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Article

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Abstract: The cost and determination of construction projects are key issues for both customer and contractor when entering into a construction contract. For customers, calculation and evaluation of the cost of construction projects is complicated by the problem of underpricing, which may lead to the failure of contractors submitting a bid for a project, and in addition, overpricing may lead to an overestimation of the average market value of specific groups of works. Therefore, the aim of the study is to compare the quality assurance of different contractors’ contracts using a multi-functional decision-making process and to develop a set of quality assessment criteria. The Analytic Hierarchy Process (AHP) was used to determine the significance of the criteria and afterwards to evaluate the construction contracts. Two groups of experts were involved in this research: specialists for the customer group, and specialists for the contractor group that comprised professionals in their respective fields, with many years of experience in managing and implementing construction projects. Based on the results of this study, conclusions and recommendations are presented regarding possibilities of ensuring quality of construction contracts and minimizing disputes between customer and contractor.

Keywords: construction contract; contract assessment; AHP; contractor; customer

1. Introduction

The procurement of construction contracts has been one of the most complex aspects of the construction industry over the last century [1]. Construction procurement is the process by which a contractor submits a bid (known as a tender) to undertake the construction of a project. This multi-step process is a crucial part of the project, allowing customers to find the best contractor for the construction work at the most competitive price [2]. Construction tenders include not only technical issues, but also economic, legal and risk management aspects. Therefore, bids play an essential role in the successful implementation of construction projects [3].

The successful and timely implementation of a construction contract depends on proper and timely cooperation between the customer and the contractor. The contractor’s business objective is to complete the contract at the lowest possible cost and thereby maximize profit. An important aspect is that the quality of the construction work should not be compromised by cost reduction. The objective of the tender is to obtain the best contractor for the execution of the works at a competitive price, in accordance with the technical specification prepared by the customer.

The construction industry is one of the most conflict-prone and dispute-prone industries, making it one of the most claim-oriented sectors [4]. A dispute can be defined as an unsolved issue if one of the parties to a contract is dissatisfied with the decision made [5]. A dispute is further defined as the inability of two parties to agree on a particular technical or management issue, which may lead them to go to court [6]. Conflict involves a breakdown in communication between the contractor and the customer, which can affect
the legal relationship and the successful implementation of the construction project [7]. In the construction sector, disputes are a constant topic of conversation. The total number of disputes in the construction sector continues to rise, with the average value of disputes reaching an all-time high in 2021 [8]. Disputes can be detrimental to a construction project and the project participants. A dispute within a project would distract from the main objective and force the participants to defend their interests. This problem can have a direct impact on the project’s objectives and can delay the project’s implementation time [9].

Therefore, the aim of this study is to compare the quality assurance of different contractors’ contracts using the Analytic Hierarchy Process (AHP)—a multi-functional decision-making process—and to develop a set of quality assessment criteria from the point of view of contractor and customer.

The methods used in this study can be applied to the assessment of quality assurance, not only from a theoretical perspective but also from a practical perspective, thus reducing potential disputes between customers and contractors to a minimum. This study also can be used to assess the quality assurance of other types of contracts in addition to construction contracts.

The next section, Literature Review, provides an overview of scientific articles relevant to the topic. It reviews the research carried out in relation to each of the project risk management criteria proposed in this paper. Section 3 describes the AHP method that will be used to determine the significance of the criteria and evaluate the contracts according to the determined significance of the criteria. Section 4 discusses the data description and assessment of the criteria values by experts and calculations of criteria significance. Section 5 presents calculations using the AHP method and assessment of four construction contracts. Sections 6 and 7 discuss the results of the study and provide conclusions and recommendations.

2. Literature Review

Change orders are a very common way of modifying the work defined in the original contract documents [10]. Many studies have focused on how change orders affect projects, and the results show that many construction projects around the world face problems related to schedule delays and cost overruns [11]. Changing the construction contract due to the increase in the amount of work leads to cost overruns or an extension of the construction schedule [12]. Numerous studies have been carried out that have looked at how changes to construction works affect projects, and the results show that many construction projects around the world face problems with contract changes due to delays in the construction schedule and cost increases [13]. In the construction sector, changes in contract terms can occur at any point in the project life cycle [14]. Contract variation during the construction phase is usually resource intensive compared to the process during the design phase, and both the root cause and any potential impact on the construction project need to be investigated. Each change requires analysis and a solution that depends on the relationship and communication between the stakeholders [15]. Despite many studies in this area, there are no effective or unique management approaches to prevent and manage contract variations [16]. Often, there is pressure on the contractor to change the contract in a timely manner to shorten the construction lead time, reduce costs, and meet the customer’s expectations [16]. In recent years, there has been an increase in the number of cases where contractors submit overly competitive bids to win the work, compensate for losses by reducing the bid price, look for ways to change the contract, and end up exceeding the budget of the construction project [16]. In construction, a change constitutes any alteration to the scope, period, cost and/or quality of the contracted works [17]. There are many reasons for modifying a construction contract, and the reasons for modifications can be categorised. The main reasons can be divided into four main points [18]:

1. Customer—changes initiated by the customer due to the customer’s requirements for changes set out in the contract;
2. Consultants—changes initiated by consultants such as design consultants;
3. Contractor—changes initiated by the contractor to save costs or time, or to improve quality;
4. Other—changes initiated by subcontractors from other parties such as the end user.

