Risk Management Analysis on Infrastructure Construction Projects with Lumpsum System and Price Unit Contract System

Saeman[1], Nurly Gofar[2]

[1,2]Universitas Bina Darma Palembang, Indonesia
saemanemon58@gmail.com, nurly_gofar@binadarma.ac.id

Abstract

This study aims to identify risks in various construction projects and what risk factors have the mostinfluence on each type of project at each stage, to find out which types of contracts have a high level of cost risk, higher time and quality between the two types of contracts based on the results of the analysis using the Analytic Hierarchy Process (AHP) method, analyzing risk on projects with lumpsum contracts and unit price, risk factors that influence these projects and which is more risky between the two contracts based on the results of the risk level analysis, conducting risk analysis on various construction projects based on the project owner and which is more risky between private or government project owners based on the results of the risk level analysis, developing a lump sum contract model and unit price whether m Indeed, there are different ways of handling risk for projects based on empirical data obtained from respondents. This implementation was carried out at the Jambi UIN STS Campus which is located at Jalan Jambi – Muara Bulian, Sungai Duren, Jambi Outer City District, Muaro Jambi Regency, Jambi 36657. This study uses Survey method using questionnaires and interviews (Interview). The data obtained were then processed and analyzed using the Analytical Hierarchy Process (AHP) method. Respondents in this study were contractors who had experience working on projects with lump sum contracts and unit price contracts. The number of respondents (sample) used is 32 respondents. The results of the analysis using the AHP method showed that in the construction project at the UIN STS Jambi Campus, the risk factor for the use of unit price contracts was higher than the lump sum contract with a ratio of 57.87%: 42.13%. From these results, it is recommended that contractors pay more attention to the dominant risk factors identified before participating in the tender process or before signing the contract as consideration for anticipating risks and avoiding project cost overruns, project completion time delays and the resulting project quality so as not to cause losses which is getting bigger.

I. Introduction

The Indonesian economy is currently improving in the property business in the form of apartments, real estate and many others, growing faster. In this condition, many large and small contractors are involved in the project, both in building and infrastructure projects.

When a business wants to be seen simultaneously, namely two contradictory things, including the opportunity to gain profit and the risk of receiving a loss, this is recorded in a construction service business. A construction activity can be said to be successful if it can fulfill its objectives, including completion on time as determined, the cost as determined

10187

and in accordance with the quality requirements. However, the achievement of these goals is influenced by several factors, one of which is the risk factor.

Problems encountered by a construction service company if not resolved immediately, the success of the project will be hampered and problems faced by construction service companies, including an uncertain situation or event in the process of construction activities that can have a detrimental impact or -Things that do not go according to plan both in terms of cost, time and quality. Various businesses are carried out in order to reduce risks so that effective results can be achieved. One of them is to analyze the risk of a construction service contract.

Project objectives are specific goals that all activities are directed and endeavored to achieve. In the process of achieving these goals, there are three main targets, namely cost, quality and time. Cost, namely the project is said to be successful if the project carried out can be completed on time, effective and cost effective. The project must be completed according to the budgeted cost. Time, namely the project must be carried out in accordance with the specified timeframe and end date. If the final product is a new product, the delivery may not exceed the specified time limit. Meanwhile, the quality of the product or the results of project activities must meet the required specifications and criteria (Ervianto, 2005).

Public infrastructure construction projects are a business process carried out to produce construction services in order to provide benefits or profits for those who build them or add value to the community. The existence of infrastructure can increase productivity, reduce production costs and create jobs. So, the development of a quality infrastructure can increase the economic growth of a country so that the welfare of the people increases. Economic growth is still an important goal in a country's economy, especially for developing countries like Indonesia (Magdalena and Suhatman, 2020). Construction projects are generally carried out in several stages in the project life cycle consisting of design and engineering stages, procurement and construction, startup for occupancy and operation & maintenance involving respective experts.

The implementation of the construction phase involves parties who need the same seriousness, vision and commitment to be able to build maximum construction products. In the implementation of a construction project, the contract is a bond between the project owner as the service user and the contractor or contractor as the construction service provider. The contract describes the form of cooperation, both in terms of technical, commercial, and legal terms with points that have been agreed upon by both parties, namely the owner and the contractor. The contract involves the rights and obligations between the two parties. So that both parties must pay attention to the articles in the contract in order to avoid the risks arising from the contract that has been determined.

According to Presidential Decree No. 12 of 2021 states that there are 5 (five) types of contracts between service users and service providers, judging from the cost calculation, the contracts can be divided into several types of contracts, including lump sum contracts, unit price contracts, combined lump sum and unit price contracts, acceptance contracts (turn key) and percentage contracts. Of the five types of contracts, the most frequently used are lump sum contracts and unit price contracts, although it is possible to use other types of contracts.

In project implementation, the contracts commonly used are Lump Sum contracts and Unit Price contracts. In projects using a Lump Sum contract, high accuracy is required in reading drawings and calculating BOQ and RAB, so that errors that arise when calculating volumes caused by inaccuracies in reading drawings can be minimized. Other problems encountered inThe project uses a lump sum contract system, namely errors in

estimating material prices. For projects that use a lump sum contract system, the price has been agreed, which is a binding price, meaning that if there is a change in volume or change in material prices, the owner does not want to know and all of that is at the contractor's risk. If the project is running, the material price decreases from the prediction in the contract then it becomes the contractor's profit, but if the material price increases from what was predicted in the contract then it is the responsibility of the contractor to continue to carry out the work according to the specifications that have been determined. If negligence is not maintained and properly,

Meanwhile, the project that uses the unit price contract as the reference is the Bill of Quantity (BQ) issued by the owner. This is the risk borne by the contractor is relatively smaller because it is paid according to the volume of the real work carried out. However, projects that use unit price contracts are not without risk. For example, the risk faced in this unit price contract project, apart from the profit which is usually smaller than a lump sum project, is the delayed payment schedule due to the owner's not completing the calculation of the volume of work in the field. In calculating the volume of real work in the field, it takes a relatively long time, due to the lack of work in the field or other things. So for contractors, if it takes longer, the payment will be delayed. so this causes the capital owned to run low because the contractor has to finance materials and labor first with the capital owned. If the contractor is a large contractor, of course, it will not be a problem. But another thing if the contractor is a medium, of course, it can threaten the continuity of the company.

Each type of contract has advantages and disadvantages that need to be taken into account by the contractor in determining actions to overcome risks. The system that is used to manage risk so that the impact does not have a too big impact on the project objectives is called a risk management system.

Risk management in infrastructure development needs to be considered, because risk management is a science lesson that discusses how an organization applies measures in describing various existing problems by including various comprehensive and systematic management approaches (Fahmi, 2018). Therefore, risk management analysis in building construction is very important. By carrying out risk management, it is desirable that the construction of building infrastructure can be realized according to the right project targets regarding cost, time and quality.

Risk management has the aim of limiting risks that have the capacity to bring about losses, therefore if the risk is reduced it can increase profits. If the master or project owner and contractor do not care about the advantages and disadvantages of each of the contracts above, they do not comprehensively understand how to reduce the risks that arise in the type of contract used, therefore both parties can be disadvantaged. The project owner can be harmed if the project does not go as expected, while for the contractor it can be detrimental if he cannot continue his work, besides that the contractor will get a bad name for other projects.

In analyzing the above, one of the methods to be used is the Analytic Hierarchy Process method. The Analytic Hierarchy Process (AHP) method is a method used in solving quality where the risk intensity of using Lumpsum contracts and Unit Price contracts can be quantified and then analyzed. This research must be carried out in order todetermine whether the risk of a lump sum contract is greater than that of a unit price contract, how big is the comparison of the risk of cost, time and quality of the lump sum contract system and unit price contract system in infrastructure construction projects.This method is one of the methods used in obtaining weights where the risk intensity of the use of Lumpsum contracts and Unit Price contracts can be quantified and then analyzed.

A risk is a variation in the likelihood that an unexpected event will occur that poses a threat to property and financial gain as a result of the hazard occurring. Risks in construction projects however cannot be eliminated but can be reduced from one party to another. If the risk occurs, it will have an impact on the disruption of overall project performance so that it can cause losses in costs, time and quality of work.

Based on the description above on research on risk management, therefore it is necessary to conduct research on "Risk Management Analysis in Infrastructure Construction Projects With Lump Sum Systems and Unit Price Contract Systems".

II. Review of Literature

2.1 Management
Knowledge management according to Hasibuan (2013) is "the science and art of classifying procedures for the benefit of human resources and other resources effectively and efficiently.

