

Evaluation of Contractor Financing Strategies Regarding Owner's Legal Entity Status Change

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Abstract— In accordance with Indonesian Financial Services Authority Regulation No. 17 of 2020, a public company is defined as an issuer that has made a public offering of equity securities or a public company. Following this transition, the entity is obliