early warning of a matter for which a compensation event has previously been notified is not required."

The clause put the mutual obligation on the project manager and the contractor to warn as soon as possible of matters which could impact on the Prices, Completion, meeting a Key Date, or the quality of the work. The Prices for the whole project is defined in clauses 11.2(30), 11.2 (31) or 11.2 (32) in main options, while the terms Completion, Key Date, and the quality of the work are clarified in 11.2 (2), 11.2 (9), and Works Information at 11.2 (19) respectively. The purpose of early warning mechanism introduced

in this clause is to encourage parties' forward-thinking and to share their vision and foresight with each other regarding any matter which could cause a problem in the future (Rowlinson, 2011, pp. 40&42). From there actions can be followed up so as to mitigate the effects of the potential problem before it can become a major issue which acts to the detriment of the project. It is argued by (Chao, 2017, p. 234) that early warning system encourages parties to learn from any undesirable situation so that potential problems can be handled in a timely manner to prevent further consequences.

The clause also states that the contractor 'may' warn the project manager of any other matters which could increase his own total costs. This is in line with the philosophy of the NEC3 ECC that parties should work in the way to achieve each other's business objectives (Rowlinson, 2011, p. 43). Furthermore, it is noted in the clause that it is not necessary to give an early warning which has already been notified as a compensation event. It is argued that this set-up in NEC3 remedies a procedural defect in NEC2 and thus prevents duplication of notices, which is designed in NEC3 to prevent unnecessary paperwork(Eggleston, 2006, p. 117; Rowlinson, 2011, p. 41).

Nevertheless, it is doubted that the project manager probably will receive a large number of early warnings raised by the contractor (Rowlinson, 2011, p. 43). This is in conformity with the argument by (Eggleston, 2006, p. 117) that one of the difficulties of clause 16.1 is that it is unclear how rigidly the early warning is going to be operated. This is mainly due to the compensation event (clause 63.5), which states the compensation event is assessed 'as if the contract had given an early warning'. Thus, the contractor is facing with the sanction for him not giving a required early warning. Though, (Eggleston, 2006, p. 117) argues that, to avoid trivial matters obscuring the intended purpose of this clause, some degree of common sense and some tests of reasonableness and seriousness are required. Furthermore, it is worth noting that it is argued by (Rowlinson, 2011, p. 43) that it is better to have warnings than not.

Another biggest hindrance for the early warning and the following risk reduction process to function properly is that the parties probably will only notify problems so to generate a claim (Broome, 2012, pp. 208–209). However, the clause 16 is obviously more than a mechanism for one party to inform the other party's mistake. It desires confession of parties' own fault(Eggleston, 2006, p. 117), as the early warning mechanism is designed to identify problems early, so that countermeasures can be taken to minimize their consequences. (Broome, 2012, pp. 208–209) argued that early warnings should be given no matter it is a compensation event or not.

<u>Early warning and compensation event (16.1& 63.5)</u>

Clause 16.1 imposes mutual obligation on the contractor and the employer (through the project manager) to warn as soon as possible of anything which might influence the cost, timing of completion or a Key Date, or the performance of the works (Downing et al., 2013, p. 446).

On one hand, the sanction if the contractor fails to give early warning is stated in the clause 63.5 (nec3 guidance notes, 2005, p. 78). The first impression given by clause 63.5 is that it does not matter if the contractor gives an early warning or not as it states that its entitlement to an extension of time and costs compensation is assessed *'as if the contractor had given an early warning'*. Nevertheless, (Eggleston, 2006, pp. 117–118) illustrates that what it is supposed to hold is that the assessment of a compensation event

cannot be greater than if the contractor had given an early warning. Therefore, the sanction for the contractor fails to give early warning is to reduce the payment due to him for a related compensation event. It is not supposed to mean that the contractor will not be entitled to the compensation event at all if he fails to give an early warning. Nevertheless, the time available for limiting the consequences caused by the problem will be taken into account, as the employer could have opted for a more cost-efficient manner for solving the problem if an early warning had been given by the contractor (Chao, 2017, p. 234). The clause 63.5 is read as:

> *"63.5 If the Project Manager has notified the Contractor of his decision that the Contractor did not give an early warning of a compensation event which an experienced contractor could have given, the event is assessed as if the Contractor had given early warning."*

On the other hand, the project manager is motivated to give early warning in order to maximize the time available to consider the problem with the contractor and thereby to increase the likelihood of finding the best solution to meet the employer's interests (nec3 guidance notes, 2005, p. 37).

Although it is indicated by (Eggleston, 2006, pp. 117–118) that there is no express sanction for the Project Manager's failure to give an early warning, (Rowlinson, 2011, p. 40) rightly argues that the sanction on the project manager for failing to give a required early warning is found in 60.1 (18) Employer's breach of contract(nec3 guidance notes, 2005, p. 73):

> *"60.1(18) A breach of contract by the employer which is not one of the other compensation events in this contract."*

The guidance notes (2005, p. 73) explained that this clause serves as an 'umbrella' or 'catch-all'(Rowlinson, 2011, p. 163) to include breaches of contract by the employer within the compensation event procedure. Without this clause, the contractor's only remedy for a breach of contract by the employer would be under the law which is governing the contract. Back to the sanction on the project manager's failure to give a required early warning, it would be a breach of contract by the employer for not ensuring the project manager to carry out his duties to give an early warning, as it is literally a breach of clause 10.1 (mutual trust and cooperation) by the project manager if it has been testified that he ought to have given an early warning but failed to do so(Rowlinson, 2011, p. 40). In the end, the contractor is entitled to the compensation event under the clause 60.1 (18)- breach of contract by the employer (Eggleston, 2006, p. 118).

Last but not least, (Downing et al., 2013, p. 446) states that the mutual obligation to give early warning is reinforced by the parties' obligation built in clause 10.1 to act as stated in the contract and in a spirit of mutual trust and cooperation.

Problem solving process

Clause 16.2- 16.4

The core clause 16 shows that the process has a number of stages for processing early warning matters (Lloyd, 2008, p. 479). First of all, the purpose of the sub-clause 16.1 as discussed in last section is to make binding the obligation for parties to give early warnings to each other (nec3 guidance notes, 2005, p. 37). The sub-clause 16.1 is then followed by sub-clause 16.2, which states:

> "16.2 Either the Project Manager or the Contractor may instruct the other to attend a risk reduction meeting. Each may instruct other people to attend if the other agrees."

The sub-clause 16.2 authorizes the project manager and the contractor to call a risk reduction meeting at any time to discuss any problems or potential problems. The purpose of this clause is to bring parties together to share all their ideas and visions about the problem (Rowlinson, 2011, p. 41). The words in the clause indicate that this risk reduction meeting is of formal nature. (Broome, 2012, pp. 223) argues that this is not necessarily true as the meeting can happen under informal circumstances as well. For instance, in the case that parties are co-located, the project manager can walk into the site manager's office or vice versa, to ask questions about an issue and how to solve it. Once they might realize it is literally an early warning issue, they can formally record it and its possible solutions in the risk register. Although, regular and formal risk-reduction meeting is still recommended, so as to monitor risks and review every item in the risk register(Rowlinson, 2011, p. 42). Furthermore, preparation is critical to have a successful meeting. For example, it is better to be clear who should attend the meeting, what should be discussed, and what would be the possible solutions. Nevertheless, it is unclear in the contract what will be the consequences if one party fails to attend the meeting (Eggleston, 2006, p. 118).

Thirdly, the sub-clause 16.3 lists what to happen during the risk reduction meeting. It starts with an idea-identification round (first bullet point) followed with a rationalization stage, in which all the ideas generated from the identification phase are further filtered (Broome, 2012, p. 224). Further, best solution is selected which must "bring advantage to all those who will be affected" (second bullet point). The sub-clause 16.3 read as:

> *"16.3 At a risk reduction meeting, those who attend co-operate in 1) making and considering proposals for how the effect of the registered risks can be avoided or reduced; 2) seeking solutions that will bring advantage to all those who will be affected; 3) deciding on the actions which will be taken and who, in accordance with this contract, will take them and; 4) deciding which risks have now been avoided or have passed and can be removed from the risk register."*

The final sub-clause 16.4 requires the project manager to make revision of the risk register and to record the decisions and proposals made during the risk reduction meeting. Also, the clause states that in case of the decision is to make change to the works information, the project manager is responsible for instructing such change and at the same time issuing the revised register to the contractor(Eggleston, 2006, p. 119). (nec3 guidance notes, 2005, p. 38) complements that it is of benefits for the project

manager to record decisions made during the risk reduction meeting, which declares not only who will take actions but also when those actions will be taken. The whole

Nevertheless, there are some practical issues regarding the terms of 'risk register' and 'risk reduction meeting' in this clause. These terms sometimes confuse people as the practice of early warning is not exactly the same with the project risk management in practice(Broome, 2012, pp. 214–215). Initially, the early warning risk register is not used for managing business risks for either party (Broome, 2012, pp. 214–215; Rowlinson, 2011, p. 43). Besides, it is not suggested every minor risk needs to be recorded, but the risks that will affect the project outcomes related to time, costs, and quality. Furthermore, according to clause 11.2 (14) the early warning risk register requires only two pieces of information which are the descriptions of the risk and the actions to be taken to avoid or reduce the potential risk. The clause 11.2 (14) is read as:

> *"11.2 (14) The risk register is a register of the risks which are listed in the contract data and the risks which the project manager or the contractor has notified as an early warning matter. It includes a description of the risk and description of the actions which are to be taken to avoid or reduce the risk."*

Therefore, the early warning risk register is basically different from other risk registers in risk management, by which risks are assessed quantitatively in terms of the probability and the potential impact. For avoiding misunderstanding and confusion, (Broome, 2012, p. 215) suggests to use terms "early warning register" and "early warning meeting" rather than the terms in the current NEC3 contract.

Win-win attitude

Clause 10.1 and clause 16.3

The performance of good faith in clause 10.1 has been extensively analyzed in previous section, which entails that one party should take the other party's reasonable interests into account. Moreover, the obligation to act in a spirit of mutual trust and cooperation extends to the early warning, in which the sub-clause 16.3 (second bullet point) states parties should 'seek solutions which will bring advantages to all those who will be affected' at a risk-reduction meeting. It is noted that the intention of this meeting is to solve the problem, rather than deciding responsibility and liability for the actions to be taken (nec3 guidance notes, 2005, p. 38). Though, (Eggleston, 2006, p. 119) argues that there remain difficulties to do so in some cases where 'win-win' is not possible anymore. For example, the contractor gives early warning to the employer for the delay of completion cause by the remedial work for his own defective work.

5.4 FIDIC Yellow Book

In this section, the English standard contract form FIDIC YB is assessed through the assessment model. The section starts with a short introduction about the FIDIC YB contract. Then, the assessment model is filled out in the second sub-section. The result of the assessment is supported by detailed analysis of specific contract clauses in the last sub-section.

5.4.1. Introduction to FIDIC YB

FIDIC is a global representation for the consulting engineering industry with the aim of promoting business interest of firms supplying technology-based intellectual services for the built and natural environment (International federation of consulting engineers, 2017).

The latest series of FIDIC contract forms- 'FIDIC Rainbow' are published in 1999, which comprises the 1999 Red Book, the 1999 Yellow Book, the Silver Book, and the Green Book. Among all of them, The 1999 Yellow Book(Plant and Design-Build) is a contract form, in which the design is carried out by the Contractor who shall be paid on lump sum basis (Jaeger & Hok, 2010, p. 125). It is a comparable contract form to the UAV-GC 2005 and NEC3 ECC, which is made up of General Conditions, Guidance for the Preparation of the Particular Conditions, Forms of Tender, and Contract Agreement and Dispute Adjudication Agreement.

The fundamental principle behind the FIDIC contracts is the use of General Conditions of Contract, which is deemed to be applicable in all cases, based on thousands of successful projects around the world. Furthermore, given that every project is unique, the Particular Conditions makes the contract more flexible by which the employer could adapt the contract to a specific situation. The 1999 Yellow Book of 'FIDIC Rainbow' suite is chosen as the research object in this research.

5.4.2. Assessment of FIDIC YB

The result of the assessment is presented in table 15. According to the assessment model, the FIDIC YB only partially address the criteria 'the presence of early warning'.

Table 15 Assessment of FIDIC YB

Dimensions of Problem solving	Aspects (requirements)	Criteria	FIDIC YB
Culture Transition	Climate of mutual trust	Reasonable behavior	X
		Equal and balanced warning responsibility	X
	Working together (Integration)	Joint problem solving process	X
	Win-win attitude	Win-win attitude	X
Early Problem Intervention	Problem solving at the lowest possible authority level	The presence of early warning	+/-
	Problem solving as quickly as possible		
Avoidance of Problem Recurrence	Learning from problem solving	Learning from problem solving	X

An overview of the analysis is shown in table 16, which reveals the specific contract clauses investigated in line with each criteria. The detailed analysis of specific clauses of the FIDIC YB contract are organized in the following two sections.

Table 16 Outline of the analysis of FIDIC YB

Criteria	Analysis outline
Reasonable behavior	N.A.
Equal and balanced warning responsibility	Warning obligations for both parties
Joint problem solving process	N.A.
Win-win attitude	N.A.
The presence of early warning	Clause 8.3 early warning provision for the contractor
Lessons learned	N.A.

5.4.3. Analysis of FIDIC YB

Reasonable behavior

There is not a general clause in the FIDIC YB which explicitly deals with how parties should behave towards each other during a contractual relationship. Nevertheless, the terms 'reasonable' and 'workmanship' are included in many clauses. For example, the clause 1.3 of FIDICY Yellow Book states that '*approvals, certificates, contents, and determinations shall not be unreasonably held by parties'*, the clause 1.8 lays down that '*the employer's personnel shall have the right of access to all the documents at all reasonable times'*, and the 1.9 sets out that *'the contractor is entitled to costs plus reasonable profit if he suffers from the errors in the employer's requirements*(Fédération Internationale des Ingénieurs-Conseils, 1999, pp. 6-7). (Jaeger & Hok, 2010, pp. 114& 129) clarifies that the term 'reasonable' aims at expressing a standard of duty or the way in which a power or authority can or may be excised, which is widely used in common law legislative system. A reasonable man or person is a hypothetical individual who can represent a sort of average citizen or professional. The reasonable time entails a time period which is needed for the intended event or activity. Besides, (Jaeger & Hok, 2010, p. 130) explains the term 'workmanship' as a standard according to which the works have to be carried out. To conclude, FIDIC does not include a clause similar to the clause 10.1 of NEC3 ECC(Downing et al., 2013, p. 450), which requires parties to act according to the contract while taking each other's reasonable interest into account. Therefore, just like the UAV-GC 2005 contract, parties' reasonable behavior under FIDIC is governed by the law of the country, in which the contract is applied.

Although both the Employer and the Contractors' reasonable behavior is not necessarily articulated, the FIDIC YB does require the Engineer to act 'fairly' in the situation that he has to play the role as a 'certifier' or 'decision maker'. This has been clarified as the dual role of the engineer under FIDIC YB. On one hand, he acts as the agent of the employer. On the other hand, he plays the role as a decision maker or certifier

in certain occasions, in which the event requires a determination under the contract. This is laid down in the Sub- Clause 3.5 of FIDIC YB, which states that *'the Engineer shall proceed in accordance with Sub-Clause 3.5 to determine any matter, the Engineer shall make a fair determination in accordance with the Contract, taking due regards of all relevant circumstances'*(Fédération Internationale des Ingénieurs-Conseils, 1999, p. 11). (Jaeger & Hok, 2010, pp. 222–223) explains that in this case the Engineer is required to use his professional skills to reach the right decision based on not only the contract and the applicable law but also technical requirements. However, (Chao-Duivis, 2006, p. 467) questioned the independency of the Engineer in this case as how could the engineer make impartial and fair decision as he is engaged and paid by the employer. The Engineer is such a powerful third party whose authority is derived from the contract between both parties, which is unknown in the civil law countries (Jaeger & Hok, 2010, p. 225).

The presence of early warning

Warning obligations

In the general provision of FIDIC YB, parties' warning obligations are laid down in the Sub-Clause 1.8 'Care and Supply of Documents', which read as

> *'Each of the Contractor's Documents shall be in the custody and care of the Contractor, unless and until taken over by the Employer. Unless otherwise stated in the Contract, the Contractor shall supply to the Engineer six copies of each of the Contractor's Documents.*
>
> *The contractor shall keep, on the Site, a copy of the Contract, publication named in the Employer's Requirements, the Contractor's Documents, and Variations and other communications given under the Contract. The Employer's Personnel shall have the right of access to all these documents at all reasonable times.*
>
> *If a Party becomes aware of an error or defect of a technical nature in a document which was prepared for use in executing the Works, the Party shall promptly give notice to the other Party of such error or defect'.*

The first part of this clause (paragraph 1 and 2) requires the contractor to take due care of all the documents as referenced in the clause. It is further provided (paragraph 3) that both parties will have to warn each other if they become aware of an error in the documents which was prepared for executing the works. However, it is doubted that what are parties' awareness towards this clause.

Given the significant role the employer's requirements play in the contract, the contractor's warning obligation in terms of employer's requirements itself among all the documents is again emphasized in the Sub-Clause 5.1 [General Design Obligations]. The Sub-Clause 5.1 states:

> *'…. Upon receiving notice under Sub-Clause 8.1 [Commencement of Works], the Contractor shall scrutinize the Employer's Requirements (including design criteria and*

> *calculations, if any) and the items of reference mentioned in Sub-Clause 4.7 [Setting Out]. Within the period stated in the Appendix to Tender, calculated from the Commencement Date, the Contractor shall give notice to the Engineer of any error, fault or other defect found in the Employer's Requirements or these items of references*
>
> *After receiving this notice, the Engineer shall determine whether Clause 13 [Variation and Adjustments] shall be applied, and shall give notice to the Contractor accordingly. If and to the extent that (taking account of cost and time) an experienced contractor exercising due care would have discovered the error, fault or other defect when examining the Site and the Employer's Requirements before submitting the Tender, the Time for Completion shall not be extended and the Contract Price shall not be adjusted.'*

The clause obliges the contractor to check the Employer's Requirements and to give notice of faults within a period after the commencement of works. Moreover, (Jaeger & Hok, 2010, p. 191) argues this clause creates a retroactive obligation, as it states that the Time for Completion and the Contract Price shall not be adjusted if an experienced contractor with due care would have discovered the error when examining the Site and the Employer's Requirements BEFORE submitting the Tender. Therefore, under the Sub-Clause 5.1 of FIDIC YB, the contractor is deemed to have already inspected and examined the Employer's Requirement. In other words, the contractor under FIDIC YB is obliged to scrutinize documents such as employer's requirements before submitting the tender and to ascertain that they contain no errors or other defects by using the Letter of Tender(Fédération Internationale des Ingénieurs-Conseils, 1999). Step further, after the contract is awarded, the contractor will be held responsible for risks which an experienced contractor would have discovered before submitting the tender. However, (Chao-Duivis, 2006, p. 457) points out that this is neither reasonable nor practicable considering the time pressure inherent in submitting the tenders. Unlike the FIDIC system, under the UAV-GC 2005 the employer is responsible for the Employer's Requirements and information provided by him, which is nevertheless justified by the contractor's duty to warn obligation. In this case, the allocation of risks is fair and reasonable.

In case that the contractor suffers delay and/ or incurs extra costs as a result of an error in the Employer's Requirements, and an experienced contractor with due care would not have discovered the error when scrutinizing the Employer's Requirements under Sub-Clause 5.1 [General Design Obligation], the Sub-Clause 1.9 sets out that

> *'…… After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine (i) whether and (if so) to what extent the error could not reasonably have been so discovered, and (ii) the matters described in sub-paragraphs (a) and (b) above related to this extent.'*

By reading the Sub-Clause 1.9, the sanction for an experienced contractor, who with due care would have given a warning when scrutinizing the Employer's Requirements is self-explanatory. That is the Engineer will decide to what extent the error could not reasonably haven been noticed by the contractor, and this extent thus relates to contractor's claims for extension of time or payment of extra costs.

Early warning provision (clause 8.3)

FIDIC YB does contain an early warning obligation (Jaeger & Hok, 2010, p. 206), which is stated at the continuing part of the Sub-Clause 8.3:

> *"…….*
>
> *The contractor shall promptly give notice to the Engineer of specific probable future events or circumstances which may adversely affect the work, increase the Contract Price or delay the execution of the Works. The Engineer may require the Contractor to submit an estimate of the anticipated effect of the future event or circumstances, and/or a proposal under Sub-Clause 13.3 [Variation Procedure]."*

It requires the contractor to inform the engineer in case any probable future events might interfere with the project. According to (Jaeger & Hok, 2010, p. 206; Totterdill, 2006, p. 180), the Sub-Clause 8.3 indeed can be considered as early warning provision. At the first glance, it expresses the same idea with the early warning Sub- Clause 16.1 of ECC. However, it exclusively places the obligation on the contractor and not the other way around. Whether the employer is obliged to give such notice to the contractor is not clearly specified in FIDIC YB. Furthermore, there are no comparable clauses to early warning clause 16.2-16.4 of ECC in FIDIC YB, in order to bring parties together for discussing the issue and seeking solutions jointly. Besides, (Downing et al., 2013, p. 447) argues that the employer is not duty bound to assist in resolving the problem, which emphasizes the traditional 'adversarial' nature of FIDIC as it operates on the basis that risks are allocated to one of the parties and it is that party's full responsibility to mitigate the risk and bear the consequences.

The Sub- Clause 8.3 also requires the contractor to submit an estimate of the anticipated effect of the future event, or a change proposal under Sub-Clause 13.3 [Variation Procedure]. Nevertheless, there is no direct link between this provision and the contractor's claims either for time relief or extra costs. Therefore, it is questioned whether the contractor can be incentivized to give such early warning notice.

5.5 Intermediate conclusion

In the end, the assessment results of all three standard forms of contract are combined, which is shown in table 17. It can be easily observed that NEC3 ECC is the most ideal contract, which fully addresses all of the criteria except for the last one - *'Learning from problem solving'*. The early warning obligation (EW in the table) of ECC plays a crucial role in meeting these criteria, and it fully addresses four criteria which are '*Equal and balanced warning responsibility'*, '*Joint problem solving process'*, '*Win-win attitude'*, and *'The presence of early warning'*. it can be concluded that the NEC3 ECC is the best with respect to facilitating construction problem solving which is mainly attributed to the early warning obligation-clause 16 of ECC.

On the contrary, the FIDIC YB is the most inferior contract which only partially addresses *'The presence of early warning'*, due to the presence of an early warning provision (EWP in the table) embedded in the clause 8.3 – Programme of FIDIC YB. Such early warning provision is neither an independent article nor is linked to other provisions in the contract. Therefore, it is marked as partially addresses the criterion of 'The presence of early warning'.

The UAV-GC 2005 stands in between the NEC3 ECC and FIDIC YB in terms of facilitating construction problem solving. In the case of UAV-GC 2005, the duty to warn obligation plays an insignificant role in meeting these criteria compared with the early warning obligation of ECC. The duty to warn obligation (DTW in the table) only partially addresses the criterion – *'The presence of early warning'*.

Table 17 Result of the comparative analysis

Dimensions of Problem solving	Aspects (requirements)	Criteria	UAV-GC 2005	NEC3 ECC	FIDIC YB
Culture Transition	Climate of mutual trust	Reasonable behavior	**+/-**	√	X
		Equal and balanced warning responsibility	X	√ (EW)	X
	Working together (Integration)	Joint problem solving process	X	√ (EW)	X
	Win-win attitude	Win-win attitude	**+/-**	√ (EW)	X
Early Problem Intervention	Problem solving at the lowest possible authority level	The presence of early warning	**+/- (DTW)**	√ (EW)	**+/- (EWP)**
	Problem solving as quickly as possible				
Avoidance of Problem Recurrence	Learning from problem solving	Learning from problem solving	X	X	X

Having clarified in chapter 2 that the limitation of desk research strategy is that the biased perspectives from the original researchers cannot be settled. In order to investigate whether and how the clauses in three standard contracts addresses the corresponding criterion in practice. It is of necessity to carry out field research with the aim of acquiring empirical knowledge. Just because the FIDIC YB characterize much of the UAV-GC 2005 in terms of facilitating construction problem solving, and there is no early warning is FIDICI YB which is comparable to the early warning of NEC3 ECC. Therefore, the research on FIDIC is suspended in this chapter, and it will not be considered in the empirical research.

Part III Empirical Research

Chapter 6 Data collection and analysis

Chapter 7 Discussion

6. Data collection and analysis

This chapter of the report explains the data collection and analysis for the research. The chapter start with the interview set-up, which specifies the objectives of interviews, selection of interviewees, and the methods and procedures for conducting the interview. Subsequently, the results of the interviews are presented in the second section. The objective of this chapter is to answer the fourth sub-question: *"What do contract practitioners regard the Duty to warn of UAV-GC 2005 and the Early warning obligation of NEC3 ECC?"*

6.1. Set-up of the interviews

6.1.1. Objectives of the interviews

In this research, the interviews have two primary objectives. On one hand, the interviews are meant to gain insight into how parties deal with project problems during project execution, and what role does duty to warn obligation of UAV-GC 2005 plays in facilitating construction problem solving. Therefore, what are insufficient with the current duty to warn obligations of UAV-GC 2005 can be identified. On the other hand, the interviews are aiming at getting a clear perception concerning early warning obligation of NEC3 ECC and how does it influence construction problem solving in practice, so as to identify what are its added value to the duty to warn obligations of UAV-GC 2005.

6.1.2. Selection of interviewees

With the aiming of acquiring sufficient empirical knowledge so to pursue the interview objectives, interview candidates are selected on the basis of their knowledge as regard to standard contract forms as well as their experience with contract management in practice. The candidates who meet such conditions are usually with a title of contract manager, project manager, or legal counselor within an organization. Firstly, candidates with knowledge and practical experience of UAV-GC 2005 are essential to map out the Dutch construction culture and to identify what are insufficient with the current duty to warn obligation of UAV-GC 2005 in project problem solving. Then, interviewees with knowledge and experience of NEC3 ECC are needed to gain insight into early warning obligation and to know what are required for it to function properly. By doing so, it makes a contrast between the duty to warn of UAV-GC 2005 and the early warning of NEC3 ECC in terms of facilitating problem solving in practice. Therefore, it can be identified that what are the added value of early warning obligation to the current duty to warn of UAV-GC 2005.

Table 18 List of interviewees

Operation side	Abbreviation	Role/Function	Contract management experience	Other relevant experience
Employer (E)	JD	Project manager	UAV-GC 2005	-
	RM	Project manager	UAV-GC 2005	-
	PS	Contract manager	UAV-GC 2005	-
	MM2	Contract management/ Project management	UAV-GC 2005	-
	MKB	Contract management/ Project management	UAV-GC 2005	-
	AV	Contract management	UAV-GC 2005	CROW
	JTB	Contract management	UAV-GC 2005	Dutch arbitration
	MM1	Contract management/ Project management	NEC3 ECC& UAV-GC 2005	-
Contractor (C)	CK	Contract management/ Project management	UAV-GC 2005	-
	JU	Legal counselor	UAV-GC 2005	-
	RS	Contract manager	UAV-GC 2005	-
	JVR	Contract management	NEC3 ECC& UAV-GC 2005	-

Candidates are selected from both the employer side and the contractor side.

6.1.3. Conduct of the interviews

The data for the interview was collected by performing semi-structured interview. Therefore, an interview protocol was organized, which primarily consists of two sections, which are a survey for investigating background of interviewee and a set of open-ended interview questions (See Appendix 5). The interviews questions were constructed on the basis of the result of Part II – Theoretical background. For each interviewee, the interview questions were slightly adjusted. The interviews were conducted face-to-face with every interviewee, during which the conversation was recorded by using audio-tape.

After the interview was finished, the conversation was summarized and the recording was deleted immediately. Later, the result of the interview was sent back to the interviewees for verification and validation. Subsequently, the interview summary (See Appendix 9) was coded by using the software-ATLAS.ti so as to identify different coding themes. The main findings are presented in the following section of this chapter.

6.2. Results of the interviews

6.2.1. The most common project problems

The most common project problems observed from the interviews are related to design (#2, 3, 4, 5, 6, 9, and 10) and scope of work (#2, 4, 5, and 7). The design problem and problem related to scope of work are

sometimes overlapped, a very good example is given in #2, in which the problem observed is both related to design and scope of work. Other examples of project problems regarding design and scope of work observed from the interviews are later changes in the contractor's technical (construction) design due to unpredictable ground conditions, different opinion with respect to the level of detail of the contractor's technical design, and miscommunication about the scope of the works etc. It can be concluded that the most common project problem observed from the interviews is related to design (technical) and/ or engineering. Those problems are mainly attributed to four factors, which are different interpretation of the contract and time pressure on the contractor (#1, 2, 5, and 9).

The result of the interviews is thus confronted with the literature review regarding the same topic (see chapter 4.1). The most common project problems identified through literature review are related to time/schedule, management, and technical design and engineering (Nikander & Eloranta, 2001, p. 390). Therefore, the bias from the literature review is eliminated.

Furthermore, it is worth mentioning that the employer and the contractor have different perceptions towards same project problem. The employer concerns more about whether problems would impair project performances or delay project delivery (#1, 2, 5, and 7). While the contractor focuses more on whether he can get compensation from the employer for solving the problem (#8, 9, and 10). It is demonstrated by interviewee #6 and 7 that there is an unbridgeable gap between parties' visions and expectations, which are deemed as the root of all evil of project problems.

6.2.2. Problem solving practices under UAV-GC 2005

Early warning signs

Given the definition of early warning (see chapter 3) proposed by (Nikander, 2002, p. 48), it is generally acknowledged among all the interviewees that early warning signs do exist in project environment. Two interviewees #7(E) and #8(C) responded that early warning actually already exists during the tendering phase. During tendering phase, warning happens through the contractor's inquiries (#8). Nevertheless, due to competition, contractors ask questions strategically. The employers have to *"read the inquiries very carefully"* (#7) so that they can identify the early warning signs.

As the tendering phase is out of the scope of this research, it is not discussed any further here. Examples of early warning identified through the interviews are summarized in table 19.

Table 19 Examples of early warning signs summarized from the interviews

	During tendering (pre-contractual) phase	**During execution (contractual) phase**
For the contractor	Unrealistic planning, requirements, or project costing etc.; Different interpretation of contract; External sources.	Different interpretation of contract; 'Obvious errors' in information provided by the employer; External sources.
For the employer	Contractor's inquiries;	Different interpretation of contract;

Different interpretation of contract.	Slack of the contractor.

It is acknowledged from the interviews that early warning signs are neither communicated timely nor treated seriously by both parties (#1, 2, 4, 5, 8, and 9), out of the consideration of liability issue (#5). Interviewee #8 stated that early warning often ends up with discussion about money.

Problem solving common practices

Almost all of the interviewees acknowledged that, under UAV-GC 2005, both parties do not work together for solving project problems, and there is in general a lack of communication and interaction between each other. Instead, contractors often deal with project problems through his own process. The contractors will only bring problem up to the employer once it becomes a liability issue either for time relief or for costs compensation. The reason for the contractor to do so is to protect himself from mistakes made by the employer (#3). At that time, the situation of the problem complicates as problem becomes two-fold, one is about 'how to fix it' (technical problem), while the other one is regarding 'who is going to pay for it' (contractual matter).

The current problem solving practices under UAV-GC 2005 are described by #9 (C) as:

- *Engineers or technicians who work on site are under "time pressure" and they have to "keep the train running";*
- *Once there is a technical problem, technicians often try to fix the problem immediately on their own without paying attention to the potential consequences;*
- *Afterwards, extra incurred time or costs are realized by other people on the project;*
- *From there, the contractor brings the problem up to the employer for either time relief or costs compensation.*

Thus, problems are usually not intervened by both parties in a practicable level but in a rather higher authority (management) level, where technical problems are discussed together with its accompanied liability issue.

Parties' attitude and behavior

Four interviewees reported that, after problem is brought up to the employer by the contractor, it is often the case the employer tries to push the problem back to the contractor from the outset (#4(E), 5(E), 8(C) and 9(C)). It is to the employer's opinion that risks are all transferred to the contractor after the contract is awarded (#2 and #8). Therefore, when comes to the liability issue, parties' attitude becomes confrontational.

Other information relevant with parties' attitude and behavior are:

- The employer often blames the contractor for not giving or giving a too late warning, while the contractor defends himself by arguing he did not anticipate that (#8);
- The employer is often suspicious of the motivation behind the warning given by the contractor (#2 and #10);
- The contractor often wait until problem becomes big so as to put pressure on the employer (#7);

- Both parties feel vulnerable to share too much information with each other (#1);
- The employer's attitude and reaction towards the contractor's warning very much depends on the employer's available budget (#5 and #10).

Settlement of project problems

Irrespective of parties' confrontational attitude, finally they still have to sit together for settling the problem. It is consistent among many interviewees (#3, 5, 6, 7, and 9) that project problems are settled mainly through negotiation between both parties, which are normally presented by people in a bit high authority level from each side. Unless it cannot be solved in that way in case consequences are huge, problem will be referred to arbitration or court for judge. One interviewee who has the experience with arbitration illustrated that, during arbitration or litigation, two subjects are often discussed by arbitrator or court of judge when determining liability for the legal consequences, which are 'whether the origin of the failure is an obvious error made by either party?' and 'whether the warning is given at the time when it should have been given (time for being aware of the problem)' (#7).

But again then, the results of the interviews indicate that it is not often the case problems are escalated to the level beyond arbitration in the Netherlands. This is mainly attributed to the principle of good faith in Dutch Civil Code, which oblige both parties to takin into account each other's reasonable interests. Because of the principle, an amicable settlement between parties is possible. The principle of good faith in the DCC is further explained in the following paragraph.

The principle of good faith in Dutch Civil Code

All the interviewees recognized the principle of good faith which refers to *Redelijkheid en Billijkheid* (The principle of reasonableness and fairness) in Dutch Civil Code. Besides, it is generally acknowledged among interviewees that the principle has a profound impact on peoples' attitude and behavior only when parties are dealing with liability issues caused by any project problems, during which not only applicable law but also certain "circumstances" are taken into consideration. An example is given during the interview with #2, which confirms that the principle does make the applicable law more flexible. Such phenomenon is reasonably explained by some interviewees that it is mainly because the principle of good faith has long been the basis, on which decision of the court of judge is made. Due to its long history in the Dutch civil law, nowadays people are well acquainted with it, and it is already embedded in the Dutch culture.

Although the principle plays a paramount role when parties are seeking compromise for damaging consequences through negotiation, many interviewees responded that the principle barely has an impact on parties' attitude and behavior in general. For instance, it has little influence on parties' warning attitude and behavior. Moreover, it is observed from the interview that there are discrepancies between people's perception towards this principle. For example, the employer's perception is always different from the contractor's. While even individual's perception sometimes is also different from his own organizations. It echoed with the literature in terms of the "open" nature of this norm (Hesselink, 2004, pp. 620- 621).

6.2.3. Duty to warn of UAV-GC 2005

Acknowledgement of the obligation

The duty to warn obligations of UAV-GC 2005 are acknowledged by all of the interviewees irrespective of their operation side. Therefore, the result of the interviews shows that the employer and the contractor as two different entities know they have obligation to warn each other as stated in the contract. Nevertheless, what cannot be inferred from the results of the interviews is whether every individual on a project necessarily knows about this obligation. It is pointed out by #10 that the duty to warn obligation either for the employer or for the contractor is not highlighted. It is logical that the obligation is recognized by all the interviewees given their role and function on a project, but their opinion does not necessarily represent other individuals with different roles and functions.

Utility of the obligation

Although the obligation is recognized by all the interviewees, the prevalent opinion among them is that duty to warn obligation is neither taken seriously nor actively used by either party to inform the other about potential project problems. While it does not necessarily mean warning never happened. In practice, warning can happen in an informal way simply by asking questions to the employer (#5, 7, and 9). However, it is often the case one party thinks that is a problem while the other do not (#4). As a result, questions were not taken seriously by the other party. In that case, formal warning letter is use to delivery this message (#4 and #5). Besides, the contractor formally warns about the obvious errors in information provided by the employer (#9).

One interviewee from contractor side reported that warning is often too late as contractor often wait until the consequence of the problem is certain (#10). This is confirmed by another interviewee from the employer side who stated that people take long time to realize what the consequences are (#4). Warning will happen once the contractor sees there is a risk from his own perspective and for his own sake (#5, 8, and 9). Thus, the main objective of warning for the contractor is to get the compensation from the employer (#8, 9, and 10).

Furthermore, it is observed from the contractor interviewees that, compared to the clause 4-7 (duty to warn) of UAV-GC 2005, the contractor is more focusing on clause 44-2 which is the duty to notify compensation and/ or extension of time (#8, 9, and 10). This somehow also explains why warning is often too late under current UAV-GC 2005. At the time the contractor warns the employer, the warning cannot be necessarily deemed as warning notification under duty to warn obligations anymore. It can a notice for costs compensation or time relief.

Lastly, the results of the interviews show that it becomes routine for only the contractor to warn the employer. This is mainly because the employer is literally not obliged to warn, while the contractor is deemed as the one who is responsible for coming up with solutions. Nevertheless, one of the interviewees (#10) explained that, in practice, many warnings from the employer are deemed as unnecessary. The warnings given by the employer are literally instructions. In the end, it is still the contractor's responsibility to warn the employer more often. Besides, some interviewees indicated that nowadays it has been seen more and more often the employer warns the contractor (#5 and #7).

Obvious error

One contractor interviewee (#9) illustrated that the contractor warns about 'obvious errors' by using formal warning letter, so as to protect himself from mistakes made by the employer. Nevertheless, he supplemented that it is hard to decide what can be deemed as 'obvious errors'. The same applies for the employer' duty to warn obligation, one interviewee from the employer (#7) pointed out that, when checking the contractor's work, the employer does not have to warn unless he sees a great failure which is attributed to an obvious error made by the contractor.

Clause 4-8

When comes to the topic of sanction against the contractor's failure of give a warning, one contractor interviewee (#9), and one employer interviewee (#7) who has experience with arbitration responded that this clause is rarely used or mentioned in practice. The clause 4-8 is intended to tell the contractor that, if the contractor fails to warn, he will become liable for the legal consequences even if it is due to the employer's mistakes (#7 and #8). But in practice, not only legal obligation but also other factors are taken into account when parties come to the negotiation of the liability for the legal consequences. Having addressed that this is mainly due to the influence of the principle of good faith in the DCC. One of the contractor interviewees (#9) clarified that whether the contractor gives a warning or gives a late warning does not influence the part of the consequences which would have been borne by the employer anyway. The costs for the contractor's failure to give a warning when it should have been given are for the contractor.

In the end, it is concluded that the clause 4-8 functions as nothing more than a threat to the contractor. One interviewee (#6) clarified that the clause 4-8 is a signal showing a low level of trust between the public sector and private market.

Facilitation of problem solving

One interviewee (#6) proposed that the existence of duty to warn obligation in the UAV-GC 2005 is logical as it is deemed as the re-explanation of the Dutch contract law, which oblige parties to perform such duty. Therefore, from a legal perspective, the duty to warn is explicit. Nevertheless, some interviewees proposed that it draws sharp line between parties' responsibility, which leaves no room for parties to work together for solving project problems as it is in nature used for protecting either party's self-interests (#3, 7, 8, and 10). Besides, almost all of the interviewees acknowledged that the current duty to warn obligation does not help solving project problems (#1, 3, 4, 5, 7, 8, and 10). It is felt by many interviewees that what is absent in the current duty to warn obligation of UAV-GC 2005 is an instrument, a procedure, or a tool, by which warning given can be better clarified and processed, and actions can be followed up to discuss and seek solutions for the problem (#3,4, 5,7, 8, 9, and 10).

6.2.4. Problem solving practices under NEC3 ECC

This section deals with the problem solving processes and practices under NEC3 ECC contract. The information is obtained from two interviewees (#3 and #10) who once worked on the ICC project as contract manager or project manager. The ICC project is the only project in the Netherlands which is executed under NEC3 ECC.

Problem solving process

It is illustrated by the contractor interviewee that, in the ICC project, the construction team was trained to identify early warning signs which might have a negative impact on the project. Once something is identified by people who worked on site (engineers and technicians), they will report the issue immediately to the contract manager of the contractor (the contractor interviewee #10) for deciding whether it is truly an early warning event. If yes, the issue will be recorded on the early warning register. The most important early warning events are discussed by both parties on the weekly held early warning meetings. From there, every early warning mainly has three ways to go.