Research articles identify the three sectors that perform the most contract changes, namely, Civil Engineering 28.57%, Construction Technology 20.97%, and Industrial Engineering 18.02% [19]. This shows that while the construction and civil engineering literature discusses contract modifications extensively (49.54%), all other industry sectors account for the other half of the research volume. As the construction sector accounts for 6% of the UK economy [20], it can be concluded that changes in the construction and civil engineering sector are relatively disproportionately large, perhaps due to the bespoke nature of construction projects [21] and the often poorly informed nature of the customer [22].

Previous studies have documented many additional negative consequences such as loss of reputation of the construction company, loss of productivity, and cash flow problems [23]. To identify the main causes of disputes in the construction sector, a model has been made [24]. The causes of conflicts were divided into three categories:

1. Task factors such as collaborative conflict, risk, and uncertainty;
2. Factors contributing to the incompleteness of a contract such as ambiguity, deficiencies, and inconsistency;
3. Human factors such as opportunistic behavior and emotional conflicts.

A similar study was carried out by [25,26] who identified three main causes of disputes:

1. Contractual provisions, where the existence of a dispute is often established through a contractual mechanism;
2. Competitive/hostile attitudes or disputing events, where claims are usually based on certain events;
3. Participants, different perceptions of justice, or conflict, where the differing objectives and needs of the parties to a project create an environment fraught with conflict.

While previous studies on quality issues in construction contracts have addressed semantic issues, there are gaps in the literature on semantic issues due to ambiguous contract terms [27].

As several examples show, disputes can arise due to a variety of project factors [28]. However, the acknowledged sources of disputes have been quite similar, thus precise and unambiguous contract terms are crucial for the successful implementation of the construction project.

Proper communication between contracting parties and a clear and unambiguous definition of contract terms, rights, and obligations in the contract document are becoming essential needs to run smoothly and minimize conflicts [29,30].

Successful contract management requires a reasonable degree of commonality in the interpretation of contract provisions. The complex structure of language [31], legal and technical terms, and the ambiguity of contractual terms [32] are considered the major factors of misunderstanding and divergent interpretation [33]. Ambiguity and imprecision in construction contract terms can lead to conflicts, claims, and disputes.

Zaneldin [34] examined the causes and severity of construction claims and recommended the use of clear written contracts at the design stage. The researcher pointed out that contract provisions that have been successfully used and implemented in previous construction projects can be used for future projects. The study found that the customer’s unwillingness to invest in quality contract documents for a construction project, unprofessionalism, and incompetence were the main causes of poor-quality tender documents and problems with misinterpretation [35].

The high level of uncertainty in construction contracts leads to many contractors going bankrupt every year. Although there are many factors that can cause a construction business to fail, the most common causes are financial and budgetary factors [36]. The lack of connection between financing and project implementation planning affects the cash flow of the project and creates unfulfilled work schedules which often leads to contractors
defaulting. Project financing problems not only affect cash flow but can also affect the interaction between project participants. Conflicts between the parties may increase and claims may be made. It is often difficult to complete a construction project without deviating from the original structural design of the structure, resulting in changes and recalculation of construction costs; inaccurate design, inadequate geological surveys, inaccurate and preliminary work quantities, and low contract price have been identified as the main reasons in many previous studies.

Successful project implementation has been linked to project cash flow, which in turn was related to payments to contractors, which in turn has an impact on construction progress. Factors contributing to project cost overruns include price overruns, poor design and implementation, inadequate and inaccurate project budget planning, administrative uncertainty, and lack of coordination between companies. Several research methods have been used to investigate the causes of cost overruns in construction projects such as access to government and private databases, case studies, and questionnaire surveys.

There are three key elements for a successful construction project:

1. Obtaining the expected quality parameters;
2. Meeting the deadline;
3. Meeting the budget.

For calculating the indicative cost of construction works, prices are calculated at a profit, considering costs, wages, the cost of operating construction machinery, direct and indirect costs, etc. Exact and unambiguous terms in the contract can therefore have a significant impact on the success of the project.

The results of the study provide several useful implications for the parties to the contract, and particular attention should be paid to contractual issues in order to limit the claims of the parties to the contract and thereby reduce construction delays.

The productivity of a construction project is expressed as the difference between time and cost. The cost efficiency of a construction project is the most important and most common issue in the global construction industry compared to the other three key indicators: scope, time, and quality.

Relevant studies have been carried out in many countries on the subject of cost overruns in construction projects, which have investigated the causes of cost overruns and have categorized the causes of cost overruns in terms of four main explanations: technical, economics, psychological, and political.

The study found that the most important factor for cost overruns is schedule delays (47%). The second most important factor is inadequate project planning (47%). The third and fourth most important factors were project changes (45%) and scope of work (43%). The fifth most important factor was inaccurate estimation of project time and cost (42%).

In most construction projects, the customer pays the contractor for the work carried out when the contractor submits a certificate of completion. Disagreements may arise between the customer and the contractor over the performance certificate, especially when the payment terms in the contract are not clear or properly administered. These disagreements can lead to conflicts between the customer and the contractor, which can have a negative impact on project performance. During the implementation phase of a construction project, the payment of the contractor for the construction work performed may have negative consequences for the project’s timeline, cost, quality, and productivity, which may lead to a dispute between the contractor and the client, bankruptcy, or even termination of the contract.

