ENGLISH SUMMARY

This summary is similar to the Dutch summary which describes the translates of the research ‘Integrated construction sector; comparative studies on the use of integrated contracts in the citizen- and utility sector and the civil engineering sector’. This summery will describe the main findings of each chapter and final results.

Introduction

The subject of this research is integrated contracts whereby the contract conditions of the ‘Uniforme Administratieve Voorwaarden voor geïntegreerde contractvormen 2005’ are used (the Uniform Administrative Conditions for integrated contracts 2005 – UAV-GC 2005). Integrated contract are used since the year 2000 and is a relatively new type of contract in the construction industry that can be used instead of a traditional contract.

Development process

A building project consists of several phases in which the project is developed from idea to completion. In a traditional contract form, these different phases and the related responsibilities are in principle strictly separated. The amalgamation of different tasks / responsibilities of various phases creates an integrated process. Doing so, the clients responsibilities of the various development- and operation tasks are transferred to the contractor. The integration of the design and construct (and operation) together into one larger contact is called an integrated contract. The different phases/tasks that can be added to the contract are described by the English first letter of the operation and are Design (D), Build (B) (also called Construct (C) like the American term ‘construct’), Finance (F), Maintain (M) and Operate (O). The abbreviation of the terms is the first letter of the task in the development DBFMO. The research focuses initially on the design (D) and build (B), and occasionally at the maintenance (M) and operate (O).

Figure 1: The building process shown containing a traditional and integrated process (image edited by the author of Wentzel, Van Eekelen, Rip, 2005)
**Integrated process**

In an integrated contract process different parts of the development tasks and responsibilities are formed together into one integrated contract. By the use of this integrated contract the terms of the Uniform Administrative Conditions for integrated contract (UAV-GC 2005) can be used. The UAV-GC 2005 regulates the contractual relations between clients and contractors. This research is focused on the use of the integrated contract using the UAV-GC 2005 but in this report it is described with the term integrated contract. Combining the different phases and the use of an integrated contract with the UAV-GC 2005 requires a different approach in the development of the project because of the changing roles and responsibilities in the process.

**Benefits integrated process**

The transfer of tasks / responsibilities of the different phases and the allocation of associated risks is the idea of an integrated process. In the literature there are several advantages that can be achieved with an integrated process compared to traditional processes.

- Supply chain integration and one counter concept.
- Divide of risks to the party that can control the risk.
- Stimulating innovation.
- Award the contract on price and quality.
- Own interpretations and involvement in the project

**Motivation research**

In this chapter the problems by means of literature research and interviews with experts (experience) are explored. The analysis took place on integrated contracts for application in the C&U construction sector. The analysis highlighted the existing knowledge, where gaps are located and which questions deserve priority. The problem analysis leads to the formulation of the goal and main research question. During the research on integrated contract there was experienced that the integrated contract mostly is applied in the civil engineering (CE) and less in the citizen- and utility construction sector (C&U) (Mooiman - Salvini , 2006). This assumption raised questions, especially because leading public clients such as Rijkswaterstaat and ProRail in the CE - sector uses the integrated contract as standard (RRBouw, 2007) (Rijkswaterstaat, 2008).

**Causes**

The reason why integrated contracts are used less in the C&U - sector is part of this research but is also studied in several other researches. The lack of knowledge is the main cause why integrated contracts are used less in the C&U- sector in comparison with CE - sector (Bonth, A. de, 2005) (Cremers, Kuypers, Mooiman-Salvini, 2006) (Karsten, 2009). Besides the lack of knowledge, there is no experience which makes it difficult to remove potential concerns about various aspects by positive experiences with the UAV-GC 2005.

**Methods**

By using an integrated contract there is required a different method of working. For the purposes of the contract the CE - sector uses standards methods to achieve the desired result. Despite this methods there is still development needed on the working processes (Koning, de, 2010) (Spekreijse,
2010). Within the C&U - sector the lack of knowledge is the main concern for the implementation of integrated contracts and they are still searching for methods and standardized specific for this sector (Streng, 2011) (Pekelder, 2011). Therefore there are no methods or standards developed specifically for this sector.