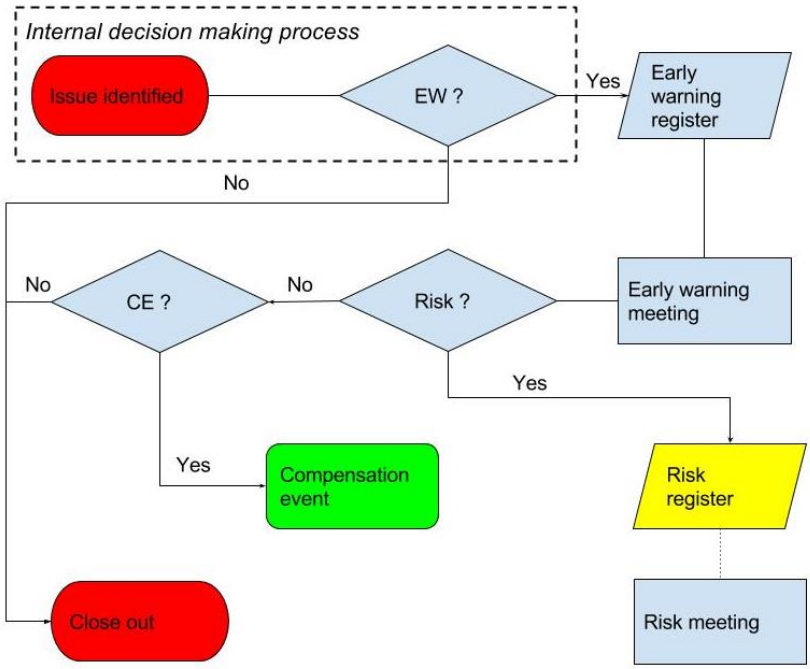

Figure 5 Problem solving process under NEC3 ECC

First of all, if the issue has a large impact on project outcomes, and it has certain chances to come to pass in the future, it will be treated as a risk and will be referred to risk register (different from the early warning register) and further discussed during risk deduction meeting (also different from the early warning meeting). Then, if it is not a risk but might incur additional time and costs for the contractor, it will be further discussed as if it is a compensation event. Lastly, if it neither a risk nor a compensation event but merely a small issue, which either has little impact on project outcomes or has small chances to happen in the future, it will be closed out and deleted from the early warning register. The general process of problem solving identified through the interview is described in figure 5.

Attitude and behavior (the spirit of mutual trust and cooperation)

From the results of the interviews, it is informed that project problems were processed by both parties in a structured way. The early warning was used actively during the ICC project to keep both parties well informed in terms of any issue that might do harm to the project.

When comes to the topic of the influence of the clause 10.1 (in a spirit of mutual trust and cooperation) on people's attitude and behavior, interviewee from the employer side (#3) demonstrates that it has a positive impact on parties' attitude and behavior, and people aware of that as it is the first line in the contract. The contractor interviewee (#10) explained that a sense of mutual trust was maintained among the management team (high authority level) between the employer and the contractor, and education regarding 'how to behave' was given to the construction team during project execution. Nevertheless, it is hard to conclude from the interviews that such trusting relationship is mainly attributed to the clause 10.1.

It is observed from the interviews that the 'target priced contract' plays a significant role in shaping people's attitude and promoting the 'spirit of mutual trust and cooperation'. Due to sharing of both 'pain and gain', parties are encouraged to work 'best for projects'.

6.2.5. Early warning of NEC3 ECC

Early warning in the ICC project

From the results of the interview with #3 and #10, it is comprehended that the early warning was used actively by both parties to solve problems before they grow 'big'. The contractor interviewee (#3) claimed that the early warning helps parties to work together for coming up with optimal solutions and to reduce unnecessary costs. The employer interviewee (#10) denoted that early warning is of great significance to the NEC3 ECC contract, and it is the philosophical nature for this type of contract to use early warning. Under ECC, parties are obliged to inform each other at the first place where problems occurred. Furthermore, both interviewees manifested that early warning is aiming at seeking what is 'best for projects', rather than benefiting either party. Early warning makes either party to think not only what is important for themselves, but what is important for their counterparty and the project as a whole (#10).

It was acknowledged by both interviewees that the early warning has a positive impact on parties' cooperation and mutual trust, as they are encouraged to share information with each other so that they know each other better at an early stage. Another aspect which promote cooperation between parties is that the early warning is an equal obligation (#3 and #10). Although, some warnings from the employer during the ICC project were deemed as unnecessary by the contractor interviewee, as those warnings are literally project manager's instructions (e.g. change order).

Early warning register

The employer interviewee (#3) acknowledged that early warning was registered digitally by using the software – *IBIS4Projects*, which is an online accessible platform for managing all project documents and communication between construction partners (ibis, 2017). It makes the communication regarding early warning notification a more structured way. By using the tool, there is no need for parties to formally

warn by sending formal letters. As long as either party register the early warning in the system, the counterpart will be seen as being notified automatically. The benefits of such electronic information management system are summarized as: 1) instant communication; 2) avoids miscommunication and costly mistakes; 3) more transparent etc. (ibis, 2017).

Besides, the employer interviewee indicated that, in ICC project, the practice of early warning is separated from the regular risk management, and the early warning register is used as the input for risk register and risk management (#3).

Compensation event

When comes to the topic of compensation event, the interviewee from the employer side declared that the early warning serves as the starting point for the contractor to get compensation. Therefore, the contractor is stimulated to issue early warnings. This is confirmed by the contractor interviewee, who clarified that there are mainly two reasons for them to give early warning timely, which are first to build and main a good relationship with the employer, and then to get the amount of compensation which they were supposed to get.

Target priced contract

In addition to the compensation event, the other reason which stimulate the contractor to give early warning is to build and sustain a trusting relationship with the employer (#10). The contractor interviewee emphasized many times that this is strongly promoted by using the target priced contract, which is the Option C in the ECC contract. Because of 'sharing of pain/gain', both parties are encouraged to work 'best for projects'. Both parties are therefore incentivized to give early warning frequently. The employer interviewee's statement about the 'target priced contract' is slightly different from the contractor interviewee, who indicates such pricing mechanism is an 'additional plus'.

Challenges of early warning (Early warning and trust)

The employer interviewee acknowledged that not many difficulties and struggles were experienced in terms of using early warning (#3). To his opinion, a low level of trust and administrative burden would be the challenges for using early warning. While the contractor interviewee demonstrated trust is not necessarily a pre-condition for early warning. Instead, early warning can promote the 'spirit of mutual trust and cooperation' as parties are encourage to share information with each other at an early stage, the more they share, the better they know each other. Therefore, early warning can be used as the starting point for parties to build trust (#10).

7. Discussion of the interview results

In the absence of theory, the results of the interviews are isolated (Fellows & Liu, 2008, p. 270).The considerations of interviews in light of theory and previous research findings facilitates the advance of knowledge and a perception of how the topic and its practice is developing. In this chapter, the results of the interviews are further discussed in light of literatures and theories. Therefore, the fifth sub-question *"What conditions are required for early warning to function properly on Dutch D&B construction projects?"* is answered.

7.1 Dutch construction culture

Give and take' culture

Based on the result of the interviews as described in previous chapter (see 6.2.2), the current mainstream culture in the Dutch construction industry is recognized as generally being in line with the main characteristics of the global 'traditional blame culture' as described by (Larson, 1997; Slater, 1998; Walker & Hampson, 2008) (see chapter 4.3).

Table 20 Dutch construction culture compared to global 'traditional blame culture' and 'no blame culture'

	Traditional blame culture	**Dutch construction culture**	**No blame culture**
Determining features	Suspicion of each other	Suspicion of each other	Climate of mutual trust
	'Working alone' (fragmentation)	'Working Alone' (Fragmentation)	'Working together' (Integration)
	'Win-lose' (dispute often end up in court)	'Give and take' (dispute resolved through negotiation)	'Win-win' (effective problem solving)

As shown in table 20, all the determining characteristic of 'traditional blame culture' are identified through the interviews except for one feature, which is the 'win-win' or 'dispute often end up in court'. However, it is not often the case in the Dutch construction industry that problems are escalated to arbitration or court for judge. Having articulated in previous chapter (see 6.2.2) that, according to the results of the interviews, problems are frequently resolved through negotiation between parties. This is mainly attributed to the existence of *the principle of good faith* in the Dutch Civil Code, which is essential in bringing amicable settlement to disputes between parties. It is typically addressed by many interviewees as a 'give and take' culture.

Trust situation in the current Dutch construction industry

Under the blame culture, there is inevitably a lack of trust and cooperation between parties, which is acknowledged among all the interviewees. Having addressed in previous sections, the principle of good faith does not play its role in influence parties attitude and behavior in general but only used in settling liability issues. It is observed from the interviews (#9) that the principle is perceived by the contractor as 'what can be expected from the other party'. Nevertheless, this varies from what the principle is meant to be. In the applicable law, the principle entails 'taking each other's reasonable interests into account'. In accordance with(Dietz & Den Hartog, 2006, p. 563), such perception indicates a 'calculus-based' trust , which is characterized by a type of relationship based on economic incentives while suspicions still remains. Therefore, it implies a low trust level between parties, and it does not cross the threshold of becoming 'real trust'. It is perceived that the Principle of good faith literally benefits the contractor more than the employer, thereby balances the situation created by the UAV-GC 2005 contract which favors the employer.

Moreover, it is identified from the interviews that one event has profound impact on influencing the level of trust between parties in Dutch construction industry. The one is the Dutch construction collusion affair happened back in 2002. Due to the construction fraud in 2001, trust between the employer and the contractor was severely damaged. Once trust is damaged, it is difficult to restore. Since then, public sectors no longer have faith in private market. Although they still have to do business together, parties approach each other with great precautions.

Other characteristics of Dutch construction culture

Other information observed from the interviews relevant with the Dutch construction culture are summarized as:

- Warning is often too late as problem already occurred and consequences are huge. The contractor is more focusing on being compensated than warning;
- Withholding and manipulating information;
- Technicians are strict and not good at communication;
- The knowledge in the public sector is not that high. This is partly due to the discontinuity of the employer' organization. As a result, the body of knowledge within the employer's organization cannot be fully utilized to help the contractor to come up with solutions. Instead, the employer spend much more energy on suspecting the contractor's motivation.

7.2 Criticisms of Duty to warn

Duty to warn is not highlighted

Although it is suggested by some interviewees that, as time pass by, parties become increasingly familiar with the UAV-GC 2005 contract and therefore the duty to warn obligations, one of the interviewees (#10) argued that not all of the people are clear about this obligation. The reason he gives is that, unlike early warning obligation of ECC (clause 16), the duty to warn obligations either for the contractor (clause 4-7)

or for the employer (clause 20-4, 21-10, and 22-3) are not highlighted in UAV-GC 2005 contract. Indeed, duty to warn obligations for the employer and the contractor are laid down separately in UAV-GC 2005 contract, and the employer's warning obligations are even scattered in three different clauses within the process of *verification and acceptance*.

Duty to warn is not incentivized

The current UAV-GC 2005 does not provide incentives for parties to give warning. The sanction against the contractor's failure to give a warning is laid down in clause 4-8, which is a form of 'active control' over warning opportunism by establishing penalties and sanctions (Woolthuis et al., 2005, p. 814). Nevertheless, it does not play its role in stimulating warning from the contractor in reality. Besides, the duty to warn obligation (clause 4-7) and the compensation and/ or extension of time (clause 44) are isolated. As a result, the contractor is not incentivized to give warning timely so as to get the compensation assessed as if he had given a timely warning. Due to such inconsistency, parties are not encouraged to exploit the 'time available' so as to reduce unnecessary costs.

Duty to warn is less equal and balanced

It is argued by some interviewees that, to their opinion, the current duty to warn obligations of UAV-GC 2005 is rather equal and balanced (#5 and #7). The first argument is that it is logical for the contractor to warn the employer more frequently as it is his responsibility to come up with solutions. While the second argument is that it has been seen more and more often the employer warns the contractor. Even though, it is generally agreed among most of the interviewees that the employer is actually not obliged to warn according to the contract. Besides, there are no sanctions against the employer's failure of giving a warning which should have been given by himself. Therefore, the contractor can never hold the employer responsible in case the employer fails to fulfill his obligation.

In a nutshell, the employer's duty to warn is less comparable to the contractor's warning obligation under current UAV-GC 2005.

Loophole in the contract (obvious error)

It is inferred from the results of the interviews that the term 'obvious error' in either party's duty to warn obligation provides a 'grey area', where both parties could escape from their duty to warn obligation. Therefore, it is a loophole for opportunistic behavior.

Duty to warn does not promote collaboration

The intention of the duty to warn obligation for 'self-protection' is legally explicit. Nevertheless, implicitly, the duty separates parties as they only oblige either party to think what's important for himself first and to only point out mistakes made by his counterparty. More importantly, how should parties cope with warning after it is given by either party is not necessarily described in parties' duty to warn obligations. As a result, it is often the case that warnings are not taken seriously at the moment when it is issued and there are certain chances for communication breakdown. The results of the interviews show that what is absent in the current duty to warn obligation of UAV-GC 2005 is an instrument, a procedure, or a tool,

which describes how parties should do so as to 'follow up' the warning, and to discuss and seek solutions together. This is in line with the result of the assessment of UAV-GC 2005 with respect to the criteria 'Joint problem resolution process'. The result of the assessment shows that the criteria is not supported or addressed by any clauses or provisions in the UAV-GC 2005 contract (see section 5.2).

Reflection on the Assessment UAV-GC 2005

According to the assessment result of UAV-GC 2005 (see section 5.2), the criteria 'the presence of early warning' is partially addressed or supported by the duty to warn obligation of UAV-GC 2005. Nevertheless, the results of the interviews reveal that warning is often too late and early warning is not often communicated between the employer and the contractor.

This discrepancy between theories and practices is necessarily explained by all the deficiencies of current duty to warn obligation mentioned above. Initially, the duty to warn either for the employer or for the contractor is not highlighted in the contract. Then, there is no incentives for either party to give warning. The sanction (clause 4-8) against the contractor's failure for giving a warning is nothing more than a gimmick. It does not play its role in incentivizing the contractor to warn. Furthermore, the term 'obvious error' give either party excuses to not warn unobvious or implicit errors. Last but not least, it implicitly undermines the collaboration between parties and discourages parties' warning behavior.

7.3 Early warning as a solution

Equal and balanced responsibilities

It is generally accepted by the interviewees that the early warning obligation is an equal and balanced obligation, by which both parties are obliged to give early warning to 'any matter' that might harm project performances on an equal foot. More importantly, early warning requires parties to confess their own faults instead of only pointing out mistakes originated with their counterparty. Besides, by indicating 'any matter', it avoids the pitfall of 'obvious error' as stated in the duty to warn of UAV-GC 2005.

Early warning as a project management instrument

It is argued by many interviewees that the clause 16.1 (early warning provision) of ECC literally expresses the same idea with the clause 4-7 (duty to warn) of UAV-GC 2005, even though the 'scope' of the clause 16.1 is bigger as it covers 'any matter' while the Clause 4-7 of UAV-GC 2005 is limited to 'obvious errors'. However, the instrumental part of early warning obligation is definitely absent in the UAV-GC 2005, which is laid down in clause 16.2 to clause 16.4 of ECC contract. Therefore, the impression early warning obligation of ECC gives to most of the interviewees is that it is a procedure, a tool, an instrument, or a practice of risk management etc., and it serves as the intermediate step between risk monitoring and risk management. Nevertheless, it should not be confused with the risk management practices such as 'risk reduction meeting' and 'risk register' etc. In practice, 'early warning meeting' and 'early warning register' are used as the input for following 'risk reduction meeting' and 'risk register'.

Active control through compensation event

It is observed from the interviews that some interviewees do not appreciate the linkage between early warning and compensation event (#5 and #7). It is concerned that, under the pressure of losing the entitlement of compensation, the contractor will give a lot of early warnings to the employer. This concern is in line with the literature (Rowlinson, 2011, p. 43).

Nevertheless, it is articulated in the interview (#3 and #10) that the contractor is actually incentivized to give early warning to the employer as quickly as possible, as it serves as the starting point for him to get uncompromised compensation or extension of time from the employer. Therefore, the 'time available' can be exploited to a great extent, so as to reduce unnecessary costs (#10). It confirms the idea expressed by (Woolthuis et al., 2005, p. 814) regarding active control over opportunism by establishing penalties and sanctions (see chapter 4.3.1).

Last but not least, it is suggested that, to avoid too many 'meaningless' early warning notifications, it is the contractor's responsibility to keep it in mind to give early warning which might truly impact the project outcomes (#3).

Passive control trough establishing trust

The clause 10.1 (the spirit of mutual trust and cooperation) has a positive impact on parties' attitude and behavior, as it is the opening of every contract. By using early warning, the 'spirit of mutual trust and cooperation' can be further promoted. The more the information parties share with each other, the better they know each other at an early stage. The relationship between early warning and mutual trust is reciprocal. Such relationship is supported by the target priced contract (Option C of ECC), by which parties share both pain and gain with each other. Therefore, both parties are incentivized to give early warning, which is 'best for projects' and 'best for all'.

7.4 Synthesis

The duty to warn of UAV-GC 2005 and early warning of NEC3 ECC make a contrast with each other. The most important added value of early warning (clause 16 of ECC) to duty to warn (clause 4-7 of UAV-GC 2005) is the instrument of managing early warnings, which is written out in clause 16.2-16.4 of NEC3 ECC. Besides, the pitfall of 'obvious error' is avoided in the early warning obligation of NEC3 ECC, as it obliges parties to give early warning of 'any matter' which could affect the project outcomes.

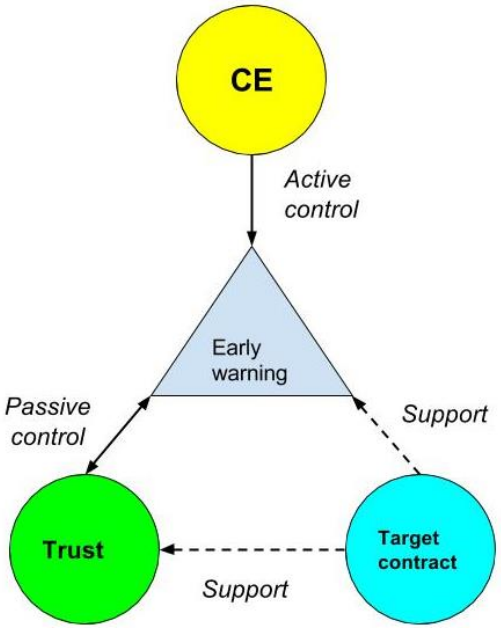

Figure 6 Early warning mechanism of NEC3 ECC (CE-Compensation event)

Two conditions are identified being critical to proper functioning of early warning of NEC3 ECC. On one hand, the linkage between early warning and compensation event serves as 'active control' over opportunism (Woolthuis et al., 2005, p. 814), which incentivizes the contractor to give timely warning so as to be entitled to the amount of compensation as if he had given a timely warning. From a project management perspective, this mechanism triggers the concept of 'time available', which can be used by parties to solve potential problems and to reduce unnecessary costs. On the other hand, trust is used as 'passive control' over opportunism so as to encourage the contractor's warning. This is necessarily supported by the sharing pricing mechanism in the contract, which is the 'target priced contract' (Option C of NEC3 ECC). Under this contract, both parties are stimulated to work 'best for projects' rather than benefiting themselves only. Therefore, warnings are appreciated by both parties. The early warning mechanism is graphically illustrated in figure 6.

Having addressed that trust is one of the two mechanisms which could incentivize both parties to give early warning. Trust is also part of the culture. In the current Dutch construction industry, a lack of trust would be a major challenge for the proper functioning of early warning. Besides, other characteristics such as 'warning often too late', 'strict and uncommunicative technicians', and 'working alone' and so on prove that it is difficult for early warning to adapt to the current Dutch construction culture.

Part IV Conclusions and Recommendations

Chapter 8 Conclusions

Chapter 9 Recommendations

8. Conclusions

Prior to addressing the main research, the five sub-questions are answered:

1. "What is Early Warning, and how does it influence project problem solving?"

Early warning in project management is originally defined by (Nikander, 2002, p. 48) as

> *"An observation, a signal, a message or some other item that is or can be seen as an expression, an indication, a proof, or a sign of the existence of some future or incipient positive or negative issue. It is a signal, omen, or indication of future developments."*

The definition is the most state-of-art and the most authoritative in the study field of early warning in project management, which takes the *theory of weak signal* proposed by (Ansoff, 1975) as scientific basis. The theory of weak signal explains the existence of early warning sign in business environment. While the definition presented by (Nikander, 2002, p. 48) positively confirms the hypothesis of (Ansoff, 1975) regarding the existence of early warning in project environment. In light of the definition of (Nikander, 2002, p. 48), it can be summarized that early warning has a risk-related and time-bounded character, it is tied up with human observation, and it is a decision making process.

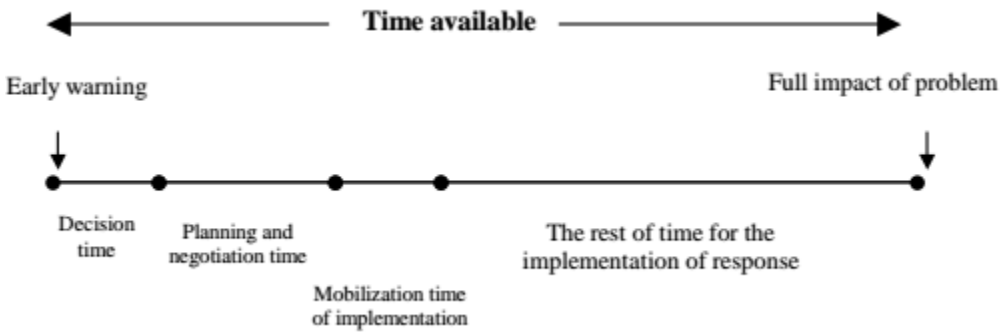

Figure 7 The composition of 'time available' (Nikander, 2002, p. 86)

The concept of 'time available' (Nikander, 2002, p. 86) is adopted to illustrated 'how does early warning influence project problem solving'. As shown in figure 7, the time available is the amount of time available before problem reaches its full impact, which consists of decision time, planning and negotiation time, mobilization time of implementation, and the rest of time for the implementation of response. Therefore, the idea of early warning is to exploit this period of time so as to minimize potential consequences of project problem.

2. "What does construction problem solving entail in light of project management theories, and what criteria are relevant for evaluating construction problem solving?"

Project management literatures suggest that construction problem solving so far has not crossed the threshold to become a mature subject in project management. Hence, there is not a widely acknowledged

definition for this concept. Scholars argue that construction problem solving characterizes much of construction management practices (Li & Love, 1998, p. 721). In addition, literatures suggest that it is associated with many other subjects such as risk management, conflict management, team-building, and project manager's competencies and professional skills etc.

In accordance with project management literatures, six aspects or requirements are identified as being relevant for evaluating construction problem solving, which are 'Climate of mutual trust', 'Working together', 'Win-win attitude', 'Problem solving at the lowest possible authority level', 'Problem solving as quickly as possible', and 'Learning from problem solving'. The six aspects are fall under three dimensions, which are Culture transition, Early problem intervention, and Avoidance of problem recurrence (See table 21).

Table 21 Construction problem solving dimensions, aspects (requirements), and evaluation criteria

Dimensions of Problem solving	**Aspects (requirements)**	**Criteria**
Culture Transition	Climate of mutual trust	*Reasonable behavior*
		Equal and balanced warning responsibility
	Working together (Integration)	*Joint problem solving process*
	Win-win attitude	*Win-win attitude*
Early Problem Intervention	Problem solving at the lowest possible authority level	*The presence of early warning*
	Problem solving as quickly as possible	
Avoidance of Problem Recurrence	Learning from problem solving	*Learning from problem solving*

Nevertheless, the project management nature of those aspects or requirements makes it difficult to be associated with contract clauses or provisions. Therefore, the aspects or requirements are further adapted to six criteria for evaluating problem solving of three standard contract forms. They are *'Reasonable behavior', 'Equal and balanced warning responsibility', 'Joint problem solving process', 'Win-win attitude', 'The presence of early warning', and 'Learning from problem solving'*, as shown in table 21.

3. "What role does warning obligation of UAV-GC 2005, NEC3 ECC, and FIDIC YB play in facilitating construction problem solving respectively?

Table 22 Comparison of three different contract forms

Dimensions of Problem solving	Aspects (requirements)	Criteria	UAV-GC 2005	NEC3 ECC	FIDIC YB
Culture Transition	Climate of mutual trust	Reasonable behavior	**+/-**	√	X
		Equal and balanced warning responsibility	X	√ (EW)	X
	Working together (Integration)	Joint problem solving process	X	√ (EW)	X
	Win-win attitude	Win-win attitude	**+/-**	√ (EW)	X
Early Problem Intervention	Problem solving at the lowest possible authority level	The presence of early warning	**+/- (DTW)**	√ (EW)	**+/- (EWP)**
	Problem solving as quickly as possible				
Avoidance of Problem Recurrence	Learning from problem solving	Learning from problem solving	X	X	X

The results of the assessment for all the three standard contract forms are presented in table 22. Apparently, the NEC3 ECC is the optimal contract in terms of facilitating construction problem solving, which meet all of the criteria except for 'Learning from problem solving'. In fact, none of the three standard contract forms meet that criteria. Among all the five criteria which are med by the NEC3 ECC, four are attributed to the clause 16- early warning obligation (EW in the table) in the contract. The second best would be the UAV-GC 2005. Nevertheless, it only partially addresses a few criteria, which are 'Reasonable behavior', 'Win-win attitude', and 'The presences of early warning'. In light of the duty to warn obligation (DTW in the table) of UAV-GC 2005, 'The presence of early warning' is rated as partially addressed, considering the duty is limited to 'obvious errors' only. Last but not least, the FIDIC YB is the worst in terms of stimulating construction problem solving. The FIDIC YB only partially addresses one criteria which is the 'presence of early warning', because of the 'early warning provision' in clause 8.3 of FIDIC YB.

4. "What do contract practitioners regard the Duty to warn of UAV-GC 2005 and the Early warning obligation of NEC3 ECC?"

By conducting interviews with contract practitioners, deficiencies of duty to warn of UAV-GC 2005 in terms of construction problem solving as well as added value of early warning of NEC3 ECC are identified. The results of the interviews are summarized in table 23.

Table 23 Comparison of duty to warn of UAV-GC 2005 and early warning of NEC3 ECC

Deficiencies of Duty to warn of UAV-GC 2005	Added Value of Early Warning of NEC3 ECC
Collaboration is not described	Project management instrument
Warning is not incentivized	Warning is incentivized by linking to 'Compensation event' (active control), and by trust building (passive control)
Duty to warn is not highlighted	Early warning as an independent and essential article
Less equal and balanced warning responsibility	More equal and balanced warning responsibility
'Obvious error' originated with the employer	'Any matter' which could affect project outcomes

The most important added value of early warning obligation of NEC3 ECC to duty to warn of UAV-GC 2005 is the project management instrument, which describes how parties should collaborate so as to 'follow up' the warning and to work 'best for projects'. In the current duty to warn of UAV-GC 2005, this is not specified. Then, duty to warn is not incentivized by the current UAV-GC 2005 contract. While early warning is stimulated by linking it to the compensation event (active control), and by trust building (passive control). Thirdly, the pitfall of 'obvious error' in the duty to warn obligation is avoided by referring to 'any matter' which could affect project outcomes in early warning of ECC. Furthermore, compared to duty to warn, early warning obligation of ECC is more equal and balanced, under which both parties are obliged to warn on an equal foot. Last but not least, duty to warn obligation for either the employer or the contractor is not highlighted, while early warning for both parties are integrated in one independent article in NEC3 ECC and it is one of the most essential articles in the whole contract.

5. "What conditions are required for early warning to function properly on Dutch D&B construction projects?"

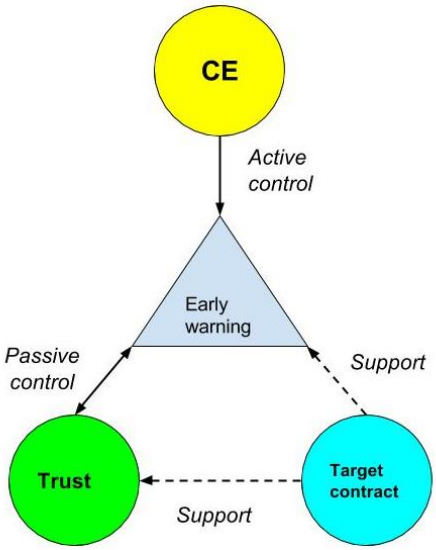

Figure 8 Early warning mechanism of NEC3 ECC

It is identified that two conditions (see figure 8) are critical to ensure the proper functioning of early warning of NEC3 ECC. One condition is the compensation event. By linking early warning to the compensation event, the contractor's compensation is assessed as if he had given an early warning. Therefore, the contractor can be incentivized to give early warning, which serves as the starting point for the contractor to get compensation and/ or extension of time. While the other condition is trust. By building trust, parties are encouraged to give early warnings. In turn, early warning can further promote 'the spirit of mutual trust and cooperation'. From the perspective of contract management, trust-building can be necessarily supported by incorporating trust in the contract, and by adjusting contracting strategies and pricing mechanism. For instance, the 'target priced contract'.

On the basis of all answered sub-questions, the main research question ***"Can Early warning of NEC3 ECC be expected to function properly under UAV-GC 2005, with the aim of improving Dutch Design and Build construction problem solving?*** is answered:

In accordance with current vison, the early warning cannot be expected to function properly under UAV-GC 2005, unless two conditions mentioned above are met. The first condition cannot be fulfilled by the current UAV-GC 2005, which is attributed to the isolation between duty to warn and compensation and/or extension of time. Nevertheless, this can be achieved by adjusting contract clauses. As for the second condition, early warning not fit in well the current Dutch construction culture, which is characterized by 'lack of mutual trust', 'warning is often too late', and 'contractor is more focusing on being compensated' and so on. From the perspective of contract management, trust is not supported by the current UAV-GC 2005. Nevertheless, this can also be achieved by incorporating trust and innovative pricing mechanism such as 'target priced contract' in the current UAV-GC 2005.

Therefore, a lack of trust is the biggest challenge for early warning to be utilized properly under UAV-GC 2005. Nevertheless, every coin has two sides. Having addressed that the relationship between trust and early warning is reciprocal, and early warning has effect on promoting mutual trust between parties. Thus, a lack of trust creates opportunities for early warning to be used with the purpose of building trust, which in turn helps with the proper function of the early warning.

To conclude, simply substituting duty to warn with early warning obligation of NEC3 ECC will never work, as it only addresses the symptoms, not the cause. For proper functioning of the early warning, the whole early waring mechanisms need to be incorporated by the current UAV-GC 2005. Besides, people need to change their attitude and 'old way of working', and to work towards 'best for projects'. Early warning creates opportunities for parties to know each other better in an early stage so that parties can build trust with each other, which in turn promote 'the spirit of mutual trust and cooperation'. Eventually, early warning can be a starting point of a virtuous cycle.

9. Recommendations

In this chapter, recommendations are initially given to the company Witteveen+Bos who is interested in implementing early warning obligation of NEC3 ECC with the aim of promoting collaboration between parties and improving Dutch construction problem solving. Then, a set of recommendations are given to CROW who is currently on the outlook for updating the current UAV-GC 2005 so as to meet the market demands. Finally, limitation of this research is addressed and recommendation for future research is presented.

9.1. Recommendation for Witteveen+Bos

For avoiding abuse of the early warning provision, it has to be kept in mind by all project participants that such provision is not used for benefiting either party. Instead, the utilization of early warning should be based on the principle of 'best for projects'. If necessary, project participants should make an informal agreement upon this during Project Start-Up.

Before project starts, it is essential to give some practical training to the construction team of the contractor on how to use the early warning obligation. For properly using early warning obligation, it requires certain consistency within the contractor's own organization. Before trying to fix the problem alone, site engineers and technicians should report the issue to contract manager or project manager immediately for judgement. it is the responsibility of the contractor's project manager or contract manager to decide whether the early warning truly has impact on project outcomes (e.g. delivery, costs, and quality etc.).

At last, the original terms 'risk reduction meeting' and 'risk register' are suggested to be adjusted to 'early warning meeting' and 'early warning register' respectively, so as to avoid confusions with risk management practices.

9.2. Recommendation for CROW

There is a call for a more equal and balanced warning responsibility between the employer and the contractor. Besides, the current market is facing a demand for an instrument or a management tool, which specifies how parties are supposed to solve problem together after warning is given.

Furthermore, the term 'obvious error' in either party's duty to warn obligation of current UAV-GC 2005 creates room for opportunistic behaviors, which is suggested to be avoided. The intention of sanction of the clause 4-8 in UAV-GC 2005 is explicit. Nevertheless, it does not facilitate the contractor's warning behavior. Therefore, it is suggested to be changed. The concept of 'time available' is not realized by the current UAV-GC 2005 due to the discontinuity between the contractor's duty to warn obligation (clause 4-7) and compensation and/ or extension of time (clause 44).

Last but not least, the current UAV-GC 2005 do not support trust either by specifying how parties should behave, or by incorporating innovative contracting strategies and pricing mechanisms. This point is worth considering.

9.3. Limitation and recommendation for further research

The research in this dissertation has made a start with exploring the opportunities to apply early warning obligation of NEC3 ECC in the Dutch Design and Build construction projects. Therefore, the research is of exploratory nature. The biggest limitation of this research is the limited case projects executed under NEC3 ECC in the Netherlands, which makes it difficult to conduct case-based research (you cannot compare an apple with a pear). Instead of case study approach, expert interview had to be adopted so as to collect the empirical data. By conducting interview, questions asked to interviewees were 'generic'. As a result, project specific characteristics such as project type (infrastructure or residential), client type (public or private, and international or national), and project scale (large, medium, or small) and so on could not be taken into account in this case. Therefore, the result of the research is not typical to a specific scenario of design and build project.

In light of the limitation of this research, it is suggested to further research early warning in a case-based approach, so as to testify whether early warning can be solution for a certain scenario of Dutch design and build construction project. For instance, large infrastructure projects initiated by the public employer in the Netherlands.

Part VI References and Appendix

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Appendices

Appendix 1. Examples of early warning summarized from literature review

Table 24 Basic early warning examples and main groups(Nikander & Eloranta, 2001, pp. 387–388; Williams et al., 2012, pp. 45–46)

Basic groups of early warning	Examples and descriptions
Gut feeling	Anticipation& personal intuitive feeling
Personal, project group	Non-verbal information; personnel behavior(mood and attitude, conflicts, talking behind the back indecision, frank talks, commitment, authority disputes, excuses etc.); lack of contact with the employer; lack of resources; unrealistic planning; professional skills
Project manager, management	Project manager's management capability; management style
Project planning	Preliminary plans, project plans, tender material, contract, contract with issues, budgeting, budget contents, advance material
Project control and reporting	Progress control; Monitoring (in general, availability of materials, working level, quality and speed); budget corrections
Working within the project	Work initiation; mobilization; Initial information/lack of information, same things repeatedly; organization type
Communication	Communication (in general, tones of messages, letters, conflicting knowledge); insinuation
Expressed by parties	Typical to employer: no/delayed decisions; trust disappears; additional research; freezing; CEO; procurement. Typical to supplier and contractor: advance billing
Documents	Reporting; Schedules: Level/quality/receiving Scheduling; Technical plans; incorrect revisions; responsibilities unclear
Differences and deficiencies in project culture	First impression and first contact with each other; project terminology; lack of experience;
External sources	-
No early warnings	Difficult to observe early warnings
Others	-

Appendix 2. Relevant contract clauses

Appendix 2.1 Relevant contract clauses UAV-GC 2005

The principle of good faith in the Dutch Civil Code

Article 3:11 'Good faith' (Dutch Civil Code 3:11, 1992)
A person has not acted in 'good faith' as a condition for a certain legal effect if he knew or in the circumstances reasonably ought to have known the facts or rights from which his good faith depends. The impossibility to conduct an inquiry does not prevent that a person, who had good reason to doubt, is regarded as someone who ought to have known the relevant facts or rights.

Article 3:12 The principle of 'reasonableness and fairness' (Dutch Civil Code 3:12, 1992)
At determining what the principle of 'reasonableness and fairness' demands in a specific situation, one has to take into account the general accepted legal principles, the fundamental conceptions of law in the Netherlands and the relevant social and personal interests which are involved in the given situation.

Article 6:2 Reasonableness and fairness within the relationship between the creditor and debtor (Dutch Civil Code 6:2, 1992)
1. The creditor and debtor must behave themselves towards each other in accordance with the standards of reasonableness and fairness.
2. A rule in force between a creditor and his debtor by virtue of law, common practice or a juridical act does not apply as far as this would be unacceptable, in the circumstances, by standards of reasonableness and fairness.6:248.

Article 6:248 Legal effects arising from law, usage or the standards of reasonableness and fairness (Dutch Civil Code 6:248, 1992)
1. An agreement not only has the legal effects which parties have agreed upon, but also those which, to the nature of the agreement, arise from law, usage (common practice) or the standards of reasonableness and fairness.
2. A rule, to be observed by parties as a result of their agreement, is not applicable insofar this, given the circumstances, would be unacceptable to standards of reasonableness and fairness.

Duty to warn obligations

*Contractor's duty to warn***:**

Clause 4-7 The Contractor shall warn the Employer in writing without delay if:

(a) the Employer's Requirements; or

(b) information provided to the Contractor by the Employer pursuant to clause 3 section 1 subsection a; or

(c) the land and/or the water put at the Contractor's disposal by the Employer pursuant to clause 3 section 1 subsection b; or

(d) goods put at the Contractor's disposal by the Employer pursuant to clause 3 section 1 subsection c; or

(e) any measure taken by the Employer pursuant to clause 43 section 2; or

(f) any Variation ordered by the Employer to the Contractor pursuant to clause 14 section 1;

evidently contain or show such faults or defects that the Contractor would be in breach of the requirements of good faith if he were to continue work without issuing any warning about such faults or defects.

Clause 4-8 If the Contractor fails to perform his obligation referred to in section 7, he shall be liable for any damaging consequences caused by his failure.

Employer's duty to warn:

Clause 20-4 The Employer shall be under no obligation whatsoever to use his authority to test pursuant to this clause. It shall be at the Employer's discretion to decide whether and how he uses such authority in the course of Design Work. Nevertheless, the Employer shall inform the Contractor in writing in due time if he actually discovers a failure by the Contractor or if he must have been aware of such a failure.

Clause 21-10 The Employer shall be under no obligation whatsoever to use his authority to test pursuant to this clause. It shall be at the Employer's discretion to decide whether and how he uses such authority in the course of Construction and Maintenance Work. Nevertheless, the Employer shall inform the Contractor in writing in due time if he actually discovers a failure by the Contractor or if he must have been aware of such a failure.

Clause 22-3 Subject to the provisions of section 2 and the provisions of clause 23 and clause 28, it shall be at the Employer's discretion to decide whether and how he acknowledges the Documents, representatives, subcontractors, Work and results of Work referred to in section 1 or the Variations referred to in clause 15 section 3. Nevertheless, the Employer shall inform the Contractor in writing in due time if he actually discovers a failure of the Contractor or if he must have been aware of such a failure.

Cost compensation and/or extension of time

Clause 44-1 Subject to the provisions of clause 45, the Contractor shall be entitled to cost compensation and/or extension of time only if:

(a) these UAV-GC 2000 expressly provide for such cost compensation and/or extension and on condition that the costs and/or delay are caused by a circumstance that cannot be attributed to the Contractor; or

(b) the costs and/or delay are caused by a circumstance for which the Employer is responsible pursuant to the Contract against which the Contractor did not have to warn given his obligation referred to in clause 4 section 7; or

(c) an unforeseen circumstance arises the nature of which is such that, according to the standards of good faith, the Employer cannot expect the Contract to be maintained unaltered.

Clause 44-2 If the Contractor is of the opinion that he is entitled to cost compensation and/or extension of time, he shall notify the Employer thereof in writing with all due despatch, stating the reasons. Unless the provisions of section 3 apply, this notification shall be accompanied by the notification referred to in section

Appendix 2.2. Relevant contract clauses NEC3 ECC

'The spirit of mutual trust and cooperation'

Clause 10.1 The *Employer*, the *Contractor*, the *Project Manager* and the *Supervisor* shall act as stated in this contract and in a spirit of mutual trust and co-operation.

Early warning obligation

Clause 16.1 The *Contractor* and the *Project Manager* give an early warning by notifying the other as soon as either becomes aware of any matter which could

- Increase the total of the Prices.
- Delay Completion,
- Delay meeting a Key Date or
- Impair the performance of the works in use.

The *Contractor* may give an early warning by notifying the *Project Manager* of any other matter which could increase his total cost. The *Project Manager* enters early warning matters in the Risk Register. Early warning of a matter for which a compensation event has previously been notified is not required.

Clause 16.2 Either the *Project Manager* or the *Contractor* may instruct the other to attend the risk reduction meeting. Each may instruct other people to attend if the other agrees.

Clause 16.3 At a risk reduction meeting, those who attend co-operate in

- making and considering proposals for how the effect of the registered risks can be avoided or reduced,
- seeking solutions that will bring advantage to all those who will be affected,
- deciding on the actions which will be taken and who, in accordance with this contract, will take them and
- deciding which risks have now been avoided or have passed and can be removed from the risk register.

Clause 16.4 The *Project Manager* revises the risk register to record the decisions made at each risk reduction meeting and issues the revised risk register to the *Contractor*. If a decision needs a change to the works information, the *Project Manager* instructs the change at the same time as he issues the revised risk register.

Compensation events

Clause 60.1(18) A Breach of contract by the *Employer* which is not one of the other compensation events in this contract.

Clause 61.5 If the *Project Manager* decides that the *Contractor* did not give an early warning of the event which an experienced contractor could have given, he notifies this decision to the *Contractor* when he instructs him to submit quotations.

Clause 63.5 If the *Project Manager* has notified the *Contractor* of his decision that the *Contractor* did not give an early warning of a compensation event which an experienced contractor could have given, the event is assessed as if the *Contractor* had given early warning.

Appendix 2.3. Relevant contract clauses FIDIC YB

Early warning provision

Clause 8.3 ……. The contractor shall promptly give notice to the Engineer of specific probable future events or circumstances which may adversely affect the work, increase the Contract Price or delay the execution of the Works. The Engineer may require the Contractor to submit an estimate of the anticipated effect of the future event or circumstances, and/or a proposal under Sub-Clause 13.3.

Appendix 3. interview protocol

Interview Protocol

The exploration of improvements for the warning obligation in Dutch design and build construction project

Delft University of Technology/ Witteveen+Bos

Introduction

Good morning (afternoon). My name is Yu Gao. First of all, I want to thank you for participating in this interview. You have been selected to speak with me because you have been identified as someone who has a great deal to share about contract management. My research focuses on exploring the improvement of the warning obligation between employer and contractor on Dutch design and build construction projects by using UAV-GC 2005. Special interest is given to the Early Warning [1] obligation NEC3 ECC originated from U.K. construction industry, so as to see whether it fits in with the context of Dutch construction industry, and if there are opportunities to use it fit the Dutch design and build construction projects. The interview consists of two sections. In the first section, I want to ask you about your basic information and experience with contract management. The second section is about interview questions, in which six open-ended questions will be posed to ask your perceptions towards the warning obligation in UAV-GC 2005, early warning in NEC3 ECC, and the role they play or might play in solving project problems. I would like you to feel comfortable with saying what you really think and how you really feel.

Audiotaping Instruction

Considering that I can get all the details but at the same time be able to carry on an attentive conversation with you, this conversation between you (the interviewee) and me (the interviewer) will be recorded by using audiotape. I assure you that this conversation will be kept confidential and will be used only for the purpose of this research.

Section I - Background Survey

Background information and experience with contract management

- Your name _____
- Your present institution _____
- Your present role/function _____

[1] Early warning clause (also see appendix 2) in NEC3 ECC read as:
The contractor and the project manager give an early warning by notifying the other as soon as either becomes aware of any matter which could increase the total of the prices, delay completion, delay meeting a key date or impair the performance of the works in use.
The contractor may give an early warning by notifying the project manager of any other matter which could increase his total cost. The project manager enters early warning matters in the risk register. Early warning of a matter for which a compensation event has previously been notified is not required.

- On which side are you operating (Employer or Contractor) _____
- Your experience with UAV-GC 2005 contract (years) _____
- Your experience with NEC3 ECC (familiar/ reasonably familiar/ not familiar/ never heard of it) _____
- Your experience with Early Warning (familiar/ reasonably familiar/ not familiar/ never heard of it) _____

Section II – Interview questions

1. Based on your experience with Dutch design and build projects (UAV-GC 2005 contract), please tell me:

   1) How project problems[2] during the project realization (design and construction) phase are handled by the employer and the contractor?

      - What project problems are the most common problems on the realization phase?
      - What kind of problems are most concerned by the employer (and by the contractor)?
      - Did either of them inform the other immediately at the first place where the problem occurred?
      - And what are the reasons for him to/ not to bring the problem up?
      - After one party informed the other about the problem, what was the attitude and reactions of the other?
      - How project problems are solved and solutions are sought by both parties?
      - How consequences of project problems are dealt by both parites?
      - Were there early warning signs for those problems?

   2) How do the employer and the contractor deal with the early warning signs[3] of those project problems?
      - How were early warning signs identified by the employer and the contractor? (by what kind of instruments, tools, and methods, or through what kind of process?)
      - If yes, how did parties react to those early warning signs, were they timely communicated between parties?
      - If yes, what are the incentives for them to share the information about the early warning signs?
      - If not, what would be the challenges or barriers for early warning signs to be communicated between parties?

[2] Problems are issues related to, for example, time schedule, planning, communication, project control and monitoring, engineering and technical design, and management and personal problems etc.,

[3] Early warning signs are matters, issues, and phenomena on which information is received that it might come to pass in the future.

2. Assuming that problems are best solved [4], what conditions are required or desired for facilitating problem solving between the employer and the contractor on Dutch design and build construction projects. Please answer this question from following perspectives.

   a. Collaboration (parties' attitude and behavior, and way of seeking solutions)
   b. Contract (parties' responsibility, contractual mechanisms and procedure, and early warning etc.)

   What else are in your mind?

3. What is your opinion about *Duty to warn*[5] obligation in UAV-GC 2005?
   Possible follow ups:
   - Do the employer and the contractor literally know they have the obligation to warn the employer?
   - Do the employer and the contractor actually warn each other?
   - If yes, when does the contractor (or the employer) warn the employer (the contractor), and out of what kind of reason? If not, why not?
   - How does the employer (or the contractor) react to the warning issued by the contractor (the employer)? Under normal circumstances, what is the next step after either party warn the other?
   - What's your understanding toward this "obvious errors" in clause 4-7?
   - What's your opinion about clause 4-8?
   - What's your opinion about the employer's duty to warn?
   - What do you think of the balance between the employer's and the contractor's duty to warn obligation?
   - Do you think under duty to warn in UAV-GC 2005, project problems can be identified earlier?
   - Do you think duty to warn obligation can encourage parties to work together for solving project problems?
   - The 'duty to warn' in UAV-GC 2005 is not exercised actively between parties on Dutch design and build construction project, do you know why?
   - To your opinion, is there room for improvements for the duty to warn obligation in UAV-GC 2005 to be used more actively?

[4] Problems are solved effectively and amicably in ways other than going to arbitration or court

[5] See appendix 2, §4(7) of the UAV-GC 2005 lays down that the contractor is obliged to warn the client immediately in writing if the Employer's Requirements, the appended annexes, the basic contract, the information, the land and/ or water or the goods provided by the client, or a measure taken by the client or a variation ordered by him, contain errors or displays defects that the contractor would be in breach of the requirements of good faith (standards of reasonableness and fairness) if he were to continue work without issuing warning notification about such faults.
§4(8) of the UAV-GC 2005 sets out the legal consequences for contractor's failure of not performing his duty to warn: If the contractor fails to perform his obligation referred to §4(7), he shall be liable for any damaging consequences caused by his failure.

4. What's the influence of '*the Principle of good faith*' [6] in Dutch Civil Law on the way the warning obligation is exercised between the employer and the contractor?
   Possible follow ups:
   - Do the employer and the contractor literally know they have to act in line with the principle of good faith *(and the principle of reasonableness and fairness)* as stated in the Dutch civil Law when exercising the warning obligations?
   - What's the influence of 'the principle of good faith' on parties' behaviors?
   - Does the principle of good faith play a role in contractor's duty to warn obligation?
   - Does the principle of good faith play a role in employer's duty to warn obligation?

5. The *mutual trust* [7]is written down in NEC3 ECC, what's your consideration about it?
   - Is it clear to you what is meant by 'in a spirit of mutual trust and co-operation'? as stated in the clause?
   - What would be its influence on the warning obligation between the employer and the contractor?
   - Different from 'the principle of good faith', mutual trust is written down in the contract, what do you think of it?

6. What's your opinion about Early Warning obligation from NEC3 ECC?
   Possible follow ups:
   - Can you describe, what's the difference between the early warning obligation from NEC3 ECC and the duty to warn obligation from Dutch UAV-GC 2005?
   - Do you think under early warning obligation project problem can be identified earlier?
   - Do you think this obligation encourage parties to work together for solving project problems?
   - How does this obligation influence parties' attitude for solving project problems and seeking solutions?
   - To your opinion, would the employer and the contractor be willing to warn each other as stated in the early warning clause?
   - Based on your experience, what else would happen between the employer and the contractor?
   - What would be the advantages or plus for early warning to be used in the Dutch DB construction projects?
   - What would be the barriers or difficulties for early warning to be used in the Dutch DB construction projects?
   - What's your personal attitude towards this obligation?

7. Based on your experience with UAV-GC 2005 and/ or NEC3 ECC contract, which clauses in the contract are relevant with the aspects mentioned in the table.

[6] See Appendix 2

[7] Clause 10.1 (see appendix 2) in the NEC3 ECC obliges the employer, the contractor, the project manager, and the supervisor to act as stated in the contract and in a spirit of mutual trust and cooperation.

Perspectives	Aspects relevant with problem solving	UAV-GC 2005	NEC3
Collaboration	Parties' reasonable behavior (working fairly and professionally)		e.g. 10.1
	Parties' attitude		
	Parties' way of seeking solutions		
Contract itself	Parties' responsibilities		
	Contractual mechanisms and procedures		
	Early warning		

Appendix 4. List of interviewees

Operating side	Partici-pants	Abbre-viation	Company	Role /Function	Date	Location	Experience
Employer (E)	Jackie Dekker	JD	Project Management Bureau in Amsterdam	Project manager	14 June	Amsterdam	UAV-GC 2005
	Robert Meijer	RM	Project Management Bureau in Amsterdam	Project manager	14 June	Amsterdam	UAV-GC 2005
Employer's agent (E)	Peter Strijbis	PS	Witteveen+ Bos	Contract mgt.	13 June	The Hague	UAV-GC 2005
	Menno Meulebeek	MM1	Brink Groep	Contract mgt.	22 June	Rotterdam	NEC3 ECC& UAV-GC 2005
	Matthew Marshall	MM2	Witteveen+ Bos	Contract mgt.	23 June	The Hague	UAV-GC 2005
	Maarteen-kees van Breukelen	MKB	Witteveen+ Bos	Contract mgt.	23 June	The Hague	UAV-GC 2005
	Arjan Visser	AV	Antea group; CROW	Contract mgt.; UAV-GC 2005 trainer	6 July	The Hague	UAV-GC 2005
	Jan Tiddo Bresters	JTB	Witteveen+ Bos	Contract mgt.; Dutch Arbitration	19 July	Deventer	UAV-GC 2005
Contractor (C)	Conny Koreman	CK	Ballast Nedam	Contract mgt.	15 June	Amstelveen	UAV-GC 2005
	Johan Ursem	JU	BAM infra B.V.	Legal counselor	5 July	Gouda	UAV-GC 2005
	Rob Smits	RS	BAM infra B.V.	Contract manager	5 July	Gouda	UAV-GC 2005
	Joost de Vries	JVR	To Interface	Contract mgt.	13 July	The Hague	NEC3 ECC& UAV-GC 2005

Appendix 5. Interview summary

Appendix (#1)

Q1. Based on your experience with Dutch design and build projects (UAV-GC 2005 contract), please tell me how the employer and the contractor deal with the early warning signs of project problems[3], during the execution (design and construction) phase of the project?
▪ There are all kinds of project problems, but most importantly due to two factors: 1) The contractor's interpretation of the contract itself and the documents provided by the employer together with the contract: The employer is concerning about the interpretation of the project demands by the contractor. However, there are a lot of misunderstandings between the employer and the contractor in terms of the information and requirements provided by the employer. 2) The timeframe for the contractor to come up with the solution: Most of the time, the time given to the contractor to get the detailed design for the project is too short or too little (not enough). ▪ I do believe there are early warnings signs during the execution phase of the project, but most of the time, the contractor will keep them for themselves if they think they are able to manage that through their own process and by their own team. So early warnings signs are not communicated frequently between parties. ▪ At the start of project execution when the contractor is making detailed design for the project, the employer has more knowledge than the contractor as he has already long (e.g. 1 year) been working on that. The employer literally wants the contractor to communicate and share the vision with him about the potential problems. But the contractor sometimes is a bit afraid of sharing either with the employer or with the employer's representative. ▪ Ironically, neither the employer is always willing to share the vision of potential problems with the contractor. ▪ Either for the employer or for the contractor, people feel vulnerable if they share too much information with each other (current mainstream atmosphere at the Dutch construction industry). ▪ A lack of mutual trust is so far a main problem in the Netherlands construction industry ▪ Not all kinds of problem, but sometimes problem are discussed by the employer and the contractor mainly because they cannot solve the problem by themselves. However, I have never experienced the early warning signs being shared by the employer and the contractor.
Q2. Assuming that problems are best solved, statements are made as the required conditions for effective problem solving. Please indicate to what extent do you agree with the following statements? You can answer agree, disagree, or you can keep your opinion as neutral. Please elaborate on your choice. At the end of this questions, you can also supplement what else would you think is desirable for facilitating problem solving between the employer and the contractor.
1) Parties should **trust/ have faith** in each other when dealing with problems Agree, basic conditions for dealing with problems 2) Once problem occurs, parties need to be clear about their own responsibilities for solving the problem, and should solve problems **jointly** as much as possible

Agree

3) The solution for a problem should as much as possible benefit **both** parties (win-win outcome)
Neutral, it depends on the situation

4) Instead of letting problems evolve into major conflicts between parties, actions should be taken **as soon as possible** to deal with them
Agree, but sometimes problems will be solved by themselves, it would be better to wait for a bit

5) Problems should be solved at the **lowest level** where it occurs by people who are familiar with them, rather than referring them to people in a higher authority level (e.g. senior management) who have less knowledge about them
Agree, but when problem could not be solved at the lowest level it has to be referred to the higher authority level

6) Both parties should have **a balanced** responsibility and opportunity to inform each other about the situation of the problem
Agree, it's not the case at the moment at the UAV-GC 2005, the warning responsibility of the employer and the contractor is not at the same level, the contractor assumes more responsibilities.

7) Once problem occurs, parties should at least have a meeting **face to face** to discuss and seek solutions
Agree

8) For avoiding a same/similar problem to occur again in the future, parties need to **learn** from previous problem solving experience
Agree, in practice, there will be an evaluation meeting at the end of the project for both parties. So the learning experience is prepared for the next project instead of the current project. However, I think it would be better to do it also in between during the process of the project.

Supplements:
It's important for both the employer and the contractor to know (get familiar with) each other.

Q3. What is your opinion about *Duty to warn* obligation in UAV-GC 2005, and what role does it play in solving project problems and identifying early warning signs during the project execution?

- Duty to warn is not dealing with all kinds of project problems. Instead, it is more focusing on errors or faults in the documents, information, goods, lands, and water provided by the employer, which, nevertheless, might lead to further problems if they are not solved properly.
- Both parties know they have the duty to warn, but the responsibility is less balanced as the contractor assumes more responsibilities than the employer.
- The employer's duty is more focusing on warning the issues in the technical specification of the project (detailed design). It is not aiming at solving all kinds of problems especially related to time, costs, and risks etc. Because, he is not obliged to do so.
- Sometimes the contractor warns the employer, sometimes they do not warn as some problems are less foreseeable.
- The reason for the contractor to warn the employer is to protect himself from the mistakes made by the employer.
- Two possibilities for the contractor not to warn the employer

- The contractor for real does not notice the problem
- The contractor pretends he does not notice the problem (it's difficult for the employer to prove that the contractor literally knew something is coming and he did not warn him)

- The employers' attitude and reactions towards a certain warning issued by the contractor differs. Good employer will try to solve the problem together with the contractor. As the consultant, our function is to encourage and help the employer in that way.
- Thus, the contractor and the employer both have different perspective when looking at project problems. The contractor is caring about problems which might have influence on time and costs, while the employer is concerning about problem which might have influence on the outcome and the quality of the project.
- In any way, there should be incentives for both parties to warn each other about the problem. For example, pain/gain sharing.
- For improving duty to warn to be used more actively, more equal and balanced responsibilities have to be assumed on both parties, so both parties have to warn each other if they see something is coming. However, the current duty to warn in UAV-GC is less or not balanced.

Q4. Does *the Principle of good faith*[5] in Dutch Civil Law have an influence on the way the warning obligation is exercised between the employer and the contractor?

- No matter whether they are from the employer's side or the contractor's side, most of people with the function of contract management are aware of the standard of reasonableness and fairness, but I do not think they all know about the principle of good faith

Q6. What would be the possible effect of Early Warning obligation from NEC3 ECC on facilitating problem solving and identifying early warning signs?

- Even if there is risk management in practice for parties to deal with project problems, however not all of the information about their own risks are shared between both parties. Sometimes, parties are not willing to let the other know about his own risks.
- In the current UAV-GC 2005 contract, there is no instrument for parties to identify and solve problems earlier.
- -Early warning would not be an almighty problem solver, but as if it is written in the contract, there is always a contractual obligation (or clause) that parties can refer to. Thus, it can help identifying problems earlier, to bring them up to the table, and to solve them, instead of keep problems for themselves. Besides, I think It would contribute to improving the relationship between parties as it assumes more balanced responsibilities to warn each other on both parties.
- The barriers or difficulties for using this obligation in the Dutch design and build projects are not clear to me.

Q7. The *mutual trust* is written down in NEC3 ECC, what's your consideration about it?

- The term 'in a spirit of mutual trust' is not clear
- But, when it is written down in the contract, then you have to behave yourself accordingly
- It has positive effects on the early warning obligation. First of all, parties have to act as stated in the contract to give early warnings. If they do not do so, that would be in breach of contract.

Secondly, they shall act 'in a spirit of mutual trust' to not abuse the early warning. Otherwise, it is also a breach of contract.

Appendix (#2)

Q1. Based on your experience with Dutch design and build projects (UAC-IC 2005 contract), please tell me:

1) How project problems during the project execution (design and construction) phase are handled by the employer and the contractor?
2) How do the employer and the contractor deal with the early warning signs of those project problems?

1)

- Once we made mistakes in our documents. After the contract was awarded, the contractor had misunderstanding with us towards part of the work written down in the contract, to which we were supposed to tell the contract that is his work, while the contractor had different interpretation and they thought that should be our work.
- By consulting the lawyer, the contractor should pay for that work, but in the end we split the costs for that part of the work as we considered the collaboration between us was good so we did not want to damage the collaboration and relationship between us.
- It was kind of a 'win-win' situation (give and take) as we also have to pay for the mistakes we made in our documents.

2)

- If I understand your definition about 'early warning' correctly, from our side (as the client), we do use this kind of mechanism or tool in practice, but we do not call it 'warning'. For example, we highlighted in every document provided by us to the contractor that 'if you see something is not correct, please tell us'.
- From the side of the contractor, based on the example I give, we brought the problem up, and we expected that the contractor should have given an early warning about our mistake. But the contractor did not give such warning to us.
- Another example as the early warning given by us, we knew that the people from the area where the project is located probably would complaint the project, which could disturb of interrupt contractor's work. Therefore, we used this early warning to inform our contractor about the possible situation.
- If the contractor would like to share warnings or potential problems with us earlier, the trust between us will be increased.
- Collaboration is important, if we have trust in each other, the early warning signs will be shared between us without saying.

Q2. Assuming that problems are best solved, statements are made as the required conditions for effective problem solving. Please indicate to what extent do you agree with the following statements? You can answer agree, disagree, or you can keep your opinion as neutral. Please elaborate on your choice. At the end of this questions, you can also supplement what else would you think is desirable for facilitating problem solving between the employer and the contractor.

9) Parties should **trust/ have faith** in each other when dealing with problems
Agree, if parties do not have faith in each other, every situation between us would be difficult, every project should begin with trust

10) Once problem occurs, parties need to be clear about their own responsibilities for solving the problem, and should solve problems **jointly** as much as possible
Agree,

11) The solution for a problem should as much as possible benefit **both** parties (win-win outcome)
Agree but controversial, win-win outcome can contribute to keeping the trust between each other and building a healthy process

12) Instead of letting problems evolve into major conflicts between parties, actions should be taken **as soon as possible** to deal with them
Agree, the sooner the better, and the longer you wait the bigger the problem you get

13) Problems should be solved at the **lowest level** where it occurs by people who are familiar with them, rather than referring them to people in a higher authority level (e.g. senior management) who have less knowledge about them
Agree but controversial, some problem has to be referred to the higher authority (for example, financial problem with big consequence), the contractor's additional wishes have the financial consequence for the employer

14) Both parties should have **a balanced** responsibility and opportunity to inform each other about the situation of the problem
Agree,

15) Once problem occurs, parties should at least have a meeting **face to face** to discuss and seek solutions
Agree, neither by email or by email, things will be getting complicated. First talk to each other face to face, then put the agreement in writing by mail for example (business as usual).

16) For avoiding a same/similar problem to occur again in the future, parties need to **learn** from previous problem solving experience
Agree, learn from your mistakes, live and learn

Supplements:
Start with good collaboration (trust and faith) and positive attitude, start with an informal session to know each other and to know each other's expectation.

Q3. What is your opinion about *Duty to warn* obligation in UAC-IC 2005?

- I think we as the employer know that we have the duty to warn, and I assume the contractor knows about it as well.
- This duty to warn is important as no one is perfect and people make mistakes. But duty to warn is not used that often by the contractor in practice.
- We as the employer wish the contractor could warn us more often, and we also expect them to warn us a bit earlier when we as the employer can do something, before either it is already in the contract or the problem is already happened.
- During the project execution, the contractor gave us a few warnings about, for example, polluted soil etc.