Delays in payment for completed works are one of the risk factors with the greatest impact on construction projects. It is common for construction projects to have contractual amounts more than 100%. Contractors face significant challenges in planning strategies to ensure sufficient cash flow throughout the construction project. Insufficient cash flow in a construction project can lead to several negative financial consequences such as cost overruns. Lack of financing and persistent delays in payments for completed works hinder cash flow, which subsequently
slows down the progress of the construction project and increases the project duration. Cash flow volatility has therefore been shown to reduce contractor profitability and lead to cost overruns in all aspects of the contractor’s operations [65]. Timely payment for work completed in accordance with the associated works can be considered as one of the key criteria for a successful construction project [66]. If the contractor does not receive payment for the work carried out, they are unable to pay material suppliers, thus the supply of materials to the construction project is disrupted [67]. Therefore, construction contracts must provide for clear payment arrangements for the work to avoid disputes between the customer and the contractor, and to ensure that the contracts are completed on time and according to the agreed schedule. Consistent payments to the contractor for the work carried out are a duty of the client and a necessity for the continuity of the construction project and the completion of the works [68].

The terms of the construction contract are set out in a contract signed by the customer and the contractor. The contract not only specifies the start and end of the work but may also provide for other deadlines related to the performance of specific works or groups of works [69]. As construction projects are becoming more complex, competitive, and collaborative, the project timeframe is an essential element in contract management. Project construction time overruns have been considered one of the most important problems affecting the performance of the construction industry worldwide [70]. With many studies focusing on the successful delivery of a project, researchers are investigating the factors that affect time, cost, and quality [71]. A study found that the vast majority of previously completed construction projects were delayed due to delays behind the approved schedule [72]. Despite various initiatives and efforts to accelerate the completion of works, many construction projects are still behind the original schedule and the contract value is increasing accordingly [73]. Being behind schedule has been identified as one of the major issues affecting the performance of the construction industry worldwide [74]. Researchers Zidane and Andersen found and reported that historical data from the construction industry confirms that many construction projects are delayed due to schedules [72]. A study analyzing developed and developing economies on five continents concluded that project delays and cost overruns remain among the biggest challenges facing the global construction industry [73]. The study revealed that more than 90% of public infrastructure projects experienced time and cost overruns Flyvbjerg, B. [75]. Thus, in construction contract obligations, clear deadlines for the completion of the construction works are of great importance for the successful and timely implementation of the contract.

Construction projects are becoming more complex, resulting in complicated construction legal contracts [76].

Contractual dispute management depends mainly on three conditions [77]:

1. Clause specificity. A specific contractual clause defines the roles and responsibilities that each party should assume [78];
2. Contractual obligatoriness. A contractual obligation constrains each party to comply with the terms of the contract, thus reducing the incidence of opportunistic behavior [79];
3. Applicability of the contract to contingencies. Refers to a contractual adjustment when an unforeseen event occurs that causes a dispute between the parties involved. Adaptation is a flexible space for negotiating a dispute in a contract while the parties to the contract are negotiating [80].

According to the World Bank, resolving contractual disputes can be lengthy, costly, and complex [81]. Contractual disputes can damage the relationship between the customer and the contractor, cause delays in the implementation of the contract, and negatively affect contract performance [82]. Disputes can significantly increase the cost of the contract. Therefore, it is in the interest of contracting parties to cooperate primarily to avoid disagreements [83]. This can be achieved, among other things, by improving communication and managing contractor labor relations [84]. The causes of disputes in a construction project range from a lack of detail in the design of the structure and inadequate risk assessment
when bidding for construction work, to poor communication between customers and contractors, with each possible cause having a different degree of severity. A research study in the Norwegian construction sector has identified the major risks in project management [85]. Disputes between clients and contractors are most likely to arise and have a negative impact on project performance due to poor communication and cooperation. Project delays and other failures have a negative impact on the sustainable development of stakeholders, human resources, projects, industries, and governments [86].

It is essential to define the duties and obligations of the contractor and the customer in the terms of the construction contract. The contract must clearly describe the conditions for the non-performance of the contractor’s obligations, as well as those of the customer, to avoid disputes and claims between the parties. Claims in projects increase the cost and time of the project and ultimately affect the performance and success of construction projects. Therefore, further study by the authors aims at developing a set of criteria and assessing different contractual agreements in terms of quality assurance and successful implementation to contribute to minimizing disputes between the customer and the contractor during the implementation of a construction contract.

3. AHP Method

The Analytic Hierarchy Process (AHP) method was introduced by T. L. Saaty in 1980. AHP is a method of measurement through pairwise comparisons that incorporates the judgment of experts in deriving priority scales. This study uses the AHP method to calculate the significance of the criteria and to evaluate the contracts according to the calculated significance of the identified criteria.

The AHP method involves the following steps [87]:

1. The criteria are compared in pairs (the criteria are compared and evaluated in a linguistic form, which is expressed as numbers);
2. A pairwise comparison matrix is constructed (if the opinions of several experts are assessed, then an average pairwise comparison matrix is constructed of the mean values of the experts’ responses):

\[
A = \begin{bmatrix}
    a_{11} & a_{12} & \cdots & a_{1m} \\
    a_{21} & a_{22} & \cdots & a_{2m} \\
    \vdots & \vdots & \ddots & \vdots \\
    a_{m1} & a_{m2} & \cdots & a_{mm}
\end{bmatrix};
\]

\(a_{ii} = 1, a_{ij} = 1/a_{ji}\)  

\(m\)—the number of criteria;

3. The pairwise comparison matrix (or the average pairwise comparison matrix of the experts’ response values) is normalized:

\[
B = \frac{a_{ij}}{\sum a_{ii}^j};
\]

4. Sum the values of each row of the square matrix:

\[
s_i = \sum_{j=1}^{m} b_{ij}
\]

\(b_{ij}\)—element of the pairwise comparison matrix;

5. Calculate the relative significance of the criteria:

\[
q_i = s_i / \sum s_i;
\]

6. The value \(\lambda_{max}\) is calculated:

\[
Aq_i = \lambda_{max} q_i;
\]
(7) the following condition must be fulfilled:
\[
\lambda_{\text{max}} \geq m; \tag{6}
\]
(8) setting the compatibility indicator:
\[
CI = (\lambda_{\text{max}} - m) / (m - 1); \tag{7}
\]
(9) from the tables, \( RCI \) is derived, which depends on the number of criteria assessed;
(10) the compatibility coefficient \( CR \) is calculated:
\[
CR = CI / RCI. \tag{8}
\]

If the calculated coefficient of concordance \( CR \) is less than 0.1 (10%), the experts’ opinions are sufficiently concordant and the pairwise comparison decision is acceptable. When the condition is not satisfied, the experts’ judgements are said to be inconsistent and unreliable [87]. In such a case, the assessment of the pairwise comparison of experts should be performed again.

4. Data Description and Assessment of the Criteria Significances by Two Groups of Experts

After interviewing the experts, the AHP method was used to determine the significance of the criteria, thus identifying criteria with the highest and the lowest influence in terms of contracts. The study identified six key criteria that have the greatest impact on the terms and conditions of contract performance and on constructive communication and dispute minimization between customers and contractors. The essence and uniqueness of the research is that the study used two expert groups to determine the significance of the criteria and to evaluate construction contracts. The first group of experts were experts in the field of the customer (project managers, engineers) and the second group of experts were experts in the field of the contractor (engineers, managers, construction contractors). The study interviewed twenty expert professionals in their field, with extensive experience in construction project management and construction project implementation.

The criteria that have a significant impact on the successful implementation of construction contracts are presented in Table 1.

<table>
<thead>
<tr>
<th>ID</th>
<th>Criteria Influencing the Quality Assurance of Construction Contracts</th>
<th>Main References</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>Clear procedures allow making changes to the contract in the event of an increase/decrease in the scope of work</td>
<td>[13,15]</td>
</tr>
<tr>
<td>R2</td>
<td>Exact and unambiguous terms of the contract</td>
<td>[26,27]</td>
</tr>
<tr>
<td>R3</td>
<td>Construction project cost overruns</td>
<td>[49–51]</td>
</tr>
<tr>
<td>R4</td>
<td>Clear payment procedure for completed work</td>
<td>[60,68]</td>
</tr>
<tr>
<td>R5</td>
<td>Clear deadlines for construction work</td>
<td>[70,71]</td>
</tr>
<tr>
<td>R6</td>
<td>Clear responsibility of the contractor and the customer for improper performance of contractual obligations</td>
<td>[85,86]</td>
</tr>
</tbody>
</table>

Construction contracts were evaluated based on expert assessment, after the significance of the quality assurance criteria had been established. Two expert panels were used to determine the significance of the quality assurance criteria. The first group consisted of specialists selected by the customer. Ten experts (project managers—4, engineers—4, lawyer—1, and manager—1) were interviewed. Most of the professionals had 10–20 years of experience, eight had a master’s degree, and two had a bachelor’s degree. The second
group of professionals were specialists in the contracting field. Ten professionals (project managers—4, construction contractors—3, and supervisors—3) were interviewed. Most of the professionals had 10–20 years of experience, eight experts had a master’s degree and two had a bachelor’s degree (see the scheme in Figure 1).

Figure 1. The scheme for assessment of the quality of construction projects (compiled by authors).

The experts rate the pairwise comparison using the AHP scale. The consistency of the completed matrix is checked using Formula (3). The pairwise comparison determines how more important one criterion is than another. The study uses a rating scale (scores 1–3–5–7–9); if the criteria are of equal importance, the rating is equal to one. If the difference between the weights of the criteria is the greatest, the score is nine. After the assessment, an inverse pairwise comparison matrix is created.

The matrix of the customer experts’ mean scores is presented in Table 2.
Table 2. Matrix of customer’s expert assessment averages.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
<th>R4</th>
<th>R5</th>
<th>R6</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>1.000</td>
<td>0.246</td>
<td>0.330</td>
<td>0.304</td>
<td>0.285</td>
<td>0.140</td>
</tr>
<tr>
<td>R2</td>
<td>4.400</td>
<td>1.000</td>
<td>1.000</td>
<td>0.330</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>R3</td>
<td>3.400</td>
<td>1.000</td>
<td>1.000</td>
<td>1.600</td>
<td>1.000</td>
<td>0.451</td>
</tr>
<tr>
<td>R4</td>
<td>3.200</td>
<td>3.000</td>
<td>0.853</td>
<td>1.000</td>
<td>0.933</td>
<td>0.933</td>
</tr>
<tr>
<td>R5</td>
<td>3.800</td>
<td>1.000</td>
<td>1.000</td>
<td>1.200</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>R6</td>
<td>7.000</td>
<td>1.000</td>
<td>3.600</td>
<td>1.200</td>
<td>1.000</td>
<td>1.000</td>
</tr>
</tbody>
</table>

The matrix of the contractor’s expert assessment averages is shown in Table 3.

Table 3. Matrix of contractor’s expert rating averages.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
<th>R4</th>
<th>R5</th>
<th>R6</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>1.000</td>
<td>1.200</td>
<td>0.980</td>
<td>1.000</td>
<td>0.330</td>
<td>0.440</td>
</tr>
<tr>
<td>R2</td>
<td>0.933</td>
<td>1.000</td>
<td>1.453</td>
<td>1.000</td>
<td>1.120</td>
<td>1.000</td>
</tr>
<tr>
<td>R3</td>
<td>1.933</td>
<td>0.999</td>
<td>1.000</td>
<td>1.000</td>
<td>0.520</td>
<td>0.933</td>
</tr>
<tr>
<td>R4</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>0.397</td>
</tr>
<tr>
<td>R5</td>
<td>3.000</td>
<td>1.333</td>
<td>3.400</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>R6</td>
<td>1.000</td>
<td>1.000</td>
<td>1.200</td>
<td>2.800</td>
<td>1.000</td>
<td>1.000</td>
</tr>
</tbody>
</table>

The normalized matrices of the customer’s and contractor’s experts are calculated with the use of Formula (2). The normalized matrix of the customer’s expert assessment averages is shown in Table 4.

Table 4. Normalized matrix of customer’s expert assessment averages.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
<th>R4</th>
<th>R5</th>
<th>R6</th>
<th>Final Priority</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>0.044</td>
<td>0.034</td>
<td>0.042</td>
<td>0.054</td>
<td>0.055</td>
<td>0.031</td>
<td>0.043</td>
<td>6</td>
</tr>
<tr>
<td>R2</td>
<td>0.193</td>
<td>0.138</td>
<td>0.128</td>
<td>0.059</td>
<td>0.192</td>
<td>0.221</td>
<td>0.155</td>
<td>5</td>
</tr>
<tr>
<td>R3</td>
<td>0.149</td>
<td>0.138</td>
<td>0.128</td>
<td>0.284</td>
<td>0.192</td>
<td>0.100</td>
<td>0.165</td>
<td>4</td>
</tr>
<tr>
<td>R4</td>
<td>0.140</td>
<td>0.414</td>
<td>0.110</td>
<td>0.177</td>
<td>0.179</td>
<td>0.206</td>
<td>0.204</td>
<td>2</td>
</tr>
<tr>
<td>R5</td>
<td>0.167</td>
<td>0.138</td>
<td>0.128</td>
<td>0.213</td>
<td>0.192</td>
<td>0.221</td>
<td>0.176</td>
<td>3</td>
</tr>
<tr>
<td>R6</td>
<td>0.307</td>
<td>0.138</td>
<td>0.463</td>
<td>0.213</td>
<td>0.192</td>
<td>0.221</td>
<td>0.256</td>
<td>1</td>
</tr>
</tbody>
</table>

The normalized matrix of the contractor’s expert assessment averages is shown in Table 5.

Table 5. Normalized matrix of contractor’s expert assessment averages.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
<th>R4</th>
<th>R5</th>
<th>R6</th>
<th>Final Priority</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>0.113</td>
<td>0.184</td>
<td>0.108</td>
<td>0.128</td>
<td>0.066</td>
<td>0.092</td>
<td>0.115</td>
<td>6</td>
</tr>
<tr>
<td>R2</td>
<td>0.105</td>
<td>0.153</td>
<td>0.161</td>
<td>0.128</td>
<td>0.225</td>
<td>0.220</td>
<td>0.164</td>
<td>3</td>
</tr>
<tr>
<td>R3</td>
<td>0.218</td>
<td>0.153</td>
<td>0.111</td>
<td>0.128</td>
<td>0.105</td>
<td>0.196</td>
<td>0.152</td>
<td>4</td>
</tr>
<tr>
<td>R4</td>
<td>0.113</td>
<td>0.153</td>
<td>0.111</td>
<td>0.128</td>
<td>0.201</td>
<td>0.083</td>
<td>0.132</td>
<td>5</td>
</tr>
<tr>
<td>R5</td>
<td>0.338</td>
<td>0.204</td>
<td>0.376</td>
<td>0.128</td>
<td>0.201</td>
<td>0.210</td>
<td>0.243</td>
<td>1</td>
</tr>
<tr>
<td>R6</td>
<td>0.113</td>
<td>0.153</td>
<td>0.133</td>
<td>0.359</td>
<td>0.201</td>
<td>0.210</td>
<td>0.195</td>
<td>2</td>
</tr>
</tbody>
</table>
The consistency index and the consistency coefficient (CR < 0.1) were determined according to Formulae (7) and (8), with the CR of the customer's experts = 0.0974 and the CR of the contractor's experts = 0.0989.

Furthermore, the expert assessment data were processed, and the significance of the criteria was determined (Tables 4 and 5).

According to customer opinion, it was found that criterion 6 (clear responsibility of the contractor and the customer for improper performance of contractual obligations) had the highest importance and significance, followed by criterion 4 in second place, criterion 5 in third place, criterion 3 in fourth place, criterion 2 in fifth place, and criterion 1 in sixth place.

While the contractors identified criterion 5 (clear deadlines for construction works) as the most important and most significant, followed by criterion 6 in second place, criterion 2 in third place, criterion 3 in fourth place, criterion 4 in fifth place, and criterion 1 in sixth place; i.e., both groups consider clear procedures allow making changes to the contract in the event of an increase/decrease in the scope of work, as the less significant criterion among the analyzed criteria. The experts' significance of the criteria is shown in Figure 2.

![Figure 2. Significance of criteria (compiled by authors).](image)

The sets of criteria are presented in Figure 3. As can be seen from the figure, the customers and the contractors both ranked criterion 3 as the fourth most significant remaining criteria and criterion 1 as the most insignificant criteria in this study, while the priority order of other criteria differs.

![Figure 3. Customer and contractor evaluations set (compiled by authors).](image)
5. Assessment of Construction Contracts

Construction contracts set out in advance the timing, responsibility, payment for work, and other provisions. Typically, standardised contracts are used for construction contracts, which describe general terms and conditions of the contract and do not always consider the complexity, specificity, and other factors that are important for the quality of the work and for the successful implementation of the construction project and for the management of risks. The main objective of the study was to ensure the quality of construction contracts, to the extent that uncertainty in the terms of the contracts can be reduced and disputes between the customer and the contractor prevented in advance. This study uses completely different general contractual clauses, both according to the type of construction work and the type of contract. All the contracts in question were implemented under the European Union’s Structural Cohesion Programme. All four contracts were implemented in the Republic of Lithuania. The general and specific terms and conditions and the type of contract were determined by the contracting authorities. For the implementation of all the contracts, the contractor was selected following public procurement procedures. The objective of the implementation of all the contracts concerned was to implement the convergence objective of the strategy for the use of structural assistance, the priority axis of quality of life and cohesion. The details of the contract documents were determined by the technical staff of the contracting authorities, according to their level of expertise.

The first contract (A) is a project for the construction of a sewage treatment plant (FIDIC Yellow Book), the second (B) is a project for the modernisation of a block of flats, the third (C) is a project for the construction of a gas pipeline, and the fourth (D) is a project for the restoration of a cultural heritage site.

The contracts were analyzed in terms of six criteria as described in previous sections and by applying AHP methodology of pairwise comparisons (see Figure 4).

![Decision-making scheme](image.png)

**Figure 4.** Decision-making scheme (compiled by authors).

The customers and the contractors—specialists and professionals in their respective fields—were asked to evaluate the construction contracts. The contract documents for each project were studied by the customer and contractor experts against all six criteria. The customer and contractor experts had many years of experience in project management; experts from the customer and the contractor groups assessed the impact of each criterion on the specific contract. Inverse pairwise comparison matrices were constructed, 12 matrices (6 matrices for the customers and 6 matrices for the contractors). The consistency index
and the consistency coefficient CR < 0.1 for each matrix were determined according to Formulae (7) and (8).

The first criterion, clear procedures to allow changes to the contract in the event of an increase/decrease in the scope of work, was rated the highest by the customer experts in the first contract, and the highest by the contractor experts in the first and the second contract. The worst assessment of the first criterion was made by both the customer and the contractor experts in the fourth contract. The contract conditions were presented without specifying the procedures that would allow changes to the contract. In the expert assessment, this indicator was rated by both the customer and the contractor experts as the least likely to have an impact on the success of the contract. The experts’ assessments of the first criterion are shown in Figure 5.

![Figure 5. Expert assessment of the first criterion (compiled by authors).](image)

The second criterion, precise and unambiguous contract terms, was rated best by the customer and contractor experts in the first contract. The customer experts assessed this indicator to be more significant in the first contract than in the second contract, with a difference of only 0.036, while the contractors assessed the difference to be significantly higher, at 0.317. The worst scores for the second criterion were given by the experts for the third and fourth contracts. The experts’ assessments of the second criterion are shown in Figure 6.

![Figure 6. Expert assessment of the second criterion (compiled by authors).](image)
The third criterion, cost overruns in the construction project, was rated the best in the first and second contracts. The experts were also in agreement on the third indicator in the second remaining contract, with the same rankings for the second contract. The lowest ranking for this indicator was for the fourth contract. The experts’ ratings for the third criterion are shown in Figure 7.

![Figure 7](image_url)

**Figure 7.** Expert assessment of the third criterion (compiled by authors).

For the fourth criterion, clear payment procedures for completed work, the customers scored the best in the first and second contract, but the contractors considered that the terms of the first contract described this indicator more clearly than the terms of the second contract, with a difference of 0.211. Both experts considered that the contractual clause clear payment procedures for completed work is worst expressed in the fourth contract. The experts’ assessments of the fourth criterion are shown in Figure 8.

![Figure 8](image_url)

**Figure 8.** Expert assessment of the fourth criterion (compiled by authors).

The fifth criterion, clear deadlines for construction work, was rated the best by the customer and contractor experts in the first contract. The contractor experts considered that clear deadlines for construction work are significantly clearer in the terms of the first
contract than in the terms of the second contract, by a margin of 0.431. However, the customer experts considered that the terms and conditions of the first and the second contract are very similar for the fifth indicator, with a difference of only 0.050. The experts rated the fourth contract the worst. In the expert assessment and the weighting of the criteria, the contractor experts assessed that clear deadlines for construction work have the greatest impact on the successful implementation of the contract. The experts’ assessments for the fifth criterion are shown in Figure 9.

![Figure 9](image-url)  
**Figure 9.** Expert assessment of the fifth criterion (compiled by authors).