2.2 Project
In our daily activities we often mention a project as an activity, but in the book A Guide to the Project Management Body of Knowledge (PMBOK) it is stated that a project is a temporary job that is done to create a unique product or service. The project is called unique because the resulting product or service will have its own specificity compared to others. So the project is basically an activity to carry out work that is temporary in nature to produce a distinctive product.

2.3 Risk
According to Loosemore et al (2013), risk is a complex phenomenon that includes physical, financial, cultural and social dimensions and for most managers consider risk more on an unpredictable event that may occur in the future and the results can affect profits and initial goals. .

2.4 Risk Identification
In the PMBOK Guide (2013), risk identification is a process to determine which risks affect the project and document their characteristics. This process is iterative, because new risks are likely to be identified if the project takes place during the project cycle. The frequency of repetition and the number of members involved in each cycle will vary greatly from project to project.

2.5 Risk Management
According to Fahmi (2018), risk management is a field of science that discusses how an organization applies measures in mapping various existing problems by placing various management approaches in a comprehensive and systematic manner.

2.6 Construction Project
According to Hansen (2015) a construction contract is a manifestation of the characteristics of the implementation of a construction project which includes technical aspects regarding the scope of cost, quality and time.

From the description above, it can be concluded that the construction project has the intended project objectives, namely budget elements, including cost, quality and time.

2.7 Analytic Hierarchy Process (AHP)

According to Taylor (2014) suggests that "AHP is a method for ranking decision alternatives and choosing the best one with several criteria". AHP develops a numerical value in ranking each decision alternative, based on the extent to which each alternative meets the decision maker's criteria.

2.8 Construction Work Contract

A contract is a promissory agreement between two or more parties that can create, modify, or eliminate a legal relationship. According to Gifis (2008) provides an understanding of the contract as an agreement, or a series of agreements in which the law provides compensation for default on the contract, or the implementation of the contract by law is considered a duty. According to the Civil Code, the definition of a contract (in this case called an agreement) is an act in which one or more people bind themselves to one or more other people, see Article 1313 of the Civil Code.

2.9 LumpSum Contract

In PP No. 29/2000 Article 20 paragraph (3) concerning the Implementation of Construction Services states that a lump sum contract is "a service contract for the completion of all work within a certain period of time with a definite and fixed amount of price and all risks that may occur in the completion of the work which are fully borne by the Service Provider as long as the drawings and specifications do not change".

2.10 Unit Price Contract

According to Presidential Decree 80 of 2003, it explains that the unit price contract is "a type of contract for the procurement of goods or services for the completion of all work within a certain time, based on a definite and fixed unit price for each job with certain technical specifications where the volume of work listed is still temporary and the system the payment is based on the actual results of joint measurements".

According to Yasin (2014) describes the unit price contract, namely "a contract where the volume of work listed in the contract is only an estimate and will be re-measured to determine the volume of work actually carried out.

III. Research Method

The method used in this study is a qualitative descriptive method. The qualitative descriptive method used is a survey method that aims to get opinions from respondents regarding events that can pose a cost, time and quality risk so that the resulting description method is in the form of respondents' opinions which must be proven again in fact. on Jalan Jambi – Muara Bulian, Duren River, Jambi Outer City District, Muaro Jambi Regency, Jambi 36657.

The steps taken to carry out this research include the following: identifying the formulation of the problem and research objectives, compiling a literature review (library study), designing a research methodology (data collection) coveringQuestionnaire Assessment and Data Analysis using the AHP method, mconduct surveys filling out questionnaires and interviews, sohierarchical structure, as a consequence of the selected criteria, to the deepest sub-criteria, results and discussion, mmake research conclusions and recommendations and provide suggestions for further research by other studies.

IV. Results and Discussion

4.1 Results
a. Criteria Weight Calculation

From the results of the calculation of the pairwise comparison matrix and the normality matrix, the dominant risk factors that affect the cost, time and quality aspects of lump sum contracts and unit price contracts using the AHP method are obtained, the weights of each criterion are as follows:

Table 1. Ranking of Risk Factors for Unit Price Contracts and Lumpsum Contracts

Ranking	Lumpsum Contract		Unit Price Contract	
	Var	Risk Factor	Var	Risk Factor
Cost				
1	A3	Government policy	A1	*Change orders*
2	A2	Corruption	A3	Government policy
3	A1	*Change orders*	A11	Unprofessional HR
4	A8	Error in selecting materials/materials used in the field	A10	Difficulty in disbursing funds and administration
5	A10	Difficulty in disbursing funds and administration	A2	Corruption
Time				
1	B11	The owner's schedule is unrealistic	B8	Environmental conditions around the time the project started
2	B8	Environmental conditions around the time the project started	B7	Access on/to the field
3	B9	Labor expertise	B2	Project implementation is not according to schedule in the initial planning
4	B7	Access on/to the field	B1	Design changes
5	B4	Approval and Licensing	B3	Difficulty in providing materials, equipment and methods used
Quality				
1	C9	Differences in field site conditions	C6	Natural conditions
2	C4	Project quality testing is not routine and does not follow the established rules	C1	Owner personnel, contractors and consultants who are not experts/professional in measuring work performance
3	C10	Incomplete scope of work	C7	Poor communication
4	C6	Natural conditions	C10	Incomplete scope of work
5	C7	Poor communication	C9	Differences in field site conditions

b. Cost Aspect

Table 2. Weight of Cost Risk Criteria

No	Criteria	Weight	Percentage Weight
A1	Change Order	0.095	0.95%
A2	Corruption	0.049	0.49%
A3	Government policy	0.149	1.49%
A4	Incorrect selection of equipment used in the field	0.446	4.46%
A5	Difficulty in disbursing funds and administration	0.033	0.33%
A6	Unprofessional HR	0.228	2.28%
Total		1,000	100%

In table 2 it is found that the error criteria for selecting equipment used in the field have the most effect on cost efficiency because it has the largest weight, which is 4.46%, while the criteria for difficulty in disbursing funds and administration have the smallest effect on time efficiency, namely, 0.33%.
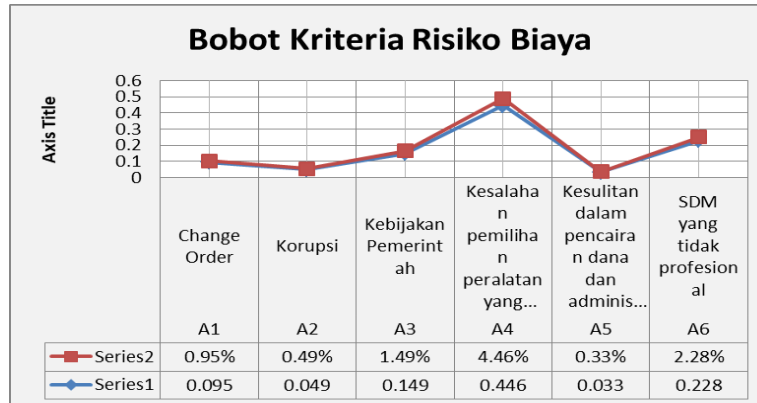

Figure 1. *Cost Risk Comparison*

Meanwhile, the global priority on the cost aspect can be seen in table 3

Table 3. Global Priority Weights Cost Aspects

	0.095 1	0.049 2	0.149 3	0.446 4	0.033 5	0.228 6	Global Weight
KL	125	0.333	0.750	0.800	0.167	0.100	**0.525**
COUP	875	0.667	0.250	0.200	0.833	0.900	**0.475**

Local priorities and global priorities of the problem of risk of cost overruns are shown in Table 3. The numbers below the line indicate the local priority of each comparison matrix at level III, while the figures above the criteria elements are at level II.
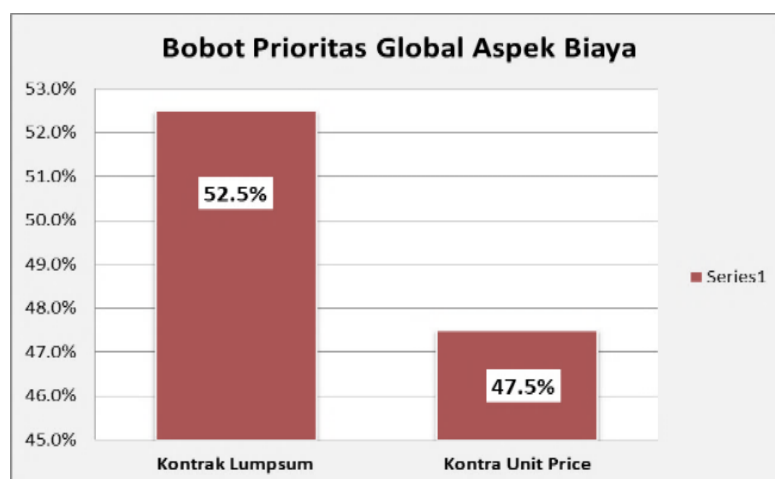

Figure 2. *Comparison of Cost Aspect Contract Risk*

Based on Figure 2, the lump sum contract has a greater risk of cost efficiency because it has a higher global priority weight value of 52.5% while the unit price contract only has a global priority value of 47.5%.

c. Aspect of Time

Table 4. Weighting Time Risk Criteria

No	Criteria	Weight	Percentage Weight
B1	Design Change	0.031	0.31%
B2	Project implementation is not according to schedule in the initial planning	0.019	**0.19%**
B3	Difficulty in providing materials, equipment and methods used	0.068	0.68%
B4	Approval and licensing	0.162	1.62%
B5	Access on/to the field	0.102	1.02%
B6	Environmental conditions around the time the project started	0.361	**3.61%**
B7	Labor expertise	0.212	2.12%
B8	The owner's schedule is unrealistic	0.044	0.44%
Total		1,000	100%

Based on Table 4, it is found that the criteria for environmental conditions when the project is started have the most influence on time efficiency because it has the largest weight, which is 3.61%, while the criteria for implementing projects that are not according to schedule in the initial planning have the smallest effect on cost efficiency, namely, 0.19%.
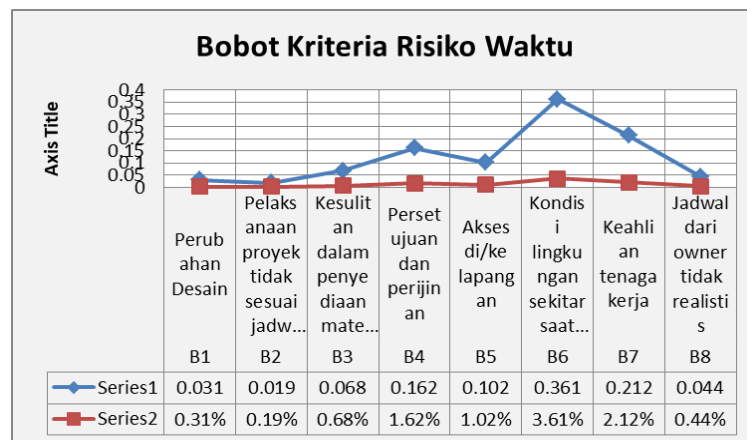

Figure 3. Time Risk Comparison

The criteria for environmental conditions when the project was started had the most effect on time efficiency, while the criteria for implementing the project not according to schedule in the initial planning made the lowest cost efficiency. While the global priority on the aspect of time

Table 5. Time Aspects Global Priority Weight

	0.031 1	0.019 2	0.068 3	0.162 4	0.102 5	0.361 6	0.21 7	0.044 8	Global Weight
KL	0.900	0.131	0.107	0.257	0.208	0.174	0.140	0.669	**0.223**
COUP	0.100	0.869	0.893	0.743	0.792	0.26	0.860	0.331	**0.777**

The local priorities and global priorities of the time-swelling risk problem are shown in Table 5. The numbers below the line show the local priority of each comparison matrix at level III, while the numbers above the criteria elements are at level II.
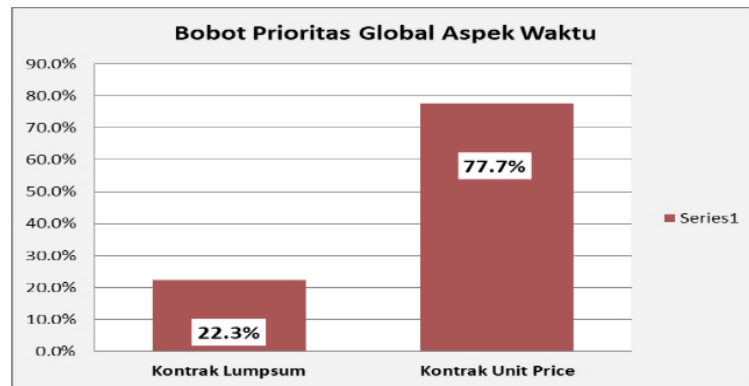

Figure 4. *Comparison of Time Aspect Contract Risk*

Based on Figure 4, the unit price contract is very influential on time efficiency because it has a higher global priority weight value of 77.7% while the lump sum contract only has a global priority value of 22.3%.

d. Quality Aspect

Table 6. Weight of Quality Risk Criteria

No	Criteria	Weight	Percentage Weight
C1	Owner personnel, contractors and consultants who are not experts/professional in measuring work performance	0.094	0.94%
C2	Project quality testing is not routine and does not follow the established rules	0.050	0.50%
C3	Natural conditions	0.169	1.69%
C4	Poor communication	0.268	2.68%
C5	Incomplete scope of work	0.030	**0.30%**
C6	Differences in field site conditions	0.389	**3.89%**
Total		1,000	100%

In Table 6 above, it is found that the criteria for differences in field site conditions have the most influence on quality because they have the largest weight, namely 38.9%, while the criteria for incomplete work scopes have the smallest effect on project quality, which is 3.0%.

Figure 6 The numbers below the line show the local priority of each comparison matrix at level III, while the numbers above the criteria elements are at level II.
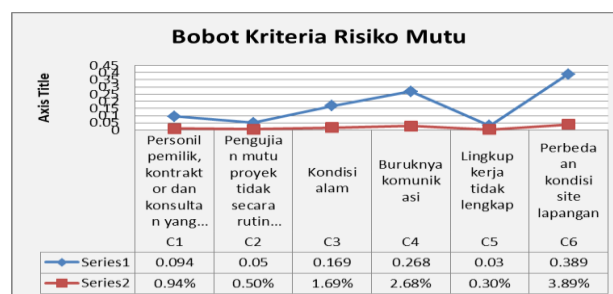

Figure 6. *Comparison of Quality Risk*

The criteria for differences in field site conditions have the most influence on quality because they have the largest weight, while the criteria for incomplete work scopes have the smallest effect on project quality. Meanwhile, global priorities in cost aspects can be seen in table 7 below:

Table 7. Global Priority Weights for Quality Aspects

	0.094 1	0.050 2	0.169 3	0.268 4	0.030 5	0.389 6	Global Weight
KL	0.143	0.889	0.800	0.167	0.125	0.250	**0.339**
COUP	0.857	0.111	0.200	0.833	0.875	0.750	**0.661**

Local priorities and global priorities of quality quality risk issues are shown in Table 7 The numbers below the line show the local priority of each comparison matrix at level III, while the numbers above the criteria elements are at level II.
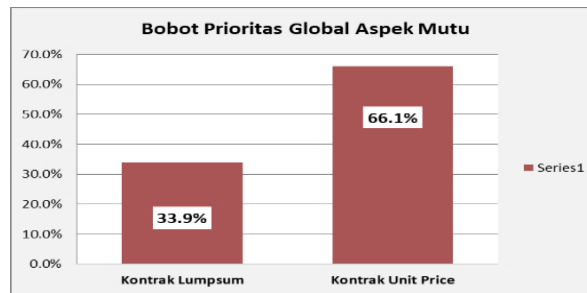

Figure 7. Comparison of Quality Aspects of Contract Risk

Based on Table 5, the unit price contract has a greater risk to quality because it has a higher global priority weight value of 66.1% while the lump sum contract only has a global priority value of 33.9%.

From the results of data processing, the weight data obtained from each in Table 7, each alternative. The next aspect is summed to determine the global priority weight of the research as follows:

Table 8. Recap of Global Priority Weights for Unit Price Contracts and Lumpsum Contracts

Risk Criteria Weight	Cost	Time	Quality	Number of Rows	Alternative Weight	Presentation Weight	Ranking
Unit Price Contract	0.475	0.777	0.661	1,913	0.5787	**57.87%**	1
Lumpsum Contract	0.525	0.223	0.339	1.087	0.4213	**42.13%**	2

The diagram of the results of the calculation of the alternative percentage weight which states that the risk factors in the use of unit price contracts are higher in percentage weight than lump sum contracts as shown in Figure 8 below:
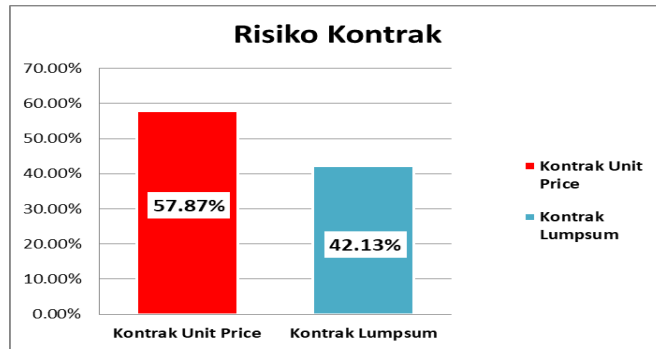
Figure 8. Lumpsum Contract and Unit Price Diagram Alternative Percentage Weight Diagram

In Figure 8, the recap of global priority weights for lump sum contracts and unit price contracts, unit price contracts have a higher percentage weight of rank 1 than lump sum contracts of rank 2
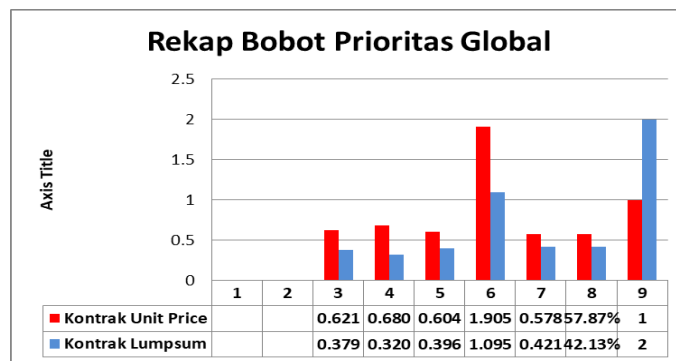

Figure 9. *Recap of Global Priority Weights for Unit Price Contracts and Contracts*

4.2 Discussion

Based on data analysis, the risk factor that most influences the cost aspect for a building project is the error criteria for selecting the equipment used in the field, the most influential on cost efficiency because it has the largest weight, which is 4.46%. Meanwhile, the risk factor that most influences the time aspect for a building project is the criteria for environmental conditions when the project starts, which has the most effect on time efficiency because it has the largest weight, which is 36.1%. And the risk factor that most influences the quality aspect for a building project is the criteria for differences in field site conditions that have the most influence on quality because it has the largest weight, which is 38.9%.

The results of the analysis using the AHP method showed that in the construction project at the UIN STS Jambi Campus, the risk factor for the use of unit price contracts was higher than the lump sum contract with a ratio of 57.87%: 42.13%. From these results, it is recommended that contractors pay more attention to the dominant risk factors identified before participating in the tender process or before signing the contract as consideration for anticipating risks and avoiding project cost overruns, project completion time delays and the resulting project quality so as not to cause losses. which is getting bigger.

V. Conclusion

1. The results of the analysis using the Analytic Hierarchy Process (AHP) method of calculating the global priority weights for cost, time and quality aspects obtained the final result where the unit price contract has a greater percentage weight than the lump sum contract with a ratio of 57.87%: 42.13%
2. Based on the data analysis, the problem of cost overruns is shown that the lump sum contract has a greater risk of cost efficiency because it has a higher global priority weight value of 52.5% while the unit price contract only has a global priority value of 47.5%.
3. Based on the data analysis, the problem of time swelling risk is shown in the unit price contract which greatly affects time efficiency because it has a higher global priority weight value of 77.7% while the lump sum contract only has a global priority value of 22.3%.
4. Based on the data analysis, the quality risk problem can be seen in the unit price contract which has a greater risk to quality because it has a higher global priority weight value of 66.1% while the lump sum contract only has a global priority value of 33.9%.

Suggestions
1. Contractors to pay more attention to the dominant risks identified in this study by preparing mitigation actions to reduce the risk of cost overruns that may occur.
2. The results of this study are expected to be an anticipatory step and input for construction project implementers and contractors as service providers to realize the importance of properly understanding the contents of the contract and the intent of the contract so that the contract can truly function as one of the guidelines in problem solving.
3. Further research will be carried out with a wider scope of research so that more samples are distributed and more sample results can be considered.

References

Afzal, F., Lim, B & Prasad, D. 2017. An Investigation of Corporate Approaches to Sustainability in the Construction Industry. Procedia Engineering. 180, 202-210.