- The duty to warn in the UAC-IC 2005 is better for the contractor to warn the employer before than after the execution. Because afterwards, the risks will be transferred to the contractor. Furthermore, we would have the suspicions that whether that is the contractor's additional wish or not.
- Whether duty to warn can identify early warning depends on how would the contractor use it.
- For the duty to warn to be used more actively, the employer and the contractor have to change their rather old mindset or attitude (battle between each other). Instead, we should work together and trust each other, and do not be afraid of warning each other.

Q4. Does *the Principle of good faith* in Dutch Civil Law have influence on the way the warning obligation is exercised between the employer and the contractor?

- We as employer act in line with the principle of reasonableness and fairness when we are exercising our warning obligation
- However, not all of the contractor do
- Out of good faith, we should have warned each other
- Contractors are afraid of losing their contracts and showing their vulnerability

Q5. What's your opinion about Early Warning obligation from NEC3 ECC?

- By reading early warning clause, those points listed make me think of the risk management (analysis) practices on the project execution phase.
- If compare this with the Duty to warn obligation in UAC-IC 2005, the range of this obligation is bigger
- Positive attitude towards this early warning obligation
- As the client, we are willing to use this obligation to prevent further delay or costs overrun
- We wish to receive early warning signs that effects the costs, quality, and planning, so that we could see if we can help or calculate the risk
- I think early warning has the function of building trust between us and the contractor
- The distrust would be a challenge for early warning to be used.

Q7. The *mutual trust* is written down in NEC3 ECC, what's your consideration about it?

- My attitude towards this clause is positive, but I do not know how to control in practice
- To my understanding, what is meant by this clause is same project goals, transparent about our personal goals.

Other relevant information

- For a Primary School in Amsterdam by using UAC-IC 2005, the contract worked very well.
- Fast building (1 year, 6 months for design and 6 months for construction)
- Output specification from the client (employer's requirements), only for the quality, which they put it on the market looking for the contractor
- Process include different steps (Verification and acceptance in every phase)
- In the traditional way of working (UAV 2012), the contractor behaves strategically to win the tender by lowest bid (for example, by leaving out something on the contract, which the client did not notice at that moment. Afterwards, the contractor was asking additional money for 'extra work' which out of good faith he should have done)

- In the UAC-IC 2005, the client describes his need in the employer' requirements without going too detail on the design. This leaves the room for the contractor to come up with the solutions. It works better than the traditional way, in which the contractor is constantly taking advantages of the errors in the contract or contract data to ask the client for additional money.
- It comes down to people, there are good contractors, while there are bad contractors as well who do everything just for making more money.

Appendix (#3)

Q1. Based on your experience with NEC3 contract and UAV-GC contract, please tell me:
1) How project problems during the project realization (design and construction) phase are handled by the employer and the contractor?
2) How do the employer and the contractor deal with the early warning signs of those project problems?

1)

- Under UAV-GC contract, the employer and the contractor deal with project problems on their own. Unless either of them sees the problem is actually caused by mistakes made by the other party, he will inform the other party about the issue
- Normally, the employer and the contractor will have a formal meeting presented by people in a bit high authority level to discuss and to deal with the problem.
- From the contractor's perspective, the biggest challenge in the project realization phase would be the translation process from preliminary design into the construction design, in which his construction design has to meet the employer's requirements.
- during which the most common problems for the contractor related to:
  - technical and engineering problems
  - communication problems in terms of the design
  - documents and information provided by the employer contain errors and consistencies
- For the employer, the most common problems are also related to:
  - technical and engineering problems
  - communication problems
- In the ICC project, problems were dealt with by both parties based on the principle of "best for projects", which is realized by using the target pricing mechanism in NEC3 ECC. Thus, the both parties were incentivized to get the "best for project".

2)

- First of all, parties discuss any issues which might impact the project internally, if they see that issue might also influence the work of the other party, either of them will give the early warning to the other party.
- The early warnings were communicated timely without delay.
- Early warning signs were firstly recorded on the document management system which is named as IBIS4Projjectsor developed by Brink group, then during the early warning meeting the newest early warnings and the attached actions to the specific early warning were discussed.
- If we see that is a risk, we will allocate the issue to risk reduction meeting during which we will further discuss that issue

- Early warnings were identified mainly by people's judgement ("gut feeling") based on their knowledge and experience
- Early warning is separated from risk management, and we use early warning as the input for the risk register.
- We add parameters to the early warning, by evaluating the its impact on time, costs, and performance etc., we prioritize different early warnings and treat the most urgent one first
- In the ICC project, I do not see many challenges or barriers(struggles) for using early warning
- In the ICC project, we use software application (IBIS4Projects) to register and communicate early warning
- In the ICC project, parties were obliged to inform each other at the first place where problems occurred due to the early warning system.
- In ICC project, parties' attitude toward the early warning received is very positive, and people treat early warnings proactively.

Q2. Assuming that problems are best solved, what conditions are required or desired for facilitating problem solving between the employer and the contractor on Dutch design and build construction projects. Please answer this question from following perspectives.

a. Timeliness
b. People's attitude and way of working
c. Solution
d. Communication responsibility
e. Communication channel and style
f. Lessons learnt

a. For problem solving, procedure is very important, the procedure clarifies once early warning is identified, what would be the following actions for both parties
b. Mutual trust and collaboration, people's awareness of "best for project and best for all" in this respect is also very important
c. Come to solution, people have to meet to discuss it. Then write it down what is the mutual agreement for which party to do what to solve the problem
d. Both the employer (the project manager) and the contractor is obliged to give early warning
e. People have to meet to discuss it, register the early warning, and frequently monitor it

Q3. What is your opinion about *Duty to warn* obligation in UAV-GC 2005?

- A contractual obligation used by the contractor for self-protection
- People are aware of that, but might not always act accordingly.
- People cannot be forced to warn as duty to warn of UAV-GC 2005 is not a management procedure but merely a legal obligation
- Duty to warn in the UAV-GC 2005 is rather unbalanced, as it is almost all about the contractor's responsibilities to warn the employer in terms of what the employer did not do well (errors and mistakes in everything provided by the employer).
- Advantages elements of early warning from NEC3 ECC can be used to improve the current duty to warn obligation in UAV-GC 2005

Q4. What role does duty to warn obligation from UAV-GC 2005 play in solving project problems? Please answer this question from following perspectives.

a. Timeliness

b. People's attitude and way of working c. Solution d. Communication responsibility e. Communication channel and style f. Lessons learnt
a. duty to warn is merely a legal obligation, there is no procedure exist for securing problems being discussed and dealt with timely b. duty to warn encourage parties to think about themselves first, it is not of the nature to encourage parties to work jointly towards solutions which benefit both parties. Instead, it separates parties. c. see b. d. duty to warn lays large warning burden on the contractor's shoulder e. not relevant, see a. f. not relevant In a nutshell, duty to warn is merely a contractual obligation, it is not of an instrumental or procedural nature to, for example, change people's attitude and way of working, or to encourage parties to seek solutions together.
Q5. What's the influence of '*the Principle of good faith*' in Dutch Civil Law on the way the warning obligation is exercised between the employer and the contractor?
▪ A lot of people are aware of it and they do use it ▪ This principle is used in the Nederland for seeking compromise during negotiation for the damaging consequences ▪ It is also part of the Dutch mentality (for example "give and take") ▪ It is formalized in the Dutch law, but it is also used a bit informally ▪ It is good for the principle to be there, but I do not think it has a large impact on the UAV-GC 2005 contract or the warning obligation
Q6. The *mutual trust* is written down in NEC3 ECC, what's your consideration about it?
▪ It has a positive impact on people's awareness of their behavior as it is the first line of the NEC3 contract ▪ The clause to me is clear, it incentivizes people to work together, to seek collaboration, to encourage parties to work together towards the "best for project" ▪ Trust is in the contract does not mean parties can trust each other automatically ▪ Generally, it is good it is there which can increase people's awareness
Q7. What's your opinion about Early Warning obligation from NEC3 ECC? (based on experience of the ICC project)

- Early warning is used actively during the project, and it serves as the starting point for the compensation event. The entitlement to the compensation event will stimulate the contractor to give early warning
- Early warning is very important to NEC3 contract, it is of the philosophical nature for this contract to use it.
- Parties are obliged to inform each other at the first place where problems occurred
- And it is aiming for potential problems that might have consequence for project costs, delivery, and performance.
- So it is up to people especially the project manager to keep it in mind to give early warning which might truly has impact on project time, costs, and performance.
- Open book principle (both parties share pain/gain) in NEC3 ECC would be an additional plus for the early warning to function properly, but not compulsory as early warning is first of all a contractual obligation, parties are obliged to do so
- Early warning is an equal obligation as the employer is also obliged to give early warning to the contractor if he sees some mistakes made by himself, because that will compromise the goal of the project if he does not do it.
- Early warning is aiming at seeking what is "the best for project", it is not used for benefiting either one of the parties
- Early warning is a really good instrument for parties to jointly solving project problems, that is what is absent at UAV-GC 2005 contract.
- Early warning function very well under NEC3 ECC in which both parties have clear roles and responsibilities
- What's important for early warning to work under UAV-GC 2005 is something can encourage parties to work together, for example, the target cost pricing mechanism in NEC3 ECC
- For early warning to function well, it is of the philosophy of the contract to provide a collaborative working environment for both parties, and the contract itself has to be more balanced, parties have to be treated equal
- Nevertheless, the value of early warning itself from NEC3 ECC is that it is of instrumental and procedural nature which is what absent in UAV-GC 2005
- The challenges for early warning could be
  - a low level of trust between parties;
  - administrative burden (paperwork) for the contractor and the project manager of the employer

Q8. What role does (or would) the early warning obligation play in solving project problems? Please also answer this question from following perspectives.

a. Timeliness
b. People's attitude and way of working
c. Solution
d. Communication responsibility
e. Communication channel and style
f. Lessons learnt

a. According to the procedure regulated in early warning, problems can be at least discussed timely, so proper actions can be taken
b. It encourages people to work together and to work more cooperatively

c. Solution is sought by parties based on the principle of "Best for project"
d. It is of both parties' equal responsibility to give early warning, the warning responsibilities for both parties are rather balanced
e. Warning followed by meeting and registering, finally the agreement would be in writing
f. Not relevant

Other:

- Kick start for the compensation event

Other relevant information

- After graduated from university, Mr. Menno Meulebeek joined Brink group
- He was involved in the ICC project as a junior project manager
- Different standard forms of contract were compared, and finally NEC3 stood out as it was considered the most suitable contract for the ICC project. For example, the value of transparency and equality highlighted by NEC3 ECC.

Appendix (#4)

Q1. Based on your experience with Dutch design and build projects (UAC-IC 2005 contract), please tell me:

1) How project problems during the project realization (design and construction) phase are handled by the employer and the contractor?
2) How do the employer and the contractor deal with the early warning signs of those project problems?

1)

- The most common projects are related to design and scope of work.
- The contractor is challenged to come up with a design which fit in the employer' requirements and which is also risk-accepted to himself (e.g. ground conditions, and surrounding areas etc.).
- The contractor's design should not be a 'black box', in which the contractor make his own design based on his own pre-conceptions (assumptions, risk analysis, and calculation etc.), as that does not really work to meet the employer's requirements and expectations.
- In principle, there is supposed to be a lot of 'warnings' (questions) from the contractor during the contractor's design process, in which the client should utilize his (background) information to help with the contractor's design (e.g. ground conditions, surrounding areas, the compatibility with the infrastructure next to it etc.)
- However, it is often the case that the interaction between the employer and the contractor during this phase is quite limited.
- One of the reason is, due to the discontinuities within the employer's organization, the body of knowledge in a certain area cannot be properly utilized to help out the contractor's design. What the employers often do is to hire the contract manager to do this job, who has much less information and knowledge than the employer. In this case, the contract manager cannot really give a warning.
- As a result, when the contractor asks very specific questions to the employer, the employer becomes suspicious of the motivations behind the question instead of the question itself.

- The design is a dynamic process, in which both parties should contribute their own effort (knowledge, experience, and information) to find the optimal solution for the project
- The design is always about making choices
- Normally, parties do not warn each other immediately when problems occur but it happened. It very much depends on the relationship between parties, and the way they do it
- What I tried to do is to separate the interaction between parties into two different types of interactions, which are technical interaction for solving the problem and contractual interaction for liability issue respectively. The contractual meeting is normally after the technical meeting.
- To my opinion, risks should be reduced together by both parties, but what parties often think is 'that is your problem, not mine'.
- So what I suggest is to, first of all, get parties to the table for solving the problem irrespective of the liability issue that who is going to pay for it. How to get parties to that table as I see is to use a warning system.
- Therefore, the process written down in the early warning clause of NEC3 ECC happened already in practice, but it just has not been formalized.

2)

- Sometimes, there are early warning signals on projects. For example, with the implicit information received you see something as a risk, but it is hard to tell how big the risk really is.
- Most of time, early warning signs are identified based on people's experience and knowledge (gut feeling).

Q2. Assuming that problems are best solved, what conditions are required or desired for facilitating problem solving between the employer and the contractor on Dutch design and build construction projects. Please answer this question from following perspectives.

a. Timeliness
b. People's attitude and way of working
c. Solution
d. Communication responsibility
e. Communication channel and style
f. Lessons learnt

The perspectives mentioned above are about how people do project together, which are not written down in the contract, thus

a. Problem should be solved timely, but the challenge is you do not always know it is a problem, you probably know that might be a problem. It requires time and efforts to explore and investigate the potential problems
b. Not relevant
c. Early warning is not explicit in the UAV-GC 2005
d. Regular meetings not in the contractual but in the practical side help dealing with potential problems, in which people could discuss potential problems and decide whether more research needs to be conducted in terms of how to solve it.

Others:

- When dealing with problems, parties need a 'comfort zone', in which they are free to talk. However, during the negotiation regarding consequences, people are always under pressure.
- Problem would better be discussed regularly, and decisions need to be made during the meeting, so that problems will no always hang around.

Q3. What is your opinion about *Duty to warn* obligation in UAC-IC 2005?

- Legally, it's clear in the UAV-GC 2005, but it is not always explicitly utilized. Because people take long time to realize what the consequences are.
- It is legally binding, but it does not help solving problems
- Whether parties warn each other depends on the situation, but I am used to be formally warned as well.
- What I often see is one party think that is a problem while the other party does not think so. If that is the case, the party who really think that is a problem will formally warn.
- Formal warning has an impact on 'change'
- It needs to be clear what the warning is. But sometime the risk is not explicit, people could not properly describe what the risk on earth is. Because people take long time to realize what the consequences are.
- I like it how NEC3 contract lays down parties' duty to warn obligation

Q4. What role does duty to warn obligation from UAC-IC 2005 play in solving project problems? Please answer this question from following perspectives.

g. Timeliness
h. People's attitude and way of working
i. Solution
j. Communication responsibility
k. Communication channel and style
l. Lessons learnt

a. Timeliness is clear, as it states warning should be given in writing without delay
b. The rest are not explicitly defined in UAV-GC 2005, and it always depends on people's choice to choose the way of work. It also makes sense that it should not limited to the contract.

Others: collaboration should not be limited by contract anyway. UAV-GC 2005 leave rooms for parties to choose their own way of interacting with each other.

Q5. What's the influence of '*the Principle of good faith*' in Dutch Civil Law on the way the warning obligation is exercised between the employer and the contractor?

- Everyone understand the principle of good faith
- Not in the normal interaction, but during the court of judge.

Q6. The *mutual trust* is written down in NEC3 ECC, what's your consideration about it?

- It's clear to me and it is the right way to do it
- But if it is written down in the contract, I think people would be a bit under pressure

Q7. What's your opinion about Early Warning obligation from NEC3 ECC?

- The process written down in the early warning clause of NEC3 ECC happened already in practice, but it just has not been formalized.
- Changing the UAV-GC 2005 takes a long time, but good practices such as early warning which describe the way how parties should deal with project problems can be used now.
- It might also be a good practice in the pre-contractual phase
- The challenges for early warning would be the time pressure, as early warning requires a lot of time and efforts from people to explore and investigate the potential problems and to make the problem clear.

Q8. What role does (or would) the early warning obligation play in solving project problems? Please also answer this question from following perspectives.

m. Timeliness
n. People's attitude and way of working
o. Solution
p. Communication responsibility
q. Communication channel and style
r. Lessons learnt

- In the end, it's about the people who use the contract. Nevertheless, contract rules need to be easy to understand and to follow.
- Warning happens in forms of asking questions, it feels like a warning but rather informal

Appendix (#5)

Q1. Based on your experience with Dutch design and build projects (UAC-IC 2005 contract), please tell me:

1) How project problems during the project realization (design and construction) phase are handled by the employer and the contractor?
2) How do the employer and the contractor deal with the early warning signs of those project problems?

1)

- The most common problems are related to
  1. The mismatch of scope interpretation between the employer and the contractor
  2. The level of detail of the part of the design provided by the contractor (the client wants everything to be certain, while the contractor wants some room for change during the realization phase).
- Parties informed each other about the problem at the time when they have to do so, but before that they could have realized the problem already
- The reason for the contractor to bring the problem up is either it costs him more money or he is afraid of his design will not live up to client's interpretation
- The problems mostly concerned by the contractor are related to time and costs, everything outside of the budget is a problem for the contractor
- The problems mostly concerned by the employer are related to quality and certainty of the end-deliverable
- The attitude and reaction of one party towards the other's warning differs, it depends on the situation:

1. People
2. Boundary conditions (e.g. client has limited budget)

- In general, problems are solved mainly through negotiation. At first, parties only think of themselves, but in the end they still have to sit together and seek solutions.
- In the UAV-GC 2005, the employer pushes the problems towards the contractor as he is responsible for coming up with solutions.
- It would be better for the client to set-up the requirements for specific changes so that he can cooperate with the contractor for designing the alternative solutions

2)

- There is no explicit information, but there are early warning (indicators) for some potential problems (e.g. in the situation that the contractor is not able to deliver his documents in time)
- Sometimes, people make judgement for potential problems based on their own experience (gut feeling)
- For example, the contractor gives early warning to the client for different interpretation
- However, neither the employer nor the contractor 'pick' the early warning up, out of the considerations about liability and responsibilities (e.g. the employer sees the contractor was not able to deliver the documents in time, he tells the contractor but he did not take any actions to deal with it he thinks that is the contractor's own responsibility)
- Early warning signals are neither explicitly nor effectively communicated between the employer and the contractor. It's not because parties do not want to make good project, there are some miscommunication.
- The incentives for sharing information about early warning signals:
  1. For the contractor, to protect himself from the risks which is not totally belong to him
  2. With good intention
- Early warning signals were identified on, for example, risk sessions (not that often) and progress meetings (one in four weeks).

Q2. Assuming that problems are best solved, what conditions are required or desired for facilitating problem solving between the employer and the contractor on Dutch design and build construction projects. Please answer this question from following perspectives.

a. Timeliness
b. People's attitude and way of working
c. Solution
d. Communication responsibility
e. Communication channel and style
f. Lessons learnt

a. Quick solution is the best way to do with the problem before the consequence grows
   The barrier for coming up with quick solution in most of time is about responsibility (who is going to solve the problem)
b. To think what's best for project, which helps people to work together.
   Also get some freedom from their own organization (sometime people want to work best for the project, but they are limited by their own company)
c. Not relevant
d. There should be shared responsibility for parties to communicate in order to solve problems

e. Not relevant

Others:

- Competencies of project team (both the employer and the contractors' knowledge, experience, etc.)

Q3. What is your opinion about *Duty to warn* obligation in UAC-IC 2005?

- As time pass by, parties become more and more aware of their duty to warn (before, it was not)
- It is primarily the contractor's responsibility to warn the employer
- But nowadays I saw it was also used frequently by the employer to warn the contractor during the testing for the design, maintenance, and construction work.
- Parties warn each other at the moment when they see there is a risk from their own perspective (the employer: risks for the quality, the contractor: risks related to time and costs for himself)
- Most of parties just ask questions by telephone or during progress meeting. But when there is a significant issue, formal letter is also used to warn.
- The reaction of either party to the other depends on the relationship between each other
- Duty to warn is not used actively:
  1. Duty to warn is merely a legal obligation, it is not a tool/instrument
  2. There was no system for warning so that how many times parties warned each other cannot be measured. (it happens during, for instance, progress meetings where parties ask questions, or on the telephone where we had discussion about some issues)
- With the aim of good intention, best for the project, it is better to have an instrument to follow up the duty to warn obligation to find solution for the problem
- What I miss in the duty to warn is that you have to warn, but you do not have to come to the solution, there is no follow ups and the problem is still there.
- For improving duty to warn obligation in UAV-GC 2005, there should be something describe what parties should do when/after they warn each other:
  1. The reason why you give a warning
  2. More Specific information about the problem (e.g. what exactly is the problem? what would be the consequences?)
  3. What would be the solutions for solving this problem?
  4. What should we do to solve the problem together

Q4. What role does duty to warn obligation from UAC-IC 2005 play in solving project problems? Please answer this question from following perspectives.

a. Timeliness
b. People's attitude and way of working
c. Solution
d. Communication responsibility
e. Communication channel and style
f. Lessons learnt

None of them, if it happens, it will not be due to contract. Duty to warn is in practice not used for solving project problems, but to allocate risks.