The sixth criterion, clear responsibility of the contractor and the customer for improper performance of contractual obligations, was considered by the experts to be the best in the first contract. As with the fifth criterion, the views of customers and contractors differed and contractors considered that the indicator cleared responsibility of the contractor and the customer for improper performance of contractual obligations, was significantly more clearly detailed in the first contract than in the second contract, a difference of 0.431. In the expert assessment and in determining the significance of the criteria, the customer experts assessed that the clear responsibility of the contractor and the customer for improper performance of contractual obligations has the greatest impact on the successful implementation of the contract. The experts’ assessments for criterion 6 are shown in Figure 10.

![Figure 10](image-url)  
**Figure 10.** Expert assessment of the sixth criterion (compiled by authors).
After comparing the terms of the contracts with each indicator, the decision matrices were drawn up. Customers’ assessment decision matrix is shown in Table 6. The decision matrix for the contractors’ assessment decisions is presented in Table 7.

### Table 6. Customers’ expert decision matrix.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
<th>R4</th>
<th>R5</th>
<th>R6</th>
<th>Final Priority</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Significances</td>
<td>0.043</td>
<td>0.155</td>
<td>0.165</td>
<td>0.204</td>
<td>0.176</td>
<td>0.256</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A contract</td>
<td>0.440</td>
<td>0.440</td>
<td>0.410</td>
<td>0.413</td>
<td>0.432</td>
<td>0.392</td>
<td>0.416</td>
<td>1</td>
</tr>
<tr>
<td>B contract</td>
<td>0.155</td>
<td>0.404</td>
<td>0.387</td>
<td>0.413</td>
<td>0.382</td>
<td>0.324</td>
<td>0.368</td>
<td>2</td>
</tr>
<tr>
<td>C contract</td>
<td>0.364</td>
<td>0.081</td>
<td>0.159</td>
<td>0.128</td>
<td>0.099</td>
<td>0.230</td>
<td>0.157</td>
<td>3</td>
</tr>
<tr>
<td>D contract</td>
<td>0.040</td>
<td>0.074</td>
<td>0.044</td>
<td>0.047</td>
<td>0.086</td>
<td>0.054</td>
<td>0.059</td>
<td>4</td>
</tr>
</tbody>
</table>

### Table 7. Contractors’ expert decision matrix.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
<th>R4</th>
<th>R5</th>
<th>R6</th>
<th>Final Priority</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Significances</td>
<td>0.115</td>
<td>0.164</td>
<td>0.152</td>
<td>0.132</td>
<td>0.243</td>
<td>0.195</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A contract</td>
<td>0.389</td>
<td>0.597</td>
<td>0.456</td>
<td>0.542</td>
<td>0.617</td>
<td>0.520</td>
<td>0.534</td>
<td>1</td>
</tr>
<tr>
<td>B contract</td>
<td>0.389</td>
<td>0.268</td>
<td>0.370</td>
<td>0.331</td>
<td>0.186</td>
<td>0.201</td>
<td>0.273</td>
<td>2</td>
</tr>
<tr>
<td>C contract</td>
<td>0.153</td>
<td>0.075</td>
<td>0.097</td>
<td>0.070</td>
<td>0.114</td>
<td>0.201</td>
<td>0.121</td>
<td>3</td>
</tr>
<tr>
<td>D contract</td>
<td>0.069</td>
<td>0.060</td>
<td>0.078</td>
<td>0.057</td>
<td>0.083</td>
<td>0.079</td>
<td>0.072</td>
<td>4</td>
</tr>
</tbody>
</table>

The expert assessment showed that the first contract clauses are the most accurate and complete in terms of the criteria considered, followed by the second contract, the third contract, and the fourth contract.

Analyzing the customers’ expert decision matrix, the difference between the first and the second contract is not extremely significant—11.54%, while the difference between the third and the fourth contract is significantly higher—62.42%. In the analysis of the contractors’ expert decision matrix, contract A is the clear leader, with a difference of 48.88% between the first and the second ranked contract, and 40.5% between the third and the fourth ranked contract.

The experts’ priorities are shown in Figure 11.
6. Discussion of the Results and Practical Implications

The study investigated two stakeholder groups—the client, and the contractor. These two stakeholder groups have different expectations and objectives in the implementation of a public works contract. The main objective of the client is to find the best contractor to carry out the construction work at a competitive price. The contractor’s main objective is to minimize the cost of the construction work, thereby maximizing their net profit. Therefore, the expert judgement of clients and contractors differs depending on the interests and objectives of each group. In the assessment of the significance of the criteria in the study, the assessments of the expert groups differ:

- The customer experts found that the criterion “clear liability of the contractor and the customer for improper performance of contractual obligations” is the most relevant. Customers transfer most of the risks that may arise during the performance of the contract to the contractor, and consequently create contractual obligations for the contractors in the contracts for the works. However, the contractor experts found that the most important criterion is “clear deadlines for construction works”. When a contractor submits a commercial bid for the execution of contract works, one of the key indicators for the calculation of the bid price is a clear deadline for the completion of the construction works.

- Both expert groups unanimously identified the fourth most important criterion “exact and unambiguous terms of the contract”. The experts agreed that this indicator is important but not a priority. When planning the budget for a construction project, the client is exposed to the risk that there may be increases in the quantities of construction works that need to be carried out to complete the project. Typically, clients take this risk into account when planning their construction project budgets. Additionally, the contractor must be fairly compensated for additional works that were not foreseen in the contract, which is why the contractors did not consider this condition as a priority.