By applying an integrated contract there is a period before the contract (specifying and creating the design) and after the contract (the monitor and control). Both phases are important to each other and affect each other. The client has a different role than in a traditional process. There is applied a different influence and control of the project (Kuhlmann, 2010), (Kremers, 2010). In practice it was found that clients are uncertain with these different methods of working. From this conclusion the study is set up whereby the priority of research has been emphasis on these aspects.

## Research design

This chapter describes the research plan. From the assumption that integrated contracts are used less in the C&U - sector is through the problem description worked to the research results. The research design is completed with the description of the goal, research design and research questions. From these findings within the C&U - sector and CE - sector the research started by asking why the C&U - sector remains using traditional contracts in relation to CE - sector where integrated contract are the standard and benefits are obtained. Additionally this should consider whether the CE- sector the C&U - sector can support for the implementation of the integrated contracts. As the motivation of the study describes, the C&U - sector is not using integrated contracts so much. Through a comparative analysis of the use of integrated contracts in the C&U - sector and CE - sector, the C&U - sector can be informed on the use of an integrated contract with the UAV-GC 2005.

## Problem statement

The research is formulated with a problem; the problem description gives direction and structure the research. The problem is solved by the outcome of the research. From the assumption that integrated contracts are used less in the C&U - sector is made the following problem statement:

*Clients in the C&U - sector have problems with working with an integrated contract and don’t achieve the possible benefits that integrated contracts can provide by using them.*

This problem statement is used to structure the research and is used to draw conclusions for the results.

## Goal of the research

From the assumption, the problem statement of the study was designed. To give this research direction a goal is formulated:

*Get from the CE- sector a proposed solution for concerns by in the C&U- sector by carrying out an integrated contract.*
The target group of this research primarily focuses on clients in the C&U sector. Additionally, the consultants that advise the client by the use of integrated contracts can use this research. Within the C&U - sector are different clients; there are clients with experience (professional) and without any experience (occasionally). This report is written for all types of clients in the C&U – sector and have some components that are known to the experienced/professional clients. For this research there is referred to projects which construction values exceeds one million Euros. This one million euro values project exclude private/local clients with small projects. In order to achieve the goals, several actions were undertaken which is described in the research set up.
Research set up
To reach the aim of the research the study was designed in three sections. The first two sections are comprised a literature and a practice part. The literature research creates a framework in which the research takes place. Once the literature is specified the practice part describe the outcome of interviews how the practice works. This practice part needs to figure out the exact reason why the C&U makes less use of integrated contract in comparison with the CE. Besides this there needs to be figured out what the precise concerns are of integrated contracts in the C&U – sector and how the CE - sector overcomes this issue.

Following literature and interviews are the underlying thought how integrated contracts worked, the concerns and a solutions are defined. Next to that the characteristics of the two sectors are defined. These characteristics of both sectors can be used to substantial of the results. All findings from the practice part are checked against the literature part. These four elements form the content of the research. The created conclusion is the basis for the second part (the results) of the study.

![Figure 2: schematic representation of the research design.](image)

The third part of the research involved the establishment of a guideline from the founded concerns in the second part. This guide is a derivative of a method that is used in CE – sector but that is adapted to the characteristics of the C&U– sector as it is defined in the second part of the research.

Research questions
To carry out the investigation there are made questions that need to be answered to reach the aim of the research. The questions also serve as a control for the theoretical and empirical research.

The main question of the research:
*Can methods from the CE-sector remove the concerns of integrated contract in the C&U-sector and advice them to use the contract?*

To find answers to the research question, the underlying thought of various aspects need to be clear. The main question is characterized by three themes. Each theme represents a research area and has its own main research question. The themes are integrated contracts, civil engineering sector and C&U construction sector. Each theme has a number of questions that should help answer the main research question. These questions also help to structures and delineate the research:

1. What is an integrated contract and what organizes the UAV-GC 2005?
2. How and why are integrated contracts executed in the civil engineering sector and C&U sector?
3. What is the reason that clients within the C&U sector keep working traditionally?

**Result of the research**

The research results show that the research is divided into two parts. The first part of the report consists of results in which the literature, characteristics of the sectors and the concerns why the use of integrated contracts is less in the C&U-sector is described. The founded concerns are tested with the literature and practice and give an overview of how the concerns could be reduced and the methods and actions are required for the application of integrated contracts.

The second part is the result/guide of the research. The guide is a method which describes how an integrated contract can be executed. From the list of concerns there is described the methods and actions which are necessary for the application of integrated contracts in the C&U. The guide is an easy to use and read document that is also described in a separate publication.

**Literature research**

The theoretical study had to answer the following questions:

- What is an integrated contract in the development of a construction project?
- What is the UAV-GC 2005?
- What are the main characteristics of UAV-GC 2005 and the differences with UAV '89?
- How is quality managed in the contract?
- What are the principles regarding the use of integrated contracts?

In this summary will only answer the theme questions.

- **What is an integrated contract and what organized the UAV-GC 2005?**

The construction process is divided into several phases in which the structure is developed from an idea to use. Within these phases developed by the principal contractors of the project until it can be used. Because these tasks include several phases, the client needs to make various contracts with different contractors. An integrated contract is a contract where parts of the development (design, construction and operation) in a contract are located. This allows the client to step away and there is a point of contact for the development of the project. The client can determine when the project is transferred and which parts are added to the contract. For the preparation of the contract can be used the basic model agreement of the UAV-GC 2005. This model describes the basic agreements between the client and contractor with the terms of the same UAV-GC 2005 application. The UAV-GC 2005 is the contractual conditions to the contract which are used. These terms describe how the parties behave in the contract. Conditions help to avoid conflicts, because the mutual rights and obligations as fully and clearly defined as possible. The UAV-GC 2005 gives tasks to both parties of the agreement and organizes how to run these. The quality of the project comes from the description of the client in the hands of the contractor. The client decides with the risk management on the demand specification his influence and control on the project.
Practice research

The practice research had to answer the following questions:

• What is the difference in features / services between the C&U -sector and CE -sector (production, life cycle)?
• How and why are integrated contracts within the C&U - sector and CE - sector applied?
• What is the reason for the limited use of integrated contracts in the C&U - sector?

In this summary, these questions treated with the most important conclusions.

• What is the difference in features / services between the C&U and CE-sector (production, life cycle)?

The practice research has shown that the minimum application of integrated contracts may also cause the differences in characteristics of the C&U-sector and CE-sector. After identifying the individual characteristics there is made the following overview.

<table>
<thead>
<tr>
<th>Project aspect / Sector</th>
<th>C&amp;U - sector</th>
<th>CE - sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client</td>
<td>Public and private</td>
<td>Public</td>
</tr>
<tr>
<td>End user</td>
<td>known</td>
<td>Unknown</td>
</tr>
<tr>
<td>Design</td>
<td>Very important</td>
<td>Focus on functional</td>
</tr>
<tr>
<td>Detailing / materials</td>
<td>Many different types</td>
<td>Permanent materials</td>
</tr>
<tr>
<td>Execution</td>
<td>Rough and finishing - Area Specific</td>
<td>Mostly rough - repetition</td>
</tr>
</tbody>
</table>

Table 4: overview characteristics of the sectors in the construction sectors

Within the C&U – sector there are several clients with a public or private background who all have different goals on a project. One client wants to achieve a public problem and the other wants to profit from the sale / rental of housing. A feature of integrated contracts is that the client by transferring the responsibility of the project can take more distance from the project. This feature can be a cause why the contract is less used in the C&U - sector than the CU - sector. Because there are more details and materials used in C&U - sector projects this affect clients using the contract who wants to have influence to see if these aspects are properly executed. This conclusion of characteristics of these sectors is included in the study and is reflected in the outcome of the research.