Q5. What's the influence of '*the Principle of good faith*' in Dutch Civil Law on the way the warning obligation is exercised between the employer and the contractor?

- They know (both the employer and the contractor)
- But people do not know how to cope with it, for example, people do not know how to behave according to this principle
- It works when parties deal with the liability issue (consequences mainly related to costs) after they have solved the problem
- However, parties have different perception toward the principle of reasonableness and fairness, if the contractor is not satisfied with the allocated liability for the consequence by the client, he will have to go to judge or arbitration with the hope to get a better 'deal'
- The principle of good faith has a large impact during the negotiation for the settlement (most of time, it's related to costs and time) of the problem, and it benefits the contractor more.
- I do not see a relation between the principle of good faith and parties' duty to warn obligation.

Q6. The *mutual trust* is written down in NEC3 ECC, what's your consideration about it?

- It's clear what it is meant with this clause, parties can hold each other in line with the intention of this clause
- It is still difficult to measure
- It should not make any differences on parties' behavior even if it is written down in the contract
- It is not to say if it is in the contract, people will behave accordingly. In the end, it is up to people
- Furthermore, there should be mutual trust between people in a higher level in client-contractor relationship so there is room for people in lower level to best solve the problem

Q7. What's your opinion about Early Warning obligation from NEC3 ECC?

- Main differences between duty to warn and early warning:
  1. It is not only about giving each other the signals, but how parties should deal with these signals
  2. It is not only about the obligation for deciding responsibility, but also an instrument to give follow ups so to solve the problem
- I do not see the value of the compensation event for the early warning obligation, I think that can lead to a lot of warnings, because the contractors will be afraid of missing the warnings. But it does not help with the quality of the warning.
- The value of the early warning is that it is a very good instrument to follow up the procedure that should lead to solving project problems
- The Challenges for using early warning:
  1. Understand each other's objective, parties should not only warn for things that are important for themselves but especially for things that are important for their counterpart.
  2. Parties competencies to timely identify, understand, and solve the problem.

3. Responsibilities that are stated in the contract (parties should be clear about their own responsibility on solving problems)
4. Deal with liability and responsibility issue after you have found solution

- The early warning instrument does not change the barriers (mutual trust and people's attitude) between parties, it helps in understanding what does warning mean specifically and making it clear that warning has to be followed up.
- My personal attitude towards this early warning is positive, and I think we should incorporate this into our contracts in the way as an instruments to facilitate parties to solve problems, but it should not be linked to sanctions (compensation event).
- It is an important first step anyway. I think such a clause will give follow ups to the duty to warn clause in the UAV-GC 2005
- I think the risk register (for recording early warning) is different from the risk register we are currently using in practice.
- The early warning is not about what's important to yourself, but you have to think about what would be important for other parties.

Q8. What role does (or would) the early warning obligation play in solving project problems? Please also answer this question from following perspectives.

a. Timeliness
b. People's attitude and way of working
c. Solution
d. Communication responsibility
e. Communication channel and style
f. Lessons learnt

- It helps to improve the communication between parties to understand the warning and potential problems
- It helps to start the follow ups to the warning issued by either party

However, it does not necessarily change any underlying perspectives, for example, it is always up to the people involved and their competencies to give warning timely, to follow up the warning by both parties, and to find the optimal solution.
Therefore, early warnings procedure does not insure that every problem can be solved effectively, but it helps to indicate the potential problem.

Appendix (#6)

Q1. Based on your experience with NEC3 ECC on ICC project, please tell me:
1) How project problems during the project realization (design and construction) phase were managed by the employer and the contractor?
2) How did the employer and the contractor deal with the early warning signs of those project problems?

1)

- There are mainly three ways that parties together deal with project problems:
  1) Contract is barely used (soft-play). In this case, parties should take contract more seriously.

2) Contract is used too often (hard-play). Parties have a lot of conflicts in terms of own interests. Thus, the contract is frequently used to defend themselves.
3) Balanced utilization of contract, which is the optimal way of using contract.

- The way parties dealing with problems depends on the quality of the tendering process and the culture.
- The normal Dutch construction culture is described as "In the public sector, the knowledge is not that high, and the technicians from the client are not good at communication while the technicians from the contractor are financial driven".
- Normally, project problems are solved in a project level between the project leaders from both the employer and the contractor. But sometimes, problems have to be escalated to a higher authority level (e.g. senior management) when arbitration (during project execution) or court of judge (tendering phase) is needed.
- During project execution, the most common problems are technical problems.
- Parties have different expectations which as I see is the main reason for problems not to be solved timely. Technicians from both parties think in a different way, for example, technicians from the contractor is more financial driven, decisions are often made too late.

2)

- There were early warning signs in the tendering process, from which I can judge whether it is a good project or not.

Q2. Assuming that problems are best solved, what conditions are required or desired for facilitating problem solving between the employer and the contractor on Dutch design and build construction projects. Please answer this question from following perspectives.

a. Collaboration (parties' attitude and behavior, and way of seeking solutions)
b. Contract (parties' responsibility, contractual mechanisms and procedure, and early warning etc.)

What else are in your mind?

- Trust is desired but not required, people can work together without trust (business as usual for normal project). Trust is necessary to make a good contract, but not necessary to make a good project.
- People's attitude is important, and also people's knowledge and professional competency. In the end, it's people's work.
- Contract should not be difficult and complex. It should be understandable and fair, which creates trust.
- Parties should work together to seek solutions.
- Parties should be not only risk-based, but also goal-based which is more positive.

Q3. What is your opinion about *Duty to warn* obligation in UAC-IC 2005?

- The duty to warn is not only written in the clause 4-7, but also in the clause 4-5 as the duty to warn obligation is in the Dutch contract law.
- The contract law obliges parties to take each other seriously, behave professionally towards each other, and to commit to the project (to warn, to cooperate, and to advise).
- Given the contract law, the presence of clause 4-7 in the contractual obligation is logical, it is deemed as re-explanation of the contract law as the duty to warn is already in the Dutch contract law.
- The problem is not within the law, but how to let people take it seriously.

- What affect parties' utilization of their duty to warn obligation (both contractual and pre-contractual) are: people's attitude, knowledge, market, people's competency to ask questions.
- Due to the construction fraud in 2001, trust between the public and the market was damaged.
- Clause 4-8 is deemed as a sign that public domain does not trust the private sector.
- In the normal projects in the Netherlands, technicians from the contractor tries to solve the problem alone at the first time, so the warnings are always given too late.
- Warn to too or not take duty to warn seriously are not good for trust

Q4. What's the influence of '*the Principle of good faith*' in Dutch Civil Law on the way the warning obligation is exercised between the employer and the contractor?

- No, normally engineers do not know the principle
- There is no one answer, people have different understandings or perceptions towards this principle
- In terms of duty to warn, the principle of good faith is discussed when the judge is questioning whether the contractor should have known something, but he fails to warn the employer
- Whether the principle has an impact on parties' warning behavior depends on other following factors:
  1) People's knowledge and perception of the principle
  2) People's attitude and competencies
  3) Quality of the company

Q5. The *mutual trust* is written down in NEC3 ECC, what's your consideration about it?

- The specific functions named in the clause are different from the professions in the Dutch construction industry. For instance, the Project Managers in U.K. are certified while in the Netherlands they are not.
- From this clause, I see a little bit of project management is in the contract. While there is nothing about project management in the UAV-GC 2005, only parties' responsibilities.

Q6. What's your opinion about Early Warning obligation from NEC3 ECC?

- Early warning is a very "formal and structured" procedure, which is incompatible with the current Dutch construction culture, as in the Netherlands parties would like to organize ways of working by themselves.
- It also depends on the types of the client and the project. For example, the Rijkswaterstaat and the normal municipality have different management style.
- Nevertheless, for a specific project where the risks are in a high level, parties have to agree with each other on how to deal with project problems together (how we work together).
- I do not see it is possible to be widely used in the Netherlands, it is not in line with our culture as it is too formal and structured.
- From the perspective of function in an organization or a community, we are not formal and structured.

Other information:

- Trust and cooperation are a big problem in the current Dutch construction industry, due to the construction fraud in 2001.
- UAV-GC contract does not say anything about how parties should work together, it's up to parties' choice to organize any forms of collaboration (alliance for example).

- Parties responsibilities is depending on the contract, but also is depending on people's willing to take that responsibility
- The trust between parties was damaged due to the building fraud. But now the culture is changing and they are getting closer again
- Normal contract in the sector of infrastructure are not good, there are many errors and mistakes.
- Two agreement parties need to think for the project
  1) Agreement about responsibilities (that is the contract- UAV-GC 2005)
  2) Agreement of how to work together, which is about the building organization
- Project management and building organization aspects are not in the UAV-GC 2005
- I agree that for the design and build (UAV-GC 2005) project, there should be more communication between parties, but that is not the case now in the Dutch construction industry.

Appendix (#7)

Q1. Based on your experience with NEC3 ECC on ICC project, please tell me:
1) How project problems2 during the project realization (design and construction) phase were managed by the employer and the contractor?
2) How did the employer and the contractor deal with the early warning signs of those project problems?

1)

- Most common problems: insufficient information from the client & changes made during the realization phase, the scope of the contract
- By the employer: the employer is uncertain about the output of the contractor's design will meet his expectation within his budget. Also, project delivery on time
- By the contractor: getting paid by the employer for extra costs
- There is a gap between parties' visions and objectives
- Warning is always too late, as problem already occurred
- The reason for the contractor to bring the problem up is to get extra paid by the employer
- The client always blames the contractor with the argument that the contractor is giving a too late warning. The client takes this as a bargaining chip for the negotiation with the contractor about the consequences.
- Most of the time, solutions and the consequences of project problems are solved through negotiation between parties.
- Sometimes but not often, the consequences are dealt with by arbitration or court of judge if, for instance, the damaging consequences are huge.
- Things discussed during arbitration are always around two topics which are the "awareness of the problem" (time for being aware of the problem) and is it an "obvious error".

2)

- Sometimes, we see early warnings through the contractor's inquiries during the pre-contractual phase if we read their questions carefully (due to certain competition, the contractor asks questions strategically).
- For example, sometimes, all of the contractors during the tendering ask the same questions, then that is implicit warnings for the client.
- The contractor always wait for the problem becomes big (e.g. it might cause potential delay if the client does not agree with changes and extra payment), so that they can put pressure on the client to take actions.

Q2. Assuming that problems are best solved, what conditions are required or desired for facilitating problem solving between the employer and the contractor on Dutch design and build construction projects. Please answer this question from following perspectives.

a. Collaboration (parties' attitude and behavior, and way of seeking solutions)
b. Contract (parties' responsibility, contractual mechanisms and procedure, and early warning etc.)

What else are in your mind?

a.

- Trust between parties is important, and trust can be obtained by social interaction (in an informal way);
- The client and the contractor together make the design and the contract (design team), then the contractor starts with the execution of the project. This kind of collaboration needs trust between parties;
- Transparent to each other (no hidden agenda)

b.

- The design team contract (contract mechanism)
- Disputes adjudication board (contract mechanism)
- Risks must be borne by the party who can better manage it (e.g. it is unfair to make the contractor fully responsible for the risks in the soil conditions)
- More balanced responsibility for problem solving

Q3. What is your opinion about *Duty to warn* obligation in UAC-IC 2005?

- Duty to warn obligation is clear to both parties, but it is mainly about the contractor's duty to warn the employer (under clause 4-7).
- Sometimes, the employer warns the contractor 'informally', for example, by reminding or simply giving a 'watch out'.
- It is not often the case that the contractor warns the employer, but it happened. For example, when the contractor sees problems in the contract document.
- The employers react towards this warning differently, and many employers push the problem back to the contractor.
- There is no follow up procedure clarified in the contract after the warning given by the contractor to discuss how to solve the problem together.

- 'Obvious errors' as stated in 4-7 is always discussed between the employer and the contractor during negotiation or arbitration in terms of settling the problem consequences. However, in many cases, errors cannot be deemed as "obvious" enough.
- The clause 4-8 is intended to say that if the contractor did not give the warning on time and it was an obvious error, then he is liable for all the consequences even in the end it is due to the client mistake. In my opinion, clause 4-8 is rarely used (mentioned or discussed) during disputes resolution. The condition is the error must be deemed as obvious.
- For the employer's duty to warn (e.g. 20-4), I have never seen it is used (during arbitration or court of judge) unless it is a great design failure (again it has to be an obvious error).
- For the clause itself, we are not under obligation to warn, but if we check the design, we have to point out the obvious errors in the contractor's design. At least from the point of view of our own organization (W+B), we (as the employer's representative) always check the contractor's work and warn for problems accordingly.
- Although 20-4 says the employer is under no obligation to warn, it is often the case the employer will review the contractor's design work.
- To my opinion, the employer and the contractor's duty to warn is balanced and equal.
- Duty to warn itself is of early warning nature, but the thing is like parties do not do it accordingly.
- I do not think duty to warn has the function of encouraging parties to work together, it is more about work apart (it draws a sharp line between parties' responsibility)
- Duty to warn is not used actively, in the end, it's about people and trust between parties.

Q4. What's the influence of '*the Principle of good faith*' in Dutch Civil Law on the way the warning obligation is exercised between the employer and the contractor?

- Parties should start with this principle to build trust with each other.
- The principle is always there during negotiation between both parties regarding consequences of any project problems.
- To my opinion, the UAV-GC 2005 favors the client a bit more, nevertheless, the principle can balance such situation.
- It neither has much influence on parties' behavior in general nor on parties' duty to warn obligation.

Q5. The *mutual trust* is written down in NEC3 ECC, what's your consideration about it?

- I found it is a very good article, but I do not know what would be the influence of it in practice.
- To my opinion, two parts in this clause 'act as stated in the contract' and 'in a spirit of mutual trust and cooperation' are somehow in conflict with each other.
- For instance, if parties work in ways a mutual trust and cooperation, then the contract is not needed.

Q6. What's your opinion about Early Warning obligation from NEC3 ECC?

- The clause 16.1 in ECC is similar with the duty to warn in UAV-GC 2005, but clause 16.2-16.5 are absent in UAV-GC 2005
- I think the point in the clause 16.1 is also about the awareness of the problem (The discussion about 'when were you aware of the problem?').
- The clause 16.2-16.5 are more about practices.
- It's not written down in the UAV-GC 2005, but sometimes risk management practices are in the process part of the contract.
- I think the risk reduction meeting (early warning meeting) in the clause 16.2 is different from the risk meeting we have in practice.
- Risk management meeting is in the specification of the contract, but not early warning meeting.
- Clause 16.2 is a good point, as in practice parties always start with putting everything about the problem on paper, which complicates the problem between parties.
- Once problem occurs, parties should not start with putting it on paper, instead they should start a meeting and talk to each other immediately to solve problems. The outcome of the meeting (agreement of solution) shall be written down on paper.
- This early warning obligation can encourage parties to work together
- Sanctions (under clause 61.5 and 63.5 of ECC) are no good for trust, awarding good behavior of the contractor is better than punishing bad behavior.

Q7. Based on your experience with UAV-GC 2005 and/ or NEC3 ECC contract, which clauses in the contract are relevant with the aspects mentioned in the table.

N.A.

Other relevant information:

- Trust and cooperation are a big problem in the current Dutch construction industry

Appendix (#8)

Q1. Based on your experience with Dutch design and build projects (UAC-IC 2005 contract), please tell me:

1) How project problems during the project execution (design and construction) phase are handled by the employer and the contractor?
2) How do the employer and the contractor deal with the early warning signs of those project problems?

1)

- A lot of problem starts with "we need more money" (costs)
- There was a lack of communication between the employer and the contractor in terms of potential problems. Before the contract was awarded, the employer literally has more information than the contractor as he has been involved in the project for a rather long time. But the employer keeps the information for himself instead of sharing with the contractor. This is a potential base for conflicts. After the execution started, the problems are coming out.
- Parties attitude towards each other are often confrontational.

- The contractor's attitude is generalized as "you should have warned us those potential problems as they either costs more time or money", or "if we should have known this, we could have warned you".

2)

- Early warning actually already happened during the tender phase, as the contractor, we warn the employer (in the form of asking questions through dialogue) in terms of, for example, the planning, given conditions or the costing is not realistic.
- But due to other factor (e.g. political pressure), the employer does not want to make a "move". While from our side, we do not want to lose the tender.
- So, both of us go ahead "just like that". Further in the construction phase, problem occurred which increased the costs and the delayed the project delivery.
- During the project execution, the early warning signs of project problems always end up with the discussion about "money".
- The employer often tries to shift risk to the contractor if that risk is going to cost him more money.

Q2. Assuming that problems are best solved, statements are made as the required conditions for effective problem solving. Please indicate to what extent do you agree with the following statements? You can answer agree, disagree, or you can keep your opinion as neutral. Please elaborate on your choice. At the end of this questions, you can also supplement what else would you think is desirable for facilitating problem solving between the employer and the contractor.

1) Parties should **trust/ have faith** in each other when dealing with problems
Total agree, it should be the starting point for doing a project, however, it is also up to the people who are doing the project. Good contract + wrong people = bad project. However, bad contract but good people can be good project. It is the basic condition when you are talking about early warning. Once people trust each other, early warning happens naturally.

2) Once problem occurs, parties need to be clear their own responsibilities for solving the problem, and should solve problems **jointly** as much as possible
Agree, always joint, not the 'ball in the court'. Parties need to support each other in finding solutions for any problems based on the principle of 'best for projects'.

3) The solution for a problem should as much as possible benefit **both** parties (win-win outcome)
It's the idea situation. Although there is no 'win-win' in the contract, parties should always look for 'win-win' solution. In practice, problems are solved mainly through negotiation in Holland. This is the Dutch mentality to negotiate and to reach consensus with people.

4) Instead of letting problems evolve into major conflicts between parties, actions should be taken **as soon as possible** to deal with them
Agree, when you see it coming, warn the other party. This is one of the main principle of 'Best Value Procurement' proposed by Dean Kashiwagi.

5) Problems should be solved at the **lowest level** where it occurs by people who are familiar with them, rather than referring them to people in a higher authority level (e.g. senior management) who have less knowledge about them
Agree, problems that occurred during project with detailed information is always in the lowest level, but when problem could not be solved at the lowest level it has to be referred to the higher authority level (decision making related to time and costs etc.)

6) Both parties should have **a balanced** responsibility and opportunity to inform each other about the situation of the problem
Agree, this the driven power behind BVP. Client look for a contractor whose knowledge and experience can give you the best solutions for avoiding and solving problems.

7) Once problem occurs, parties should at least have a meeting **face to face** to discuss and seek solutions
Agree, it must be face to face, should not be sent by email. Once people get any problems by phone or by email, they start thinking about more than the problem itself (for example, improving your strategic position).

8) For avoiding a same/similar problem to occur again in the future, parties need to **learn** from previous problem solving experience
Agree, in practice, there will be an evaluation meeting at the end of the project for both parties. So the learning experience is prepared for the next project instead of the current project.
However, I think it would be better to do it also in between during the process of the project. This is also common sense with the BVP projects.

Supplements:
It's important for both the employer and the contractor to know (get familiar with) each other.
Parties should always do a Project Start Up (PSU) with each other.

Q3. What is your opinion about *Duty to warn* obligation in UAC-IC 2005?

- Duty to warn does not describe what the relationship between the employer and the contractor will be
- It's a very good contractual rule
- Warning happens in the form of asking questions during meetings (e.g. progress meetings).
- Problems are dealt with most of time by referring to the clause 44 compensation, in which we have to discuss about consequences (related to time, costs, and quality) of any problems
- For clause 4-8, we have realized that if we do not warn, we are liable for the consequence. But most of time, we are not aware of the problem.
- It becomes routine for only the contractor to warn the employer, but it is in nature two parties responsivities to warn each other.
- Employer's duty to warn is not exercised sufficiently either, this is partly out of consideration of improving his own position during this relationship.
- No matter it's the duty for the employer or for the contractor to warn, the reason for them not to warn is for their own sake.
- In UAV-GC 2005, it is not obligatory for the employer to warn, and it is hard to prove whether he should have had such information or not.
- Duty to warn is just a legal obligation in UAV-GC 2005, it does not help solve any problems and risks
- Different parties have different perception towards risk, low risk for the employer might be high risk for the contractor. Parties should share information about any potential risks. Parties should do this in a possible early stage.

- What is absent in the duty to warn in UAV-GC 2005 is how should parties share their own knowledge and information in an early stage, so as to manage risks.
- Furthermore, risk should be managed by the party who can better deal with it.
- Early warning can be a good instrument to fill up this gap in the UAG-GC 2005

Q4. Does *the Principle of good faith* in Dutch Civil Law have influence on the way the warning obligation is exercised between the employer and the contractor?