- In last place, both the client and the contractor experts ranked “clear procedures allow making changes to the contract in the event of an increase/decrease in the scope of work” as the least influential criterion. This criterion is considered by the experts to have the least impact on the successful implementation of the contract, as the presence or absence of this clause in the contract documents does not exempt either the clients or the contractors from requesting an amendment to the contract in the event of an increase/decrease in the scope of work. Contract amendments are governed by the legal regulations on construction and by the Public Procurement Act.

In the evaluation of the contracts, although the significance of the criteria differed in order of priority between the client’s and the contractor’s expert judgement, the calculations were based on the AHP method. The priority order of the contracts was set to be the same. The details of Contract A were clearly different from the details of the other three contracts. Although all four contracts were prepared in the context of European Union support, the absence of basic criteria for standardizing the granularity of the contracts opens a gap in the construction sector and thus hampers the successful management of projects.

7. Conclusions

The most important document governing the relationship between the customer and the contractor is the construction contract. To avoid disputes between the customer and the contractor due to inaccurate or ambiguous contractual terms and conditions, it is important that the contractual terms and conditions are as precise as possible to complete the construction project successfully and on time. The authors, during the course of their study, have identified a set of criteria to ensure the quality of construction contracts and to minimize disputes between the customer and the contractor during the implementation of the contract. The study analyzed two perspectives, that of the customer and that of the contractor. Two groups of experts were interviewed to identify the sets of criteria. The first group of experts were the customer experts, and the second group were the contractor
experts. The 20 experts interviewed were professionals in their respective fields, with many years of experience in managing and implementing construction projects.

Customers found that clear responsibility of the contractor and the customer for improper performance of contractual obligations (criterion 6, weight 0.256) has the highest importance and significance, followed by criterion 4 in second place, criterion 5 in third place, criterion 3 in fourth place, criterion 2 in fifth place, and criterion 1 in sixth place.

The contractors identified clear deadlines for construction works (criterion 5, weight 0.243) as the most important and most significant, followed by criterion 6 in second place (weight 0.195, i.e., the criterion is much less significant according to opinion of contractors compared to opinion of customers), criterion 2 in third place, criterion 3 in fourth place (significances of criterion 2 and 3 are similar for both customers and contractors), criterion 4 in fifth place, and criterion 1 in sixth place (the rank is the same, but the criterion is more than twice as significant compared to customers assessment, i.e., 0.115 compared to 0.043).

The next objective of the study was to ensure the quality of construction contracts to the extent that uncertainty in the terms of the contracts can be reduced, and disputes between the customer and the contractor prevented in advance. This study used completely different general contractual clauses, both according to the type of construction work and the type of contract. The first contract (A) is a project for the construction of a sewage treatment plant (FIDIC Yellow Book), the second (B) is a project for the modernization of a block of flats, the third (C) is a project for the construction of a gas pipeline, and the fourth (D) is a project for the restoration of a cultural heritage site.

Specialists of the customer and the contractor groups—professionals in their respective fields—were used to evaluate the construction contracts. The expert assessment, applying the AHP method, showed that the first contract clauses are the most accurate and complete in terms of the criteria considered, followed by the second contract, the third contract, and the fourth contract. This is not surprising, since the Fédération Internationale des Ingénieurs-Conseils (FIDIC) is a well-known international organization, not only in Europe but also worldwide, whose main activity is the drafting of standard terms and conditions of contract and other documents. The FIDIC recommended models for construction projects are clear and the contract structures are consistent. In FIDIC contracts, the risks of a construction project are balanced and distributed between the parties to the contract, according to the chosen model. FIDIC contract clauses have been tested by internationally active engineers in the construction sector, as well as by customers and contractors, and can be adapted to any contract. In the current research, the experts also unequivocally gave priority to the first contract (construction of a sewage treatment plant, FIDIC Yellow Book).

In the analysis of the contractors’ expert decision matrix, the first contract A is the clear leader, with a difference of 48.88% between the first and second ranked contracts, and 40.5% between the third and fourth ranked contracts. Analyzing the customers’ expert decision matrix, the difference between the first and second contract is not extremely significant (11.54%), while the difference between the third and fourth contracts is significantly higher and reaches 62.42%.

Even though the relative importance of the criteria was assessed differently by individual groups of experts, after using these criteria to analyze the construction contracts, the opinions of both groups of experts coincided. Based on the performed analysis, uncertainty in the terms of the contracts can be reduced and disputes between the customer and the contractor prevented in advance. The set of criteria can be applied for quality assessment of other construction contracts, as well as application of the suggested methodology not only to construction contracts, but also to other contracts. The authors believe that this study will have important practical implications for the field of contract management and for further research in the areas of contract and risk management. The criteria identified in the study will help contracting authorities to prepare procurement documents in a more professional and qualitative manner, thus reducing potential disputes between customers and contractors to a minimum. In addition, given that the study involved two groups of experts, further studies could include more experts from more stakeholders (material
suppliers, subcontractors, designers, etc.). The study also evaluated four contracts that are partly financed by the European Union, so this proposed model can be adapted to other types of contract models in future studies.

**Author Contributions:** Conceptualization, A.V., J.A. and V.K.; methodology, software, validation, and formal analysis, A.V. and J.A.; writing—original draft preparation, A.V.; writing—review and editing, J.A. and V.K.; supervision, J.A. All authors have read and agreed to the published version of the manuscript.

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