• How and why are integrated contracts applied within the CE - sector?

The CE - sector consists of public clients who are spread out over three levels (National, provincial and local level). The clients are mostly powerful clients from Central Government that by means of policy have to work with integrated contracts. From this policy the application of the contract is worked out by various methods that clarify the progress. Within the provincial and local government the implementing of the contract is still minimal.

The resources of the CE-sector which are applied to the application of integrated contracts are Systems Engineering and System contract management. Systems Engineering is a method of specifying the design and is used for developing the demand specification. In Systems Engineering a construction project is seen as a system, which is surrounded by other existing systems (the project
environment or system context). System contract management is a method for verifying if the contractor performs under the agreed contract arrangements. It tests through product, process and system to see whether the contractor performs as agreed or not.

- What is the reason for the limited use of integrated contracts in the C&U - sector?

As described in previous conclusions on a research question ignorance of the integrated contract under UAV-GC 2005 that keeps clients away for choosing an integrated contract. The concerns expressed are appointed for implementation of integrated contracts in the B & U are analyzed and reduced to a term within the development. This ignorance is explored in the following points:

1. Doubts about preserving architectural quality (materials, detail) / Ignorance on demand specification.
   This concern is shown by a term that direct to the solution: assurance

2. Lack of trust in exporting parties / Uncertainty about quality assurance within the agreement.
   This concern is shown by a term that direct to the solution: trust

   This concern is shown by a term that direct to the solution: control

The reasons are examined through a literature and practical testing and showing that the concerns are not legitimate and that the concerns may be caused by many unclear for work with an integrated contract under UAV-GC 2005. The concerns have been translated into the terms influence and control within the integrated contract. The results of the study are included in the results of the research.

Outcome of the research

The outcome of the research is based on the conclusions of the literature and practice part and works towards a solution created for some of the conclusions from the practice part. This solution direction is created in the form of a description for clients in the C&U-sector who are working with an integrated contract. Besides this description there is made a guide which released the survey results more fully treated.

Introduction result

The research shows that clients within the C&U-sector want to get trust and manage the project during development. Next to that they have doubts about concerning quality assurance in an integrated contract. The interviews of the research show that in the CE-sector user resources like Systems Engineering and System Contract Management to develop a project with an integrated contract. With this tools can raise the trust and help the project management during the project. Within the C&U-sector the development of working with the contract still busy. With an explanation of the tool of the CE-sector is made a step towards a solution that aims to describe how quality assurance and control will establish within an integrated contract.
Result

The result is written down in three parts.

- Prepare contract.
- Contract.
- Contract management.

Prepare contract

For influence and control in the development process requires assurance in the preparation of the contract. In this phase there needs to be prepared project plans and demand specification. The client can/should capture all relevant requirements and wishes of the building and development. Within the CE-sector they make use of systems engineering for designing and specifying the project.

![Figure 5: the principle of Systems Engineering (Rijkswaterstaat, 2007)](image)

This designing specification/method is a structured method for the specification/design of the building.

Specification

The time when contracting of the contractor take place is a decision of the client. Through risk management on risk issues within the design need to be determine how far the project should be developed. The later in the development process the project is transferred to a contractor, the more detailed the project is developed. This mean less engineering and design solutions brought by the contractor. By the preparing of the project there needs to be compile a contract risk management plan and test plan. If the client does not want to design to the smallest detail he may prescribe a specified personal favorite or renowned architect.

Contracting

By contracting, the arrangements are established in the agreement. By contracting, the client enters into a dialogue with the contractor on performance, risk, acceptance/test plans and payments. Following the dialogue, the dossier documents such as risk, contract management plan and test plan will be updated. For the integrated contract, the contract model of the Uniform Administrative Conditions integrated contracts 2005 (UAV-GC 2005) can be applied. The model contract is a standard definition of documents that should be added to the contract. The contracting of an integrated contract is done with the condition of the UAV-GC 2005. UAV-GC 2005 creates the
conditions for cooperation, with clearly separated responsibilities between client and contractor. It is possible to delete or add conditions by using the UAV-GC 2005. The principals in the CE-sector make use of this opportunity, this can be a solution as well for clients in the C&U-sector. There should be an entry made in the contract.

