

MASTER THESIS

# TRANSITIONING TOWARDS A COLLABORATIVE RISK MANAGEMENT PROCESS

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# TRANSITIONING TOWARDS A COLLABORATIVE RISK MANAGEMENT PROCESS

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**ABSTRACT:** Over the past decade, Dutch construction and infrastructure projects regularly experience cost overruns, time delays, and fights over claims. During the execution phase, unforeseen events are rule rather than exception. Evidently showing that parties failed to foresee and quantify major risks at the planning stage. Currently, the question as to how this can be explained and altered is debated in the Netherlands and is also the leading question for this research project. In the current Dutch risk management strategy, project liabilities are allocated to the client and the contractor through transactional contracting methods - even when the extent of liability is uncertain. Such contractual arrangements obstruct problem solving: parties tend to revert to their contractual positions, creating interactions that are confrontational and adversarial. Managing unforeseen events during the execution phase requires efforts of all parties involved. Non-adversarial relations are a precondition for cooperation in problem solving. Therefore - to change the current adversarial project interactions - a more collaborative risk management culture has to be developed. The purpose of this research was to examine the current risk management practice, and compare this practice with the collaborative success factors that literature proposes for transitioning towards a collaborative risk management culture. This research utilised literature together with data obtained from (1) in-depth interviews, (2) document analysis, and (3) an expert session. Twelve factors were identified for the successful establishment of a collaborative risk management culture. The empirical study showed that client and contractor follow similar risk management processes. However, client and contractor do so in parallel, separated from each other. Coordination between the parties can be traced back to organised risk sessions. However, the parties do not jointly mitigate and manage risks. Although representatives of clients, contractors, and engineering firms acknowledge the potential benefits of a more collaborative risk management culture, the current practice scores low on the identified factors supporting a collaborative risk management. To remedy the current situation, this study identified three domains where steps could be taken towards collaboration, namely, (1) procurement, (2) contract, and (3) human. First, the procurement needs to be focused on the selection of a contractor with the required attitude and behaviour by using effective selection criteria that incorporate the success factors. Second, the contract and its arrangements, have to be focused more towards supporting and defining such a relationship. Lastly, the human domain needs to be focused on finding project team members with a certain 'collaborative aptitude' and an intrinsic motivation to collaborate.

*"Coming together is a beginning, Keeping together is progress, Working together is success" – Henry Ford*

Key words: risk management, collaboration, relational-based approaches, relational contracting, unforeseen events

## 1 INTRODUCTION

Currently, the construction of Dutch infrastructural projects, such as tunnels, bridges, and roads, have become larger and more complex (Ruijter, 2019; Bosch-Rekvelde, 2011; Williams, 1999). The cause for this increasing complexity is that project teams, in addition to dealing with the construction of the project, have to deal with other factors, such as environmental aspects, landscape integration, and increased societal involvement (Ruijter, 2019). The competitive, risky, and uncertain nature of the construction industry (Zhang, 2008; Floricel, Michela, & Piperca, 2017; Bosch-Rekvelde, 2011; Williams, 1999) in combination with the increasing project complexity challenges the project managers even further in achieving the main objective(s) of a project, namely, to deliver a high quality project in a safe manner, within schedule and budget, and with as little as possible conflicts, disputes, claims and litigation issues among the stakeholders (Zhang, 2008). Over the last decade, the projects are identified by poor project performances (Koops, 2019; Marrewijk, Clegg, Pitsis, & Veenswijk, 2008; Meng, 2012; Bosch-Rekvelde, 2011), resulting in an increase in the importance of achieving the previously mentioned objectives. The poor performances are in the form of projects regularly experiencing cost overruns, time delays, and quality defects (Meng, 2012; Enshassi, Al-Najjar, & Kumaraswamy, 2009; Cantarelli, 2011; Flyvbjerg, Holm, & Buhl, 2003). Ward and Chapman (2003) and Hoseini et al. (2019) provide a solution by indicating that researchers and practitioners believe that the probability of project success is increased by implementing risk management. Even though researchers and practitioners recognise the importance of risk management (Bosch-Rekvelde, 2011; Shenhar & Dvir, 2007), including its possible positive effects on project success (Ward & Chapman, 2003; Hoseini, Hertogh, & Bosch-

Rekvelde, 2019; Podean & Benta, 2012), risk management practices are either not implemented thoroughly or still have room for improvement (Hoseini, Hertogh, & Bosch-Rekvelde, 2019).

According to Cheung et al. (2003), risk management implementation can be hindered by an unbalanced allocation of risk, adversarial relations, and the traditional client-contractor mentality. These factors are the consequences of (1) contractual methods based on allocating risks to different contractual parties, (2) the construction industry being focused on short-term benefits in single projects, and (3) the competitive environment (Rahman & Kumaraswamy, 2004; Lam, D. Wang, & Tsang, 2007; Eriksson & Lind, 2015; Bishop, et al., 2009; Cheung, Ng, Wong, & Suen, 2003). These factors are exacerbated by the risky and uncertain nature of construction, in which unforeseeable events are bound to happen, which leads to controversy among the different parties and cause relationships to become more confrontational and adversarial (Zhang, 2008).

Collaboration between public and private organisations is a crucial factor for project success in infrastructural projects (Koops, 2019). Accordingly, scholars and researchers have searched for possible solutions for the described problem in areas such as collaboration and relational contracting (RC) methods (e.g., project alliance and partnering) (Bishop, et al., 2009; Rahman & Kumaraswamy, 2002; Suprpto, 2016). These 'new' management approaches are focused on developing closer relationships between the client and the contractor in order to facilitate project delivery on time and within budget and specifications (Bishop, et al., 2009). In this scenario, collaboration is identified as a process in which different parties share information, resources, and responsibilities to jointly plan, implement, and evaluate processes towards achieving a common goal (Podean & Benta, 2012). In other words, collaboration is a process of shared creation that involves the mutual engagement of participants to solve a problem by sharing risk, resources, responsibilities, and rewards (Podean & Benta, 2012), reducing the occurrence of schedule delays and cost overruns (Meng, 2012). This process is described as a collaborative risk management culture for the purpose of this study.

Not only do scholars and researchers recognise the importance of collaboration, but project participants realise that sharing information and knowledge is one of the critical elements of a successful contractual relationship (Rahman, Enduta, Faisal, & Paydar, 2014). An example of this recognition among Dutch practitioners is the 'market vision (marktvisie)' in which multiple parties strive to collaborate on a solution through a shared perspective, including alternative behaviours, focused on collaboration and based on trust (Marktvisie, 2016). Another example from the Netherlands is the 'construction team (bouwteam)' that is identified as an enabler for improved collaboration during the design phase. The construction team develops the (execution) design involving all the different parties, which should result in benefits concerning price, lead times, and total project quality (PIANOo (a), n.d.) by utilising the contractors' execution knowledge and mitigating execution risks (Early Contractor Involvement). However, the construction team is established solely to collaboratively develop the design, meaning that the execution phase (phase in the project life cycle during which the required construction is done) will be performed under a different contract model. Generally, the parties resort to transactional contracting models for the execution phase (Westhuis & Wals, 2019), which calls for clear and definitive allocation of responsibilities and liabilities (i.e. risks). Even though, not all possible risks and uncertainties are foreseeable and quantifiable at the outset of a project (Rahman & Kumaraswamy, 2004), the responsibility is allocated to one of the parties (administrative convenience). This clear and definitive allocation of responsibilities and liabilities, will put the focus on minimizing the costs to each contracting party separately (Rahman & Kumaraswamy, 2004). The result will be that parties will hinder problem-solving by tending to revert to their contractual positions (Cheung, Ng, Wong, & Suen, 2003), leading to the development of adversarial relationships that have negative effects on project outcomes (Chakkol, Selviaridis, & Finne, 2018; Challenger, Farrell, & Sherratt, 2014; Clifton & Duffield, 2006).

The current practices regarding risks and risk management do not facilitate this shift towards developing collaborative relationships but rather create confrontational, adversarial, and selfish relationships among the parties. Therefore, they hinder the development of a collaborative risk management culture for parties to be jointly managing unforeseen risks during the execution phase. A closer look at the current risk management process regarding collaboration is necessary to enable the Dutch construction industry to move away from the apparent adversarial relations and traditional client-contractor mentality during the execution phase. The purpose of this research is, therefore, to examine the current risk management process and compare this practice with the collaborative factors that literature proposes for transitioning towards a collaborative risk management culture. First, an overview of the risk management process regarding collaboration following transactional approaches is presented. Second, a document analysis examined combining risk management and collaboration in accordance with a relational approach used in the Netherlands (construction team). Together, these results provide an overview on the current risk management process during the execution phase of projects, possibilities for improvement, and what factors evidently play a role in the transition towards a collaborative risk management process. This resulted into a possible process design that supports organising a collaborative risk management process.

## 2 LITERATURE STUDY

In the Netherlands, large infrastructure projects are mostly commissioned by public organisations (governments) and built by private organisations (contractors). To contain these projects within the estimated cost and schedules, sound strategies, good practices, and careful assessments and decisions are required (Enshassi, Al-Najjar, & Kumaraswamy, 2009). One of the processes that support managers to stay within the estimated cost and schedules is risk management. Risk management is one of the nine identified project management knowledge areas as per the Project Management Institute (2000), and has always been an essential process in construction projects (Bosch-Rekvelde, 2011; Shenhar & Dvir, 2007; Walker & Hampson, 2003). The reasoning behind this statement is that (1) risks and uncertainties are inherent to construction projects and (2) not all risks and uncertainties are foreseeable and quantifiable at the start of a project (Rahman & Kumaraswamy, 2004). In the construction project management context, risk management involves creating awareness of uncertainty, quantifying risks, managing controllable risks, and minimising the impact of uncontrollable risks (Liu, Li, Lin, & Nguyen, 2007). Consequently, risk management is described as a comprehensive and systematic process of identifying, analysing, and responding to risks to accomplish the project objectives (Banaitiene & Banaitis, 2012).

The importance of the contributing effects of risk management on project success has been recognised in the construction industry (Ward & Chapman, 2003; Hoseini, Hertogh, & Bosch-Rekvelde, 2019; Podean & Benta, 2012). However, previous research has shown that opportunities for improvement exist and that collaboration can be introduced as a means to further enhance the risk management process (Bishop, et al., 2009; Rahman & Kumaraswamy, 2002; Suprpto, 2016; Walker & Hampson, 2003), especially for managing unforeseen events during the execution phase (Rahman & Kumaraswamy, 2005).

### 2.1 Risk Management and Its Inefficiencies

As previously mentioned, an unbalanced allocation of risk, adversarial relations, and the traditional client-contractor mentality are hindering risk management (Cheung, Ng, Wong, & Suen, 2003). Past research illustrates that one cause for this is the use of transactional contracting methods, which are based on allocating the risks to the different contracting parties (Rahman & Kumaraswamy, 2004; Bishop, et al., 2009; Cheung, Ng, Wong, & Suen, 2003). According to Bishop et al. (2009), the 'adversarial' transactional forms of contracting have dominated the industry with a common notion among the parties to exploit each other whenever possible. Consequently, a hostile and litigious environment that is not in line with more strategic and coordinated modes of project management has been created. These transactional models express the liabilities, including the uncertain liabilities, of the client and the contractor explicitly as part of terms of the contract, hindering problem solving as parties tend to revert to their contractual positions (Cheung, Ng, Wong, & Suen, 2003). In addition, other researchers have found that transactional procurement and contractual routes could result in adversarial relationships and more conflict, negatively affecting project outcomes (e.g., cost overruns and time delays) (Chakkol, Selviaridis, & Finne, 2018; Challender, Farrell, & Sherratt, 2014; Clifton & Duffield, 2006).

The aforementioned issue has been recognised in the Dutch construction industry. One contracting model that is frequently used in the Netherlands is the UAV-IC (2005). This contracting model is an integrated contract in which the contractor is allocated more tasks and responsibility (PIANOo (b), 2020). The UAV-IC (2005) model is based on the principle that risks should be allocated to the party that is able to manage the risk in the best way at the lowest cost (Clifton & Duffield, 2006; Meng, 2012). Therefore, as part of the risk management strategy, risks are allocated to the different contractual parties through the contractual arrangements (Lam, D. Wang, & Tsang, 2007; Rahman & Kumaraswamy, 2005). However, the complete and definitive allocation of risks cannot be achieved through contractual conditions alone, and it is not always conducive to risk management (Rahman & Kumaraswamy, 2005), especially because the construction industry is described as a highly dynamic environment with numerous stakeholders and technological challenges. Accordingly, projects are characterised by uncertainties and unpredictability (Bosch-Rekvelde, 2011). As a consequence, with the implementation of the UAV-IC (2005) for the execution phase, confrontational and adversarial relationships are common while open communication and honesty among the stakeholders are rare (Cheung, Ng, Wong, & Suen, 2003). A culture of mistrust, inequality, suspicion, short-termism, and inflexible and formal structures and penalties are created (Walker & Hampson, 2003). As a result, there is a decrease in collaboration and hinderance to problem solving during the execution phase. According to existing literature, the aforementioned cause a number of inefficiencies to be introduced into the risk management process:

1. A lack of interaction among different parties, including clients, contractors, insurers, and suppliers (Liu, Li, Lin, & Nguyen, 2007, p. 383).
2. People do not know what they are looking for; project goals are unclear due to a lack of long-term focus and interaction with and exclusion of many players from the early stages of the procurement process (Walker & Hampson, 2003).

3. Confused monitoring responsibilities as a result of complex contracts due to a lack of trust and frequent, often ad-hoc, changes in project team membership (Walker & Hampson, 2003; Lukas & Clare, 2011).
4. Conflicting objectives that generate problems in regard to communication and withheld information and also regarding problem solving, since there is a lack of agreement on proposed solutions (Walker & Hampson, 2003).
5. People cover up problems due to the competitive nature of construction and because of a culture of division, blame, fear, and mistrust (Walker & Hampson, 2003).
6. Allocating responsibilities is in itself a problematic process and has great potential for conflict; there is little room for charity and to make an adequate response without the temptation of looking for ways of reclaiming losses in other aspects of the project. Furthermore, complex contracts in such projects make it more likely that people have not realised their responsibility (Walker & Hampson, 2003).
7. Not considering opportunities when performing risk management; society associates risk with negative outcomes while project risks could equal opportunities or threats (Lukas & Clare, 2011).
8. Underestimating impacts when a risk occurs might be due to the optimistic nature of project teams, especially early in the project. When impacts are understated, the risk factor calculations become skewed, prioritisation flawed, and the entire risk management process is threatened (Lukas & Clare, 2011).

It is evident that transactional contracting arrangements create a set of confrontational, adversarial, and selfish relationships and rigid performance standards that hinder the openness, freedom, and confidence that enable people to take advantage of the major opportunities when an event occurs during the execution phase (Walker & Hampson, 2003). This results in pessimistic organisations that will focus on threats rather than the opportunities and, therefore, are unable to achieve their full potential (Walker & Hampson, 2003).

## 2.2 Collaboration

In the realisation process, a capital project intrinsically involves an intertwined relationship between the organisations in which client and contractor have different but complementing roles (Suprpto, 2016). Scholars and researchers have searched for a possible solution to overcome the inefficiencies regarding risk management in relational contracting (RC) methods (Bishop, et al., 2009; Rahman & Kumaraswamy, 2002; Suprpto, 2016; Walker & Hampson, 2003). RC methods include project alliances, project partnering and public-private partnerships (PPP) (Suprpto, 2016). According to Bishop et al. (2009), the theoretical underpinning of RC methods includes models such as 'co-configuration' and 'knot-working', in which collaborative efforts, open communication, collective learning, and knowledge sharing are the focal points. This statement is further supported by Rahman et al. (2002), stating that RC is based on the recognition of mutual benefits and win-win scenarios by developing more cooperative relationships between clients and contractors.

The RC methods are interchangeably used to describe a collaborative relationship. This relationship has characteristics such as aligned goals and interests, open and honest communication, mutual trust, joint problem solving, and dispute resolution among parties (Suprpto, 2016). To clarify collaboration and the aspects it entails, Suprpto (2016) identified different factors of collaborative relationships within projects (Appendix I). Suprpto (2016) divided these factors into four main categories:

1. *Owner and contractor capabilities*, which consist of factors related to the capabilities of the client and the contractor. It covers factors such as sufficient financial capacity, prior relationship experience, technical and project management competences, and reputation (Suprpto, 2016, p. 19/20).
2. *Relationship indicators*, which focus on the factors that are related with the joint alignment of objectives, mutual trust, open and honest communication, no-blame cultures, equitable involvement, and clear definition of responsibilities among parties (both organisational and individuals) based on equality (Suprpto, 2016, p. 23).
3. *Relationship practices*, that are the practices intended to establish the actual collaboration, resulting into the above described 'relationship indicators'. Examples of these practices are team integration, early involvement, team building, joint problem solving, joint risk management, and performance measurement (Suprpto, 2016, p. 23).
4. *Relational attitudes*, which is in regards to inter-organisational trust between owner and contractor and between individuals in the project team, together with organisational cultural fit, long-term orientation, and top management commitment between client and contractor. Inter-organisational trust is evidenced in improved buyer-supplier relationships and project performance, while inter-personal trust or trust within the project team is considered to catalyse team effectiveness (Suprpto, 2016, p. 23)

### Connecting Risk Management and Collaboration

Considering that both complexity and uncertainty inherently exist in construction projects, it is difficult to foresee every risk at the outset of a project, and foreseeable risks might change as the project moves forward (Rahman & Kumaraswamy, 2005). According to Rahman and Kumaraswamy (2005), risk management should, therefore, be a continuous process in which the management of some risks may need the combined efforts of all related contracting parties for possible future adjustments due to changing situations. Therefore, to overcome these situations, risk management should be a joint process during the execution phase with the combined efforts of all the related parties. According to the research of Rahman and Kumaraswamy (2005), practitioners in the construction industry from across 17 different countries preferred this option of jointly managing various unforeseen risks. These various unforeseen risks include (1) risks that are not foreseeable and quantifiable at the planning stage, (2) risks that are foreseeable and quantifiable, but need joint efforts, and (3) risks that unforeseeably change in nature during project progress (Rahman & Kumaraswamy, 2005). However, Rahman and Kumaraswamy (2005) stated that non-adversarial relations are a precondition to succeed at such a joint process during the post-contract stage. In this regard, Cheung et al. (2003) recognised the importance of RC methods as a management tool to advocate collaboration, open communication, and joint problem solving, which lead to improving quality, reducing confrontations between parties, and enabling an open and non-adversarial environment.

Rahman and Kumaraswamy (2004) have identified success factors required in RC approaches to enable joint risk management among the parties. When comparing these success factors to Suprpto's (2016) collaboration categories, it becomes evident that several relationship practices, indicators, and relational attitudes are success factors to enable parties to jointly manage the risks (see Table 1). In this research, the focus was on two categories regarding collaboration and the transition towards a more collaborative risk management culture. The first category is the relationship practices intended to establish the actual collaboration. The second category involves the relationship indicators since they provide a guideline to the collaborative indicators for the risk management process that are currently present in Dutch infrastructural projects.

Table 1 - RC success factors for implementing Joint Risk Management

Categories	Suprpto (2016)	Rahman & Kumaraswamy (2004)
Relationship indicators	Mutual objectives, goal alignment, and/or shared vision	Understanding each other's objectives and alignment of objectives
	Mutual trust and trust-based arrangement	Mutual trust
	Open and honest communication	Open communication among parties
	"No blame" culture attitudes	Attitude of project participants
	Balance or equitable participation	Professional ethics and collective responsibility instead of personal responsibility
	Clear definition of responsibilities	Equitable and clear allocation of foreseeable and quantifiable risks
Relationship practices	Joint problem solving and active dispute resolution	Agreed process for dispute resolution
	Performance measurement and benchmarking	Agreed mechanism for performance appraisal
	Integrated team working Knowledge sharing	Effective coordination*
Relational attitudes	Organisational cultural compatibility	Compatible organisational cultures
	Expectation of future work	Possibility of future work

Note: \*Coordination involves the use of strategies and patterns of behaviour aimed at integrating the actions, knowledge and goals of interdependent members to achieve common goals. Coordination ensures that a team functions as a unitary whole (Rico, Sánchez-Manzanares, Gil, Alcover, & Taberero, 2011, p. 59);

### 3 RESEARCH METHOD

In accordance with the purpose, this research project required insights into: (1) the current risk management process regarding collaboration following transactional approaches, and (2) combining risk management and collaboration in accordance with a relational approach used in the Netherlands (construction team). Consequently, underlying reasons, motivations, and opinions from the practice of the Dutch construction industry and in-depth information of specific concepts to the aforementioned purpose were needed. For this reason, a qualitative and empirical focus was used for this research, in which the initial data was collected through conducting interviews and a document analysis. This was followed by a data analysis and an expert session to review the conclusions obtained from the data analysis.

#### 3.1 Data Collection

To obtain a better understanding of the current situation regarding the risk management process and collaborative success factors, a mixture of data collection methods was used. A literature study and two qualitative methods were

used as a means of triangulation (Bowen, 2009): (1) in-depth interviews and (2) a document analysis. Starting with a clear view on the problem, first, a literature study was conducted. This literature study provided a better understanding of and insight into the risk management process and essential collaborative factors in RC approaches that positively influence the joint management of risks. Second, nine in-depth interviews were conducted to obtain data that provided detailed information and insight into underlying reasons, motivations, and opinions (Saunders, Lewis, & Thornhill, 2008) in the current situation. Third, a document analysis was conducted to provide external validity and strengthen the data found in the literature regarding Dutch collaborative practices in a construction team model.

#### *In-depth Interviews*

In-depth interviews were used to collect data for this research. These in-depth interviews sought to examine the general area of risk management, relevant for this research project. This data collection method allowed the interviewees to speak freely about events, behaviours, and opinions (Saunders, Lewis, & Thornhill, 2008) regarding the practical dynamics of risk management in Dutch infrastructural projects, responses to unforeseen events, and experiences regarding the collaborative practices and indicators. Furthermore, this method allowed further exploration, given the answers and their meaning (Saunders, Lewis, & Thornhill, 2008). The literature study was used as a basis to provide a format for the in-depth interviews on different themes, namely, the risk management process, responses towards unforeseen events, and collaborative practices and indicators.

To gather the empirical data, nine experts with relevant knowledge concerning the current risk management processes (contract managers, risk managers, project managers, and process managers) were interviewed. All these experts have multiple years of experience with the management and execution of projects. Since this research was focused on collaboration between public and private organisations, it was important to obtain unbiased views regarding the interview topics. Therefore, the nine experts were from different organisations and perspectives, namely clients, contractors, and engineering firms.

#### *Document Analysis*

For project teams to be able to transition to a collaborative risk management process a document analysis was conducted to provide an insight into this transition. This method of collecting data is a systematic procedure of reviewing or evaluating documents (Bowen, 2009). According to Bowen (2009), documents can assist the researcher in uncovering meaning, developing understanding, and discovering insights relevant to the research problem. Therefore, the document analysis serves as an external validity for the results found in the literature study regarding the success factors required for parties to jointly manage risks. Furthermore, the document analysis was used to uncover domains in which a collaborative relationship, was described, assessed, and established in order to facilitate the validated success factors.

The analysed documents were obtained from a specific case in the Netherlands in which they are currently using the construction team model and analysed to determine the collaborative incentives used within the design phase of the project. The analysed documents included the construction team agreement, technical specification, and tender document.

### **3.2 Data Analysis & Validation**

#### *Data Analysis*

Prior to analysing the data obtained from the interviews, the data was processed into workable formats through the use of intelligent verbatim. Intelligent verbatim allows words, intentions, and original messages to remain while removing the false starts, stutters, word repetitions, and interjections, which allows for clearer analyses of the data. Through the use of this processing method, a large amount of data was collected from the interviews. A data reduction process of coding and categorisation was followed to reduce the amount of collected data, (Hartmann, 2017). The coding unit for this research was the statements made by the interviewees. This means that specific statements were labelled and rearranged for later categorisation. The data reduction process for coding and categorisation was done according to the objectives of this research, leading to the creation of three main categories, namely, (1) risk management, (2) collaboration factors, and (3) collaborative risk management culture.

#### *Expert Session*

To obtain specialised input and opinions to evaluate the found domains, an interactive session with experts was organised. To gather these inputs and opinions, a variety of experts (contract managers, risk managers, project managers, and process managers), based in various fields of expertise and organisations in the Dutch construction industry, were engaged (client, contractor, and engineering firm). The experts for the expert panel were different from the ones interviewed to obtain an unbiased set of opinions. During the session, the experts were asked to form

their own process, given the domains found in the literature and practice (interviews and document analysis). Thereafter, a discussion of the critical points in the domains and the opted factors was initiated.

## 4 RESULTS

This section outlines the results derived from the aforementioned data collection, analysis, and expert session. First, results obtained from the interviews are presented to provide insight into the current risk management process, and the collaboration between parties in this process, in accordance to the success factors relationship practices and indicators. Thereafter, the document analysis shows how collaboration is organised and arranged in a contracting method (construction team) that supports collaborative relationships among the parties.

### 4.1 Risk Management Following Transactional Approaches

For the purpose of this research, it was relevant to first obtain a general idea on how risk management is implemented and executed in infrastructural projects in the Netherlands. The nine interviewees were asked to describe the general risk management process for the execution phase. Based on their individual descriptions (see statements 1.1 and 1.2), there is a shared vision regarding the risk management process and the steps that are part of this process among the different organisations (client, contractor, and engineering firm). Consequently, this vision led to the notion that there is a shared perception of how to approach risk management, which some of them described as a standard process. This standard process starts with identifying the risks, conducting an analysis, deciding what risk response should be used, and evaluating/monitoring these responses while identifying new risks throughout the project life-cycle.

*1.1 – Client: we use the standard approach that exists for risk management: identify, analyse, think carefully about what control measures should be implemented, determine whether they have the desired effect, and adjust accordingly.*

*1.2 – Contractor: we use the standard process of risk management. It starts with identifying and prioritising the risks. A list with all the risks is drawn up and control measures instituted. Thereafter, the effectiveness the control measures are analysed, and then they will be implemented and evaluated. When the cycle is completed, this process will start again. Actually, it is the standard process used repeatedly.*

During the execution phase, parties such as the client, the contractor, and, if present, the engineering firm, meet every couple of months for a risk session. The frequency of these risk sessions can be changed when needed (see statements 1.3-1.5). The interviewees indicated that the frequency depends on (1) the complexity of the project (statement 1.5) and (2) in which stage of the project the risk management process is executed (statement 1.4).

*1.3 – Engineering firm: during the execution phase, a risk session with the client and one with the client and contractor is organised every quarter.*

*1.4 – Contractor: the risk management process is a process you repeat in every stage of your project. There are risk sessions with our clients, once every quarter of a year or once every six months. The frequency depends on the current stage that the project is in. In general, there are more risk sessions at the start of the project, because there is more work ahead of you. At the end of the work, what still needs to be done is less, therefore the risk profile of the project is lower compared to the start. The frequency depends on the risk profile of that specific stage that the project is currently in. In general, a risk session with the client happens four times a year, and this frequency is the same for the internal risk sessions.*

*1.5 – Client: the contractor is obliged to update his risk file once a month, where after the risks will be discussed with the client and the contractor together. In addition, the risk file of the client to control the contractor is also updated once a month, or once every two months, depending on the test period (audit period). For example, with a simple project, an audit can be done every six months. If it is a complex project, it may be once a month or once every two months. It is flexible to change when needed.*

The interviewees identified two types of risk sessions to manage the project risks (see statements 1.3, 1.6 and 1.7), namely (1) internal risk sessions with the client and, optionally, an engineering firm (depending on whether the client contracted an engineering firm) and (2) risk sessions in which the client, engineering firm, and the contractor are present. During the risk sessions in which the contractor is included, the current status of the project is discussed, and the contractor presents the important risks at that point in time together with the progress of the control measures implemented during the execution phase.

*1.6 – Engineering firm: during the risk sessions, the associated progress report that the contractor draws up is discussed. In this report, the contractor must deal with the current risks. These are often the top 10 risks at that time and the progress in containing the risks, especially regarding the control measures. These may be joint risk sessions, but often there is still a culture of we versus them. There is no feeling of joint responsibility for a risk. It is quite distant.*



1.7 – Client: the client has their risk file and, to keep this file up to date, risk sessions are organised internally. After these sessions, the risk file of the client will be updated. The contractor also does this with his progress reports; the contractor looks at his part and delivers the document at a given moment. After this, the contractor's document will be discussed in a joint risk session.

The general risk management process during the execution stage, as described above, is presented in Figure 1.

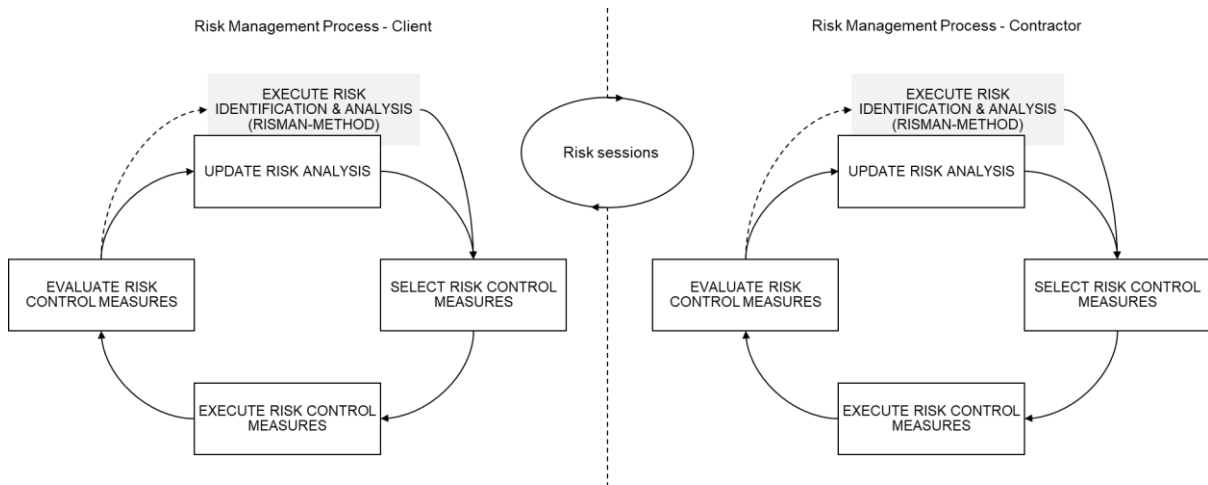


Figure 1 - Risk management process during the execution phase as described by practitioners (adjusted from (Ministerie van Verkeer en Waterstaat, 1999))

The results indicate that risk management is an implemented process during the execution phase of an infrastructural project for both the client and the contractor. It also shows that the client and the contractor both have their internal risk management processes. Coordination between the parties can be traced back to the organised risk sessions in which mostly the contractor updates the client on the current status of the project. Altogether, the client and the contractor use the same risk management method and share the same language when it comes to identifying the steps in this method. However, they do not perform this method together. In other words, the parties do not jointly mitigate and manage risks.

The derived interview data, was assessed to obtain the current degree of collaboration in the Dutch construction industry regarding risk management. This assessment was conducted based on the success factors, found in literature, to develop collaborative relations and enable a collaborative risk management culture among the parties. These success factors were divided into three categories: relationship practices, relationship indicators, and relational attitudes. The success factors mentioned in the categories of relationship practices (joint problem solving and active dispute resolution, performance measurement and benchmarking, integrated team working, and knowledge sharing) and relationship indicators (mutual objectives/goal alignment/shared vision, mutual trust and trust-based arrangement, open and honest communication, “no blame” culture attitudes, balance or equitable participation, and clear definition of responsibilities) were used for this assessment.

#### Relationship Practices

To gather practical information regarding the current situation of collaboration in the risk management process, the nine interviewees were asked about the extent in which they used the relational practices. Out of the nine experts that were interviewed, only three interviewees had had experience with project alliancing, a transactional contract including some collaborative practices, or experience with the construction team. The remainder of the interviewees indicated that they had only heard of such practices but not used them, except for the practice; performance measurement. Although performance measurements were being implemented, there were mixed feelings towards this specific practice: (1) when there are no issues, it is a great tool to see which project aspects can be improved and to start a conversation among the parties on this topic and (2) it is not effective when there is already a certain amount of friction between parties since, in that case, parties tend to measure subjectively as opposed to objectively measuring the facts.

Although the vast majority of the interviewees had not used the relational practices, they did recognise the importance of a collaborative risk management culture to enable better control for risks and cope with unforeseen events during the execution phase (see statements 1.10 and 1.11).

1.10 – Client: we are now sharing the risks openly, which has been quite difficult for a long time. We now look where we can help each other in managing the risks, so that we help to manage their risks and they help us to manage ours.

1.11 – Client: to actually solve an unforeseen event, the ambiguity in contracts, including the risk allocation per party, gets in the way. When a project alliance is used, all parties being together does not immediately result in a discussion about who is responsible. We are sharing (some) risks together in order to be able to mobilise all the knowledge and skills to solve it.

### Relationship Indicators

As mentioned by Suprpto (2016), the relationship indicators are results of implementing and using relationship practices. As described in the previous section, in most of the projects the interviewees had worked on, the relationship practices were not utilised. Therefore, the relationship indicators are currently not the result of the relational practices, due to the lack of implementation and usage of such practices. Nonetheless, to obtain a better understanding of collaboration in the current risk management processes in the Netherlands when a transactional contracting approach is used, the current risk management process was analysed to establish whether relationship indicators were present without the use of the collaborative practices (see Table 3).

Table 3 - Relationship indicators in current Risk Management Process

Relationship Indicator	Current situation	Statements
Mutual objectives, goal alignment, and/or shared vision, and understanding each other's objectives	Interests, objectives, goals and visions are not clear due to a lack of communication and understanding since the start (procurement) of the project an existing blame culture (see indicator: "No blame" culture attitudes).	<p>2.1: <i>Goals and visions of the different parties are not expressed or verified at the start of a project.</i></p> <p>2.2: <i>How a contract is procured and which incentives should be in a contract are elements we should consider more often and look more closely into to bring parties together and work together. A tender is an extremely cold process, notes are sent back and forth and questions are answered, but never an actual conversation because people do not want that certain rights can be derived from what was said.</i></p> <p>2.3: <i>Clients often have explicit objectives, while contractors also have objectives. However we often do not make them explicit.</i></p> <p>2.4: <i>In the project start up (PSU) there is little communication in regard to joint vision and shared goals. The PSU is the first moment to talk about such things. During the procurement it is not discussed.</i></p>
Mutual trust	Trust is not shown by using complex and voluminous contracts with fines. Furthermore, there is a notion within the industry that any vulnerability exhibited can and will be used against you.	<p>2.5: <i>Including fines in a contract is not really an incentive to make things go better; it comes across to the other parties as a sign of distrust.</i></p> <p>2.6: <i>In a traditional way of thinking, opportunities for a contractor are often risks for the client.</i></p> <p>2.7: <i>In case of an event, you first want to secure your own interest and you will not just cooperate because, otherwise, they will hold you responsible.</i></p>
Open and honest communication	Parties are not used to being open, especially when it comes to changes with big financial consequences and making their objectives/interest explicit.	<p>2.8: <i>For organisations it feels strange to be completely open.</i></p> <p>2.9: <i>It is really difficult to be completely open and transparent when it comes to major consequences. You have to be able to fully trust people if you put all your cards on the table.</i></p>
"No blame" culture attitudes	Currently, parties often concentrate on minimising their own exposure. Furthermore, the mind-set of people is still towards us versus them.	<p>2.10: <i>The moment something is unclear, especially when the interests are unclear, we immediately start pointing fingers at each other, which simply stands in the way of a solution.</i></p> <p>2.11: <i>The UAV-IC (2005) starts with the obligations of the client and the obligations of the contractor. When you start with such matters, you already create the first attitude.</i></p> <p>2.12: <i>There is a 'we-them' relationship during risk sessions.</i></p>
Balance or equitable participation	The risk management is based on controlling the contractor and making sure the contractor does what the client wants.	<p>See quotations 1.5 and 1.7</p> <p>2.13: <i>The client actually imposes a risk management process on the contractor, in which they have to share their risks with us.</i></p>

Clear definition of responsibilities	Currently there is not always an equitable allocation of foreseeable and quantifiable risks	<p>2.14: Today, more and more risks are actually being allocated to the contractor.</p> <p>2.15: The UAV-IC (2005) with a classic E&amp;C (Engineering &amp; Construct) contract, designed by the client, certain execution risks associated with that design, nevertheless, end up with the contractor, and the client does not always deliberately do everything to eliminate these risks.</p>
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Note: Project start up (PSU) is a structured meeting of the future project organisation at the start of a project (after the contract had been awarded) (Twynstra Gudde , n.d.).

Through the data obtained from the interviewees, it is apparent that there is little to no evidence of parties establishing a risk management process in which the client and the contractor share information, resources, and responsibilities to jointly plan, implement, and evaluate processes towards achieving a common goal for the execution phase. The majority of the interviewees had no experience with implementing and using the relationship practices. In addition, the data shows that the presence of relationship indicators scores low in the current process. Consequently, there is little evidence of a developed collaborative risk management culture to support the management of unforeseen events during the execution phase in the current situation.

Despite the little evidence of a developed collaborative risk management culture, data shows that the management of unforeseen events during the execution phase will benefit from a collaborative management culture. Such collaborative culture, according to the interviewees, advocates an open communication in which all knowledge is mobilized, and reduces the 'blame' culture.

Considering the analysed risk management process regarding collaboration, the data shows that the transactional forms of contracting are still dominating the Dutch construction industry. There is a clear separation between the client and the contractor in the process of risk management (see Figure 1). In addition, the current risk management process scores low on the identified success factors (relationship practices and indicators) supporting a collaborative risk management culture. The data shows a culture of blame, mistrust, and formal structures and penalties, in which parties find it difficult to communicate in an open and transparent fashion.

#### 4.2 Combining Collaboration with Risk Management

One contracting method used in the Netherlands is the construction team. This contracting method is identified as an enabler for more collaboration between the client and the contractor. In this context, a document analysis was conducted to identify how collaboration is organised and arranged in a contracting method that supports collaborative relationships among the parties. To obtain the required data, three documents from one case in the Netherlands were reviewed: the construction team agreement, the technical specification, and the tender document. The analysis of the documents revealed that the construction team model focuses on social control (open communication, collaboration-oriented mentality, knowledge sharing, respect for each other, equality among parties, and mutual trust). The focus on social control will enable the parties to create an environment in which both parties are encouraged to have open dialogue regarding risks, and share and collectively manage risks. To create such an environment between client and contractor, the contract focused on three main collaborative success criteria, namely, (1) to make optimal use of available knowledge and expertise from all parties, (2) to develop a clear organisation and unambiguous decision-making process, and (3) to establish an optimal and transparent collaboration. These three main success criteria consisted of several underlying success factors. The success factors, as described in the reviewed construction team documents, are shown in Table 2 and were classified in accordance with the categories identified by Suprpto (2016).

Table 2 - Collaborative factors to enable joint management of risks during execution phase

Category	Success Factors in Construction Team documents
Relationship Indicators	Parties are aware of each other's interests. The common interest/goal must be the central focal point.
	Mutual trust.
	Open communication.
	Collaboration-oriented people functioning as an integrated team and contributing to the work of the other party.
	Respect each other, provide an equal basis. Locate the most suitable person for a specific task regardless of the organisation this person comes from.
	Mutual certainty and clarity regarding the division of responsibility.
Relationship practices	Joint problem solving and active dispute resolution*.
	The performance of the project will be periodically evaluated by the client and the contractor.
	Integrated team working*.

	Optimal use of the available knowledge/expertise of all parties.
Relational attitudes	The client contracts a contractor with the required attitude and behaviour which is in line with the desired team culture as established in the project approach.
	Expectation of future work*.

Note: \*x, no evidence was found in documents.

The document analysis resulted in success factors and were compared to the list of collaborative success factors collected from RC approaches as identified in the literature study, as shown in Table 1. This comparison shows that the twelve identified success factors, according to the literature, were also deemed as success factors in the reviewed case of the construction team in the Netherlands. Therefore, the success factors identified for parties to develop collaborative relations and enabling a collaborative risk management culture are indeed relevant. The total compared list can be found in Appendix II.

Furthermore, the documents revealed that the contract was not the only domain directed towards enabling and developing a collaborative relationship among the parties. The procurement procedure and the people that were part of the project team played important roles in creating a collaborative risk management culture as well. According to the analysis, the procurement was focused on selecting a contractor with the required attitude and behaviour in alignment with the three main collaborative success criteria. This was done by initiating dialogues and interviews with key personnel to select the most suitable contractor who understands, respects, and contributes to the central focal point, namely, project goals in which everyone's interests are united. Therefore, this research project recognized three domains, to facilitate the twelve success factors, namely, procurement, contract, and human, to foster the required collaboration for this project.

However, the current risk management process regarding collaboration, shows that there is too little focus on the design and implementation of the procurement approach and contractual arrangements, and selecting people with the required collaborative attitude and behaviour towards collaboration (see Appendix III). This can be traced back to the little experience interviewees had had with using, implementing, and exhibiting the success factors identified as relationship practices and indicators (section 4.1). Currently, the transactional contracts are often the foundations of conflict and adversarial mind-sets, even though contracts are considered as important tools in establishing clear agreements between client and contractor. There is little face-to-face communication between the client and contractor during the procurement phase, making it difficult to understand each other and to convey the intent of the contract to the contractor. Furthermore, the mind-set of the people in the project teams will determine whether a tool, such as a contract, is used in a positive or negative way, and whether they see the benefit of collaboration. This shows that there are still advances to be made regarding the design of the three domains to facilitate the twelve success factors, which ultimately would lead to the development of a collaborative risk management culture.

#### 4.3 Expert Session

Specialised input and opinions were gathered in an interactive expert session to evaluate the results described and shown above.

##### *Procurement*

The experts indicated that the procurement phase in a project is an important domain in establishing collaboration, especially since first impressions are formed during the procurement process. These first impressions are important for further collaboration on the management of unforeseen events during the project life-cycle of the project. The experts recognised that, currently, the goals, visions, and interests of the different parties are generally not communicated during the procurement phase of a project. Furthermore, discussions and conflict points regarding the described risk management process seem to stem from the client and the contractor not engaging with clarity and openness and not ascertaining that information had been communicated properly. During the procurement phase, it is important to develop a relationship that includes trust and understanding (becoming acquainted). Moreover, a good match/connection between people and organisational culture are important factors that should be developed between client and contractor. Therefore, the design of the procurement phase needs to be adapted to the nature of different projects and accommodate specific project collaborative requirements. This is in agreement with what Rahman and Kumaraswamy (2005) found in their research:

1. Design appropriate procurement arrangements in accordance to a collaborative relationship.
2. Implement effective selection criteria while incorporating relational elements.

##### *Contract*

The experts view the contract as a tool for parties to utilise for the realisation of the project goals. It is important that the contractual arrangements include the required contractual incentives and strike a balance between control and flexibility. Furthermore, a contract should be based on the premise of equality and clarity regarding the division of

responsibility between the client and the contractor. Altogether, the contract should be focused more on supporting and defining a collaborative relationship.

*Human*

Another important domain that was recognised by the experts are the influences from both the individual team members and the originations who will be part of the project team. The external mechanisms, such as the procurement process and the contractual arrangements, should be focused on establishing a collaborative relationship, and its success depends foremost on the intrinsic motivation of people to collaborate. This is in line with the research of Kamminga (2012), who describes that a collaborative attitude and behaviour depends on the willingness of people to collaborate, combined with a certain ‘collaborative aptitude’ among those who are involved in the project team to develop collaboration.

**5 DISCUSSION**

The current situation, as presented in this thesis, indicates that relationship-based approaches are not often utilised and implemented, and the transactional forms of contracting are dominating the construction industry. Remarkably, Bishop et al. (2009) already recognized the dominant presence of the ‘adversarial’ transactional forms of contracting in the industry in 2009. Furthermore, the recognition of the importance of collaboration regarding risk management seems to be unchanged. In 2003, Cheung et al. (2003) already recognised the importance of RC methods as a management tool to advocate collaboration. The empirical data of this research shows the same recognition. In retrospect, over a time period of more than ten years no significant changes have been made to move away from confrontational and adversarial relationships during the execution phase, despite the recognized importance of collaboration. This raises the question as to why no significant advances have taken place regarding establishing a collaborative risk management culture for the execution phase.

**5.1 Organizing a collaborative risk management process**

Taking the described results into consideration, a process that indicates how parties can transition and organise a collaborative risk management process was developed. The focal point at the start of any project should be the project goals which are derived from the intended project result(s). These, will lead to the collaboration requirements, aimed to increase the probability of attaining said project goals. This collaboration can be defined in terms of the determined collaborative success factors, such as practices, indicators, and attitudes (see Appendix II). The collaboration requirements serve as input for the three domains, the procurement approach, contract conditions, and required people with corresponding attitudes. As a result, the three domains will be designed to support and facilitate the identified success factors in order to enable a collaborative risk management culture. Furthermore, it is important that all the relevant parties are present during the development of such joint practices and processes. This will eventually result in a jointly designed collaborative risk management process, with the accent of the risk management process shifting from individualistic to collective. A process in which risk files are being openly shared amongst all parties. Consequently, the required collaborative risk management culture will be enabled to jointly finding optimal solutions when unforeseen events occur (see Figure 2).

Because of the ever-changing environment and circumstances of construction projects, this research focused on providing criteria, in the form of success factors, that assist parties in attaining a collaborative risk management culture suitable for any project. Therefore, due to the many unknown and varying project conditions, the implementation details to facilitate these twelve success factors in the three domains (procurement, contract, and human) were out of the scope of this thesis.

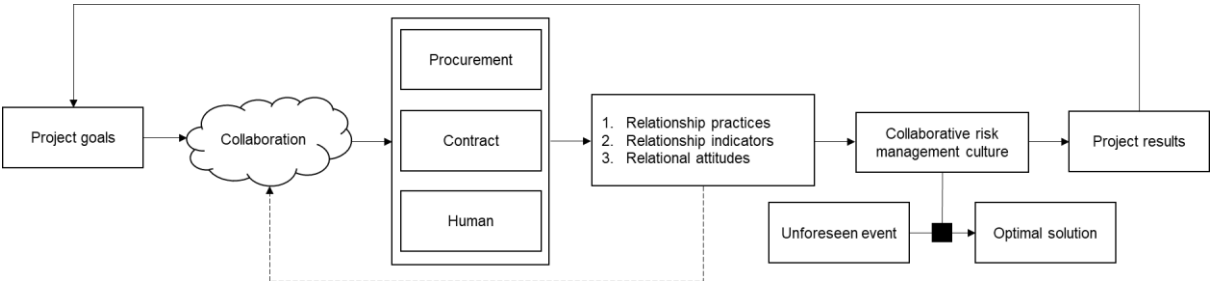


Figure 2 - Process that enables parties to transition to a collaborative risk management process.

**5.2 Practical implications**

Initiating, developing, and implementing collaborative practices introduce certain relationship risks of which all parties have to be aware. Relational risks are related to achieving the goals of the collaboration (Lehtiranta, 2011). In large and complex projects, the relational risks are significant determinants of project success, meaning that

collaborative work in project implementation has the potential to either add or withhold significant value (Lehtiranta, 2011). Such relationship risks are related to two categories, namely, (1) the form of the collaboration and (2) the collaborative process (Préfontaine, 2003). According to Préfontaine (2003), the risks associated with this form of collaboration are an inadequate or inappropriate type of agreement, misunderstandings regarding the content of the agreement, and an inappropriate selection of partners. Relationship risks concerning the collaborative practices, such as problems occurring with coordination, communication, culture differences, inertia, dependency, mistrust, and lack of consensus or involvement, were identified by Préfontaine (2003).

### **5.3 Limitations and Future Research**

The findings of this study have to be seen in light of some limitations and the need for possible future research. First, only a small number of experts in the field provided data from practice for this research. Second, not many interviewees had had actual experience with a project alliance, which means that the practical applicability and effectiveness of joint risk management is mostly based on expectations rather than experience. Therefore, future research is required to further elaborate on the current situation and the effectiveness of implementing the factors of relationship-based approaches in the Dutch construction industry. Third, this research did not add weightings to the twelve success factors. Future research can focus on identifying these weightings to discover which success factors are the most important to consider, especially considering that most projects have time constraints. In addition, future research should focus on developing practical implementation guidelines for this process to materialise its potential benefits in a transition towards a collective and collaborative risk management process. This field of study is rather new, so there is a need for further research explicitly linking the practices of a relationship-based approach applied to the risk management process.

## **6 CONCLUSIONS**

This study found that the current risk management process is based on individual parties conducting similar, but separated, risk management processes. Coordination between the parties can be traced back to organised risk sessions during which both the client and contractor were present. Nonetheless, during these risk sessions, parties often felt a distant, client versus contractor, mentality and the lack of a feeling of joint responsibility. The described process is rather individualistic while the combined efforts of all related contracting parties are required to make future adjustments due to changing situations. As a consequence, the involved parties currently do not utilise the most effective way of managing risks and need to move towards a dynamic risk management process. This room for improvement does create the opportunity for collectively optimising such practices within the industry under the premise of collaborative approaches. For this reason, this research focused on identifying success factors and how these success factors can be facilitated. In the literature study, twelve success factors that influence the establishment of a collaborative risk management culture during the execution phase were identified. Although literature provides certain success factors in the form of relationship practices and indicators, the current practice scores low on these identified factors. The data shows a culture of blame, mistrust, and formal structures and penalties, in which parties find it difficult to communicate in an open and transparent fashion. Consequently, there is no evidence of a developed collaborative risk management culture to support the management of unforeseen events in the current situation. Despite the little evidence of the success factors in current practice, the interviewees did recognise that the management of unforeseen events during the execution phase will benefit from a collaborative risk management culture.

To transition towards collaboration, the research identified the need to design three domains namely, procurement, contract and the human domain, in order to facilitate the twelve success factors. In the current risk management process regarding collaboration, there is too little focus on the design and implementation of the procurement approach, contractual arrangements that encourage collaboration, and the selection of people with the required collaborative attitude and behaviour. Therefore, to facilitate the twelve identified success factors, (1) the procurement process needs to be focused on selecting a contractor with the required attitude and behaviour by using effective selection criteria while incorporating relational factors, (2) the contractual arrangements should be focused more on supporting and defining such a relationship, and (3) a collaborative risk management culture should be built and established by incorporating the internal willingness of people to collaborate combined with a certain 'collaborative aptitude' among those who are involved in the project team.

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APPENDIX I - 24 elements mentioned as critical success factors of collaborative relationship in project context:  
(2016) Collaborative contracting in projects - Mohammad Suprpto (page 19-23)

Nr.	Element	Category	Example of definition
1	Owner's technical capability	Owner-contractor capabilities	Owner's technical capability which includes knowledge and skills in specific area and the ability to generate innovative ideas
2	Top/senior management commitment and support		Commitment and support from senior management of the permanent organization from both owner and contractor
3	Financial strength		Sufficient financial capacity from different parties
4	Prior relationship experience		Prior understanding/relationship experience among contracting parties help build integrated teams
5	Mutual objectives, goal alignment, and/or shared vision	Relationship indicators	Mutual objectives ensure that every party's interests will be best served by concentrating on the same direction towards the overall success of the project for best value and mutual benefits.
6	Mutual trust and trust-based arrangement		Trust is the willingness to rely upon or be vulnerable towards another party. There are various types of trust such as system-based trust, cognitive-based trust, and affective-based trust
7	Open and honest communication		An open, two-way communication that is characterized by the exchange of information, sharing ideas and knowledge, which can maximize understanding and stimulate mutual trust
8	"No blame" culture attitudes		The parties collectively concentrate on finding the best possible solution instead of seeking to minimize their own exposure to poor performance
9	Balance or equitable participation		All members are treated equal, involved in project decision-making process and significant professional capability needed on the project
10	Clear definition of responsibilities		The clear responsibilities of participants help the parties should develop aligned relationships to support the objectives
11	Joint problem solving and active dispute resolution	Relationship practices	Joint problem solving need to be focused on problems at the lowest possible level and as early as possible
12	Knowledge sharing		Sharing ideas and knowledge, which can maximize understanding and stimulate mutual trust
13	Integrated team working		The parties working together as an integrated team and is reflected by joint efforts in decision making, problem solving, and continuous improvement
14	Continuous improvement		Constantly monitoring and improving works including reducing duplication, and eliminate waste and barriers in delivering greater value and increasing mutual competitive advantages
15	Contractor's early involvement		The relationship is developed as earliest as possible during the design or front end phase by involving contractors, major subcontractors and key suppliers
16	Performance measurement and benchmarking		Performance need to be monitored on a regular basis throughout the project, which helps the team to review progress and identify opportunities for further improvement
17	Risk-reward or gain-pain sharing scheme		An arrangement to allow the parties to share profits and/or losses due to cost increases and may include satisfaction and recognition; this provides the parties incentives to achieve project goals
18	Joint risk management		Joint risk management involves identification and mitigation planning of the project risks by the project parties to deal with unforeseen risk events
19	Long-term orientation/ commitment	Relational attitudes	Orientation of the parties towards future added values, reputation, and/or repeat relationship
20	Adequate resources or willingness to share resources		Sufficient allocation of resources from different parties includes knowledge, technology, information, and specific skills
21	Organizational cultural compatibility		The fitness of the different sets of corporate value toward shared values
22	Owner's commitment and support		Owner's organization-wide acceptance reflected in commitment and support from cross-functional units
23	Expectation of future work		Expectations of continuity that affect the behavior of parties in the project so that opportunistic behavior may be reduced
24	Reflection and self-assessment		The awareness and recognition of the team on of each member's different roles and responsibilities

APPENDIX II – Success factors to be able to jointly manage risks during execution phase

Suprpto (2016)	Rahman & Kumaraswamy (2004)	Construction Team
I***: Mutual objectives, goal alignment, and/or shared vision	Understanding each other's objectives and alignment of objectives	Parties are aware of each other's interests. The common interest / goal must be the central focal point.
I: Mutual trust and trust-based arrangement	Mutual trust	Mutual trust
I: Open and honest communication	Open communication among parties	Open communication
I: "No blame" culture attitudes	Attitude of project participants	Collaboration-oriented people and function as an integrated team and contribute to the work of the other party
I: Balance or equitable participation	Professional ethics and collective responsibility instead of personal responsibility	Respect each other, provide an equal basis. Locate the most suitable person for a specific task regardless the organization this person comes from
I: Clear definition of responsibilities	Equitable and clear allocation of foreseeable and quantifiable risks	Mutual certainty and clarity about the division of responsibility.
P***: Joint problem solving and active dispute resolution	Agreed process for dispute resolution	x*
P: Performance measurement and benchmarking	Agreed mechanism for performance appraisal	The performance of the project will be periodically evaluated by the client and the contractor.
P: Integrated team working	Effective coordination**	x*
P: Knowledge sharing		Make optimal use of the available knowledge / expertise of all parties
A***: Organizational cultural compatibility	Compatible organizational cultures	The client contracts a contractor with the required attitude and behaviour which is in line with the desired team culture as established in the project approach.
A: Expectation of future work	Possibility of future work	x*

Note: \*x, no evidence was found in documents; \*\*coordination, involves the use of strategies and patterns of behaviour aimed to integrate actions, knowledge and goals of interdependent members, in order to achieve common goals. Coordination ensures that a team functions as a unitary whole (Rico, Sánchez-Manzanares, Gil, Alcover, & Tabernero, 2011, p. 59); \*\*\*I (Indicator), A (Attitude), P (Practice).

APPENDIX III – Three domains that are currently barriers to establish collaborative relations

Domains	Interview statements
Procurement	<p>How the contract was intended did not come across quite well during the procurement phase.</p> <p>You have to invest during the procurement of the project in collaboration and understanding each other, know what the interests are, and also understand that the other person just has other interests. A tender is so very cold process, notes are sent back and forth and questions are answered, but never an actual conversation.</p> <p>The UAV-IC (2005) starts with the obligations of the client and the obligations of the contractor. When you already start with such matters then you already create the first attitude.</p>
Contract	<p>A contract helps in order to have clear agreements. However, it also puts people in the client vs. contractor relation instead of the 'best for project' mentality.</p> <p>A contract is never 100% complete. The contract is often the basis of a conflict, but we do need a contract. When you look at our contracts, you will be amazed by how thick they are.</p> <p>The contract did not facilitate during an event, it was used to prove, by a certain party, to the other party that they are correct.</p> <p>We realize a project in which the contract is a tool to help reaching the project goals. However currently the main goal is making a contract. Meaning that when we realized the contract we have realized the project.</p> <p>To actually solve an event, the ambiguity in contracts including the risk allocation per party, gets in the way.</p>
Human	<p>In the case of a setback, the first human reaction is to take a look at my own organisation and its interest and secure it.</p> <p>Risks are perceived as something negative and that we are too concerned about things that we do not want than what we do want.</p> <p>It depends on the user what they do with it and how they use it, since you can use tools in a positive way, but you can also use them in a negative way.</p> <p>It needs to be something in which both parties see the importance of working collaboratively together, because if you can do it alone why would you do it together?</p> <p>Solving a problem depends very much on the people of the project team, how it is communicated, how they are as a person, what kind of experiences they had in the past, and how open people are to collaborate and try and solve a problem together.</p>