- This principle is most of the time used when parties are dealing with the confrontations and the discussions between each other
- In an ideal situation, all discussions should be ended up with this principle of good faith
- Parties' perception and understanding towards the principle the reasonableness and fairness are different (your reasonableness is not necessarily my reasonableness).
- The principle of reasonableness and fairness is not an issue of 'black or white'. Irrespective of the differences among personal perception towards this principle, sometimes personal principle is in conflict with the principle of organizations (principle of business). It seems also reasonable for the company not to warn.
- It is very difficult to deal with this principle as it is rather 'grey'. So how to judge the outcome influenced by this principle is left to the judge of court.
- In the PSU parties can agree with the principle of good faith. During Project Follow Up (PFU) parties can evaluate these principles.

Q5. What's your opinion about Early Warning obligation from NEC3 ECC?

- It's good instrument, but it also needs to be interpreted in the right way by people who will be using it.
- It does not help solve problems if it is used by people who only look at advantages at their own side
- For effectively using this instrument, parties should look at the same direction and have the same understanding about the purpose of this early warning
- I think early warning should be the starting point for each relationship between the employer and the contractor, as it is related to many other things in a project.
- Many good instruments have already been used in practice which have a similar function with early warning, but we do not call it early warning and they are not written down in the contract yet.
- Early warning should be 'picked up' at the start of the project with the purpose of improving collaborative relationship and facilitating mutual trust between parties.
- When deciding to use early warning, parties should have mutual agreement about what is early warning, what purpose it serves, and how to use it.
- Early warning is the basic principle for parties to work together in a right way, it should be in the contract
- The challenge for using early warning is that people should abandon their old ways of working, in which they only think of their own benefits or interests.
- Early warning encourages parties to share information with each other, which in the other way around can increase parties trust with each other.
- Based on all the above mentioned parties should have the right definition of "best for projects".

Q6. The *mutual trust* is written down in NEC3 ECC, what's your consideration about it?
▪ Mutual trust and good faith are human aspect, and they are related to people ▪ It is not to say people will trust each other, once trust is written down in the contract ▪ It is not about the how the contract will say about trust, right people is very important ▪ Therefore, solving problems should always base on the principle of reasonableness and fairness, and mutual trust ▪ Project should start with mutual trust
Others relevant information: - Before the current D&C contract, there were always mistakes in the contract drafted by the employer, which provide the contractor opportunities to get additional funding from the employer due to those mistakes made by the employer. - Due to competition pressure in the tender phase, we did not tell the employer about the mistakes at that time, which could cost the employer more money. - After the contract is awarded to us, we had to tell the employer the mistakes in his contract, which increases the costs of the project. But at that time, the warning has a negative aspect on the relationship between parties. - It is very difficult for the employer to make a good contract, and it is also difficult for the contractor to read this contract in a good way. A reliable relationship between parties can take over the role of the contract. So that parties solve problems together. - Technicians are very strict (or straight), human relationship, principle of reasonableness and fairness are absent on their side.

Appendix (#9)

Q1. Based on your experience with Dutch design and build projects (UAV-GC 2005 contract), please tell me: 1) How project problems during the project realization (design and construction) phase are handled by the employer and the contractor? 2) How do the employer and the contractor deal with the early warning signs of those project problems?
1) ▪ The most common problems: design changes problems caused by ground conditions, for example, the underground cables. Therefore, the design does not fit in the employer's requirements. Those ground conditions are the risks for the employer. So we can get extra money or extension of time from the employer. ▪ The reason for the contractor to communicate whatever problems with the employer are problems related to time and costs, for example, to get the extra incurred costs covered by the employer. ▪ We do not always communicate problems immediately with the employer. The current practices (standard procedure) for dealing with project problems are: 1. People who work on site are under "time pressure" and they have to "keep the train running" 2. They will deal with the problem and try to find solutions immediately on their own instead of communicating with anybody (including the client), which most of time ends up with extra costs incurred.

3. After they have realized there are extra costs and time incurred, they will communicate this with their own contract manager
4. From there, negotiation starts with the employer for the compensation/ extension of time for the problems occurred.

- So, we do not warn the employer timely enough as stated in the contract
- Under UAV-GC 2005, both parties do not often work together for finding solutions for project problems. As the employer are more relying on the contractor to come up with solutions.
- The client's attitude: "we do not want to pay anymore"
- The problem most concerned by the client is about the delivery of the project (time) due to political or credibility pressure (as the client is receiving part of the funding from EU for example).

2)

- Early warning signs were there, but were not often communicated with the client
- Once we found obvious errors in the employer's documents, we put them in the risk register and discuss them with the employer.
- We also discuss potential problems (or risks) with the employer during monthly meeting to find the solution which is best for the project, and allocate the risks to party who can better manage it.
- Three things to deal with (potential) problems:
  1. Risk register for potential problems (not a contractual mechanism)
  2. Warning obligation for obvious errors and defaults in information provided by the employer (under clause 4-7)
  3. Variation procedure (change) for potential changes followed by compensation event (under clause 14 and clause 44)

Q2. Assuming that problems are best solved, what conditions are required or desired for facilitating problem solving between the employer and the contractor on Dutch design and build construction projects. Please answer this question from following perspectives.

a. Timeliness
b. People's attitude and way of working
c. Solution
d. Communication responsibility
e. Communication channel and style
f. Lessons learnt

a. -
b. Trust, more open, transparent, best for projects, work together
c. Be creative to find a joint solution
d. -
e. Informal talk (Face to face) to solve problems, not in writing (less emails)
f. -

The most important thing is trust and people's attitude, which serves as the foundation for searching creative and joint solutions

Q3. What is your opinion about *Duty to warn* obligation in UAV-GC 2005?

- We know that obligation, and we warn for obvious errors which will be at our risks if we do not warn. But it is hard to decide what is deemed as 'obvious errors' as stated in the clause 4-7.
- We do ask a lot of questions to the client, but among all the questions just a few are about errors in the information provided by the employer. When we find obvious errors in the information provided by the employer, we warn them by using formal warning letter. We tell the client about the problem when we think that is also his problem. Nevertheless, I hardly see the discussion about duty to warn during project execution. The questions asked to the employer during the pre-contractual phase is to get the scope of the work clear
- Most of time, the employer's attitude and reaction towards the warnings issued by us is 'I think you are wrong, use our information, and we are correct' (does it mean distrust?)
- We hardly warn the employer, instead we send the employer notice of change. Because the notices are important for us to get the compensation for extra incurred costs.
- We only warn them when they want us to execute work (e.g. by ordering variations) which could affect the quality of work
- We hardly ever see situations about clause 4-8, whether we give a warning or we give a late warning does not influence the part of the consequence which would have been borne by the employer anyway. The consequences are that the contractor is liable for all the costs except the costs which also
- Indeed, the costs are for us if is ascertained that we fail to warn the employer, but not all the costs are borne by us. The client will have to bear part of the costs incurred due to him 'anyway' irrespective of the contractor's duty to warn responsibility. The part of the costs because of we warn the client too late are for us.
- We are more focusing on our duty to warn in the compensation for time and costs (under clause 44-2)
- The employer does not realize that they have warning responsibility under UAV-GC 2005. The employer's duty to warn is mainly about the design work, and normally I do not see them warn anything. The client most of the time accept the design, but that does not waiver our responsibility.

The explanation of why duty to warn is not used actively during project execution:

- People have to be aware of the matter so to warn (people do not aware of the matters)
- Time pressure for the people work on site without "cost pressure"
- For example, if they find something wrong with the design or calculation, they will just adapt the design or calculation, and go on with the work. They do not notice the employer about this issue. Later on, the cost-driven people on the project will notice the extra costs incurred and start searching where is this extra costs coming from. Then, the costs-driven people will inform the contract manager (contractor side) to have a look at the contract. From there we will tell the client that we have a change so we need extra money. The client normally will say 'you did not tell me anything about it.
- There are different people play different roles on project, once problems occurred, they do not look at the problem but start searching for solutions immediately because 'the train is running'. To make it simple, there are two teams mainly. One team is totally focusing on

the project and keep the train running. The other is more costs-driven and this team is always behind the first one. ▪ People work on project deal with lots of problems per day, they do not recognize the differences among those problems because some problems are of less or no contractual nature, while some are contractual problems. If we report to the client directly where the problem occurs, the information would be 'unfiltered'.
Q4. What role does duty to warn obligation from UAV-GC 2005 play in solving project problems? Please answer this question from following perspectives. a. Timeliness b. People's attitude and way of working c. Solution d. Communication responsibility e. Communication channel and style f. Lessons learnt
▪ DTW Hardly affect the trust between the employer and the contractor; ▪ DTW hardly affect people's attitude and ways of working ▪ People work on the project are scope based, they do not look at the contract
Q5. What's the influence of '*the Principle of good faith*' in Dutch Civil Law on the way the warning obligation is exercised between the employer and the contractor?
▪ We all know the principle of reasonableness and fairness ▪ The principle deals with people's attitude, i.e. <u>what can be expected from others</u> ▪ But it hardly has any influence on our duty to warn obligation ▪ DTW is very "black or white" ▪ But in practice, the principle benefits us when we discuss the consequence with the client. For example, based on the principle of reasonableness and fairness, we still get paid by the client for the extra costs incurred due to his mistakes (they would have been borne 'anyway') even if there was not a warning by us. ▪ So this principle is used most often when we start to talk about consequences, then we look back to find what can we reasonably expect from the other party.
Q6. The *mutual trust* is written down in NEC3 ECC, what's your consideration about it?
▪ In Holland, you do not have to put mutual trust in the contract, as the principle of reasonableness and fairness is one of the big pile of our legal system ▪ It's clear what it means, but it's hard to start a procedure (legal?) with this ▪ I think it's very hard for the judge to say why and how you do not act in a spirit of mutual trust and cooperation (it is uncertain about this legal enforceability; it's very "grey")
Q7. What's your opinion about Early Warning obligation from NEC3 ECC?
▪ It expresses the same idea with 44-2 clause in UAC-GC 2005

- I think the risk register mentioned in the NEC3 contract is different from the risk register currently used by us.
- The impression the risk register in NEC3 gives is that it is a compensation event tool, while the risk register we use is a risk minimization tool.
- In the UAV-GC 2005, what is absent is the 'next step' after warning, which is written down in the NEC3
- There are some useful elements in the early warning clause.
- The other way around, it is about how to use this contractual mechanism to work 'best for the projects', rather than putting responsibility on the other party.
- It is about trust and people's attitude anyway to use it
- Actually there are some similar mechanisms like the early warning, for example, the contract meeting which happens every two weeks during which we talk about what's happening on the projects

Q8. What role does (or would) the early warning obligation play in solving project problems? Please also answer this question from following perspectives.

a. Timeliness
b. People's attitude and way of working
c. Solution
d. Communication responsibility
e. Communication channel and style
f. Lessons learnt

At the end, how to solve problems are not determined by the contractual clauses, it is about trust and people's attitude to work together

- It increases transparency, and helps with trust
- It can better facilitate client's involvement in the project

Other relevant information:

One of the biggest problem now within Dutch construction industry, especially for the DB projects is that some problems are dealt with too late and big changes have to be ordered which costs much more extra time and money. Those problem should have been handled earlier to prevent extra costs and time.

Appendix (#10)

Q1. Based on your experience with NEC3 ECC on ICC project, please tell me:
1) How project problems during the project realization (design and construction) phase were managed by the employer and the contractor?
2) How did the employer and the contractor deal with the early warning signs of those project problems?

1)

- Most common problems: design problems. First of all, the later changes in the technical design demanded by the Employer and quoted by the contractor. Secondly, mistakes in the works information provided by the employer, for example, some parts of the preliminary design made by the Denmark architecture company sometime were impossible to execute as the design was incompatible with the Dutch building regulation.
- The contractor was concerning about whether they will get paid for fixing the problems without compromising the relationship with the employer.
- The employer was more concerning about whether the project outcome will meet their expectation or not (quality and performance related problems)
- We inform each other immediately about any problem or potential problems.
- The reason for us (as the contractor) to bring the problem up is two-fold:
  - To build and maintain a good relationship with the employer
  - To make sure that we will get paid should there are extra costs caused by any problems.

2)

- Our construction team was trained to identify any problems that might cause additional time and costs. Once they (people who worked on project) realize something, they will come to me for deciding if it is an early warning or not.
- Early warnings were discussed on weekly held early warning meeting. During the meeting, the most important early warnings were discussed and analyzed, and decisions were made together by the project manager and the contractor.
- There are three different ways for early warning to go:
  1) First of all, the early warning is literally a risk as it cannot be solved at the moment and it might come to pass in the future, which has a relatively large impact on project outcomes (time, cost, and quality mainly). Then we allocate it to the risk, and it is further discussed during the risk meeting (different from early warning meeting).
  2) Secondly, the early warning is treated as a compensation event, which means there are solutions for this early warning but additional time and costs will be incurred for the contractor.
  3) Thirdly, the early warning is closed as it either has a small chance to occur in the future, or it has little impact on the project outcomes.
- There are mainly two reasons (or incentives) for us to give the early warning to the employer:
  1) In case we do not get the compensation from the employer
  2) We want to trust each other and have a good relationship with the employer, so we have to be open to each other about everything
- We did not experience many struggles or difficulties to use this early warning. In contrast, we think it improved the cooperation with the employer.

Q2. Assuming that problems are best solved, what conditions are required or desired for facilitating problem solving between the employer and the contractor on Dutch design and build construction projects. Please answer this question from following perspectives.

a. Trust between both parties (to what extent)
b. People's attitude and ways of working
c. Contractual mechanisms or procedures
d. Solution

e. Parties responsibility (between the employer and the contractor)
f. Lessons learnt

What else do you think is desirable from the perspective other than mentioned above?

a. Yes
b. People need to be professional, work and locate together, be open and transparent
c. It would be additional plus to use sharing pricing mechanism
d. First fix the problem, then talk about the consequences for the problem
e. It is the contractor's responsibility to propose solutions, and it is the employer's responsibility to decide which is the optimal solution
f. By doing early warning meetings, people learn from project very frequently

Q3. What is your opinion about *Duty to warn* obligation in UAV-GC 2005?

- I do not think all of the people are clear about their duty to warn obligation under UAV-GC 2005. Unlike the early warning obligation in NEC3 contract, duty to warn obligation either for the contractor or for the employer in UAV-GC 2005 is not highlighted.
- Unlike under NEC3, we do not always warn the employer if we are not sure of something, we only warn when 'we are sure'.
- We wait until we are sure about the problem, which means the problem has already happened, then we warn the employer about the consequences cause by such problems.
- We are afraid if we do early warning, the employer will get even more suspicious about the motivation behind the warning
- Two reasons for the contractor to warn the employer under UAV-GC 2005:
  1) To build a good relationship with the employer, and to be transparent with each other
  2) To get compensation from the employer
- There is not an obligation for the employer to warn the contractor. We cannot do anything with clause 20 if the employer did not warn.
- The duty to warn for the employer and the contractor are not equal. A problem in the contractor's design work, will never become a problem for the employer as he is under no obligation to test the design, construction, and maintenance work. It may make sense for the contractor to warn the employer more often as he is the one to come up with solutions, but it's not good for the cooperation between parties.
- The duty to warn obligation of UAV-GC 2005 can be improved by highlighting the duty to warn clause in the UAV-GC 2005. Nevertheless, only highlighting is not enough, a cooperative and trust environment is necessary for duty to warn to be used more actively.
- The cooperation and trust between parties can be improved by using sharing pricing mechanism used in NEC3, by which both parties are incentivized to work together and to share both pains and gains.
- UAV-GC 2005 is not focusing on cooperation, and it is just depending on the people whether they are willing to cooperate or not.

Q4. What role does duty to warn obligation from UAV-GC 2005 play in solving project problems? Please answer this question from following perspectives.

a. Trust between both parties (to what extent)
b. People's attitude and ways of working
c. Contractual mechanisms or procedures
d. Solution

e. Parties responsibility (between the employer and the contractor) f. Lessons learnt
▪ It is up to people. Nevertheless, warning in practice does not lead to working together but separation, as the employer is usually suspicious of warnings given by the contractor. ▪ It is also up to people ▪ Under UAV-GC, there is no sharing pricing mechanism which could facilitate cooperation ▪ In some cases, the UAV-GC 2005 does not create the opportunities for parties to come up with optimal solution. For example, in case that the employer only has limited budget, he becomes defensive when negotiating solutions as they cost him additional money. ▪ The UAV-GC 2005 draw a sharp line between parties' responsibilities. Nevertheless, such line does not create opportunities for parties to work together. In addition, parties warning responsibilities are not equal, as it is mainly the contractor's responsibility to warn the employer. ▪ What's missing in the UAV-GC 2005 is the cooperation in all aspects of the contract, it should be better processed in UAV-GC 2005.
Q5. What's the influence of '*the Principle of good faith*' in Dutch Civil Law on the way the warning obligation is exercised between the employer and the contractor?
▪ We as the contractor are aware of this principle ▪ It is not only a principle that tells people how to behave, but also a principle, on which the judge's decision is based ▪ Due to the existence of this principle, the 'circumstances' are taken into account by the court ▪ For example, to what extent one party has to stick to his obligation depends on the degree of the expertise of the other party. The less expertise the one party, the heavier the obligation for the other party (for example, duty to inform) ▪ The principle of good faith does not have a large impact on the contractor's duty to warn ▪ On the other hand, it should have influenced the employer's duty to warn the contractor more often ▪ The principle has been used in many situations, as it is literally a cornerstone of Dutch civil law ▪ This clause is not a 'black or white' issue, it does not have a general impact on people's behavior. But it is always considered when weighing benefits and losses
Q6. The *mutual trust* is written down in NEC3 ECC, what's your consideration about it?
▪ Once we trust each other, things become easier. But if there is distrust between parties, there is no "giving and taking" but only "taking" ▪ The clause 10.1 of ECC requires more than the principle of good faith ▪ We as the management team during the ICC project are aware of this clause, so we educated the people working on the project act 'like' this. ▪ We had a sense of mutual trust at a rather high authority level (management) during the project. ▪ We as the management team had the duty to educate our construction team the significance of cooperation for the (ICC) project, where the objective should be clear to everyone which is 'less costs and better quality'. ▪ We were not under pressure of breaching clause 10.1 during the project. Instead, we understood for this (ICC) project, we have to cooperate and trust each other, it is good for both parties, and we can get a better result by doing so.
Q7. What's your opinion about Early Warning obligation from NEC3 ECC?
▪ In the end, early warning of ECC and duty to warn in UAV-GC 2005 are quite the same. But due to different culture, duty to warn under UAV-GC 2005 works out very differently.

- Under ECC, we always warn if we are not sure about something without hesitation. Early warning was used to solve problem before they grew 'too big', and it largely reduced unnecessary costs.
- The employer, sometimes but not often, also gives early warning to the contractor. Most of the early warning from the employer were to me not necessary, because that could be a project manager instruction (e.g. variation) directly followed by a compensation event.
- Trust is not a pre-condition to use early warning. Instead, early warning can be the starting point to build trust with each other. By using early warning, mutual trust can be increased as parties are encouraged to share information with each other so that they know each other better in an early stage.
- I am positive with early warning in the context of ECC, but not under UAV-GC 2005. I think early warning will not function properly if it is used in the environment created under the UAV-GC 2005. Only substitute duty to warn with early warning from ECC does not work, it calls for changing the whole way of thinking behind the UAV-GC 2005. It probably can be changed by using, for example, the sharing pricing mechanism stated in Option C of ECC.
- The challenge for early warning to be used is to change the whole 'atmosphere' between parties.

Q8. What role does (or would) the early warning obligation play in solving project problems? Please also answer this question from following perspectives.

a. Trust between both parties (to what extent)
b. People's attitude and ways of working
c. Contractual mechanisms or procedures
d. Solution
e. Parties responsibility (between the employer and the contractor)
f. Lessons learnt

- The main idea of NEC3 is cooperation. Early warning will help to build trust between parties
- Early warning make parties think not only what is important for themselves, but also for the other ones.
- Other mechanisms in UAV-GC 2005 should also be changed in order to make early warning function properly
- Under NEC3, parties work together to come up with optimal solutions. Early warning helps to reduces unnecessary costs.
- Both parties have the duty to warn each other. This is partly due to the sharing pricing mechanism, as the employer also have to pay part of the costs for the consequences caused by the contractor's mistakes. This leads to more equality among the parties and helps to build and to main cooperation between parties.

Other relevant information:

- Dutch construction culture in a nutshell:
  1) The focus on being compensated than on working together;
  2) Trust between the employer and the contractor was damaged by the construction fraud happened in 2001.
- I think the sharing pricing mechanism is the best way for parties to work together.