Ahmad, Subagya. 2010. Marketing in Business. First Edition. First Printing. Jakarta: Media Discourse Partners.

Banihashemi, S. et al., 2017. Critical Success Factors (CSFs) for integration of sustainability into construction project management practices in developing countries. International Journal of Project Management. 35, 1103-1119.

Cooper, D. and Chapman, C. (1993), Risk Analysis For Large Projects, 1st edition, John Wiley & Sons Ltd., Norwich.

Dannyanti, E. 2010. Optimization of Project Implementation Using PERT and CPM Methods (Case Study of Twin Tower Building Post Graduate UNDIP). Semarang: Diponegoro University.

Djohanputro, Bramantyo. 2008. Corporate Risk Management. Jakarta: PPM Publisher.

Ervianto, WI (2002). Construction Project Management, First Edition. Yogyakarta: Salemba Empat.

Flanagan, MT (1993). Anglo–Norman change and continuity: the castle of Telach Cail in Delbna. Irish Historical Studies, 28(112), 385–389.

Gifis, Steven H, 2008, Dictionary of Legal Terms (revised edition), Barron's Educational Series, United States.

Handoko, S., Hestiningsih, I., Afif, AA, & Mohammad, M. (2012). Management Information System For Cafe Management. Journal of Informatics Ahmad Dahlan, 6(1), 102749.

Hansen, S. (2015). Construction contract management. Main Library Gramedia.

Hasibuan, Malaysia. 2013. Human Resource Management. Seventeenth Printing. Jakarta: PT. Earth Literature.

Herjanto, E. (2007). Operations Management (3rd Edition). Grasindo.

Irmawati, S. (2021). Risk Management Analysis on Projects Using Lumpsum Contract System (Case Study: Bekasi-Cawang-Kampung Melayu Toll Road Construction Project). Journal of Poly-Technology, 20(1), 15–26.

Isnanto, RR (2009). Professional ethics textbook.

Kerzner, H. (2009). Project management: A systems approach to planning. Scheduling, and Controlling,

Loosemore, Martin., Raftery, John., Reilly, Charlie., Higgon, Dave. 2013. Risk Management in Projects. London and New York: Taylor & Francis.

Magdalena, S., Suhatman, R. (2020). The Effect of Government Expenditures, Domestic Invesment, Foreign Invesment to the Economic Growth of Primary Sector in Central Kalimantan. *Budapest International Research and Critics Institute-Journal (BIRCI-Journal)*. Volume 3, No 3, Page: 1692-1703.

Muhaimin. 2008. Paradigm of Islamic Education. Bandung: PT. Rosdakarya Youth.

Nugeraha, D. (2017). Decision Support System. Yogyakarta: Garudhawaca.

Nurhayati, R. (2010). The project budgeting system at the Bandung Civil Service Agency.

Permana, Magyar Slamet. 2013. The Influence of Country of Origin, Brand Image and Perception of Quality on Intensity of Purchasing Working Papers. Salatiga: Satya Wacana Christian University.

Ramli, Soehatman. 2010. Practical Guidelines for Fire Management (Fire Management). Jakarta: Dian Rakyat.

Rachim, Rady K., 2008, Settlement of Disputes Due to Construction Claims Through Courts, download dated January 9, 2010.

Saaty, TL (2000). Fundamentals of decision making and priority theory with the analytic hierarchy process (Vol. 6). RWS publications.

Sipayung, EM, Fiarni, C., & Sutopo, S. (nd). Boarding Place Recommendation System Around ITHB Campus Using AHP Method.

Soehatman, R. (2010). Practical Guide to Fire Management. Jakarta: Dian Rakyat.

Susilo, N., Hasbullah, R., & Sugiyono, S. (2013). Parboiled Rice Processing Improve Quality and Reduce Glycemic Index of Paddy cv. Ciherang. Journal of Food, 22(3), 209–220.

Suswinarno. 2012. Safe from Risk in Government Procurement of Goods/Services. Jakarta: Media Vision.

Terry, J. (2010). An American obsession: Science, medicine, and homosexuality in modern society. University of Chicago Press.

Turban, E., Sharda, R., & Delen, D. 2011. Decision Support Systems and Intelligent Systems. 9th Edition. Pearson Education Inc.