The client must ensure that everything at this stage prepared enough for its own influence and control the projects.

**Contract Management**

As described in the literature of integrated contract the contracts management is done in a different way than with a traditional process. Because the lack of a detailed description of the specifications the client’s should test the agreement of the development against the demand specification and quality plan of the contractor. Rijkswaterstaat and ProRail use in the CE-sector project to test the so-called system contract management.

**System contract management**

This result focuses on the system contract management and describes how the client can apply this to his project. To make tests within contract management they make use of the demand specification (product) quality and use of the plan of the contractor (process). This control is only possible if the system (= development described in the Quality Plan) of the contractor works in practice, and the contractor (self) determines that the requirements are met and records.

The client will manage the contract in this case where it consists of by checking the operation of the contractor’s quality plan and testing of the reliability of the registrations. This allows less direct supervision and largely remote review. The test follow from ensuring the operation of the contractor (the quality plan), risk processes (Risk analysis) and the requirements of the realized products. Testing is carried out regularly by the system to perform tests, supplemented with process and product buttons.

**Tests**

The tests that are named by the system contract management are system, process and product tests. System tests are focused on the functioning of the quality plan. Process tests aimed at high risk processes or process steps. Product tests are made to the records of the contractor to verify reliability.

**Concerns**

If a feedback is made to the concerns, the client control of the project is in this stage of the project. The client can control by planning controls on the risk aspects of the project that are important for him. The tests of aspects contained in the demand specification. If the client wishes to make amendments on the demand specification then there will be created a similar situation as in a traditional process and will work with more and less work. Remedy for the concern ‘quality in the development process’ lays in the specification of the demand specification. The more detailed the documentation is developed, the more clear the contracting. If the client wants to control quality after contracting, he needs to write this down with test and accept test in the specification. In that
document the client can perform tests where he wants to test if the quality specified in the contract is obtained.

**Conclusion**

After the conclusions of the literature and practice research there was created the result. When the research was done the following final conclusions could be made. The conclusions should answer the questions of this study.

**Conclusions**

This research was triggered by an observation in the construction industry. The finding was that integrated contracts under the conditions of the UAV-GC 2005 more applied in CE-sector than in the C&U-sector. From this observation a problem was formulated which resulted in the following research question:

‘Can methods from the CE-sector remove the concerns of integrated contracts in the C&U-sector and advice them to use the contract?’

Main Research question:

- **Can methods from the CE-sector remove the concerns of integrated contracts in the C&U-sector and advice them to use the contract?**

The tools / methods that the use of integrated contracts can advice are engineering and systems engineering - system contract management. These two resources are developed within the CE-sector and supporting major clients in working with an integrated contract, but the C&U-sector can support their concerns that they have integrated contracts related problems. The concerns within the C&U-sector is concerned that clients want to influence and control within the project. In the result what has been described shows how assurance, influence and control can hold and carry out by working with an integrated contract. It describes the different method of working whereby through risk management on specifications, the needs of influence and control is determined. By investigate the characteristics of both sectors it shows that projects within the C&U-sector are more detailed, materialization and more specific spatial aspects than the CE-sector where many standardization and repetition exists. These features of the C&U-sector are included during the development of the research and the result.

Consequently, the result described by funds from the CE-sector which are then adapted to the characteristics of the C&U-sector. It specifies that the client need to work out their demand specification at risk design aspects. these aspects require further detail resulting in less choice for freedom for the contractor. Additionally, based upon risk analysis of the design, quality and the quality plan of the contractor acceptance and test plans are completed. This allows the clients influence and control in the project to decide according to the attitude what it wants included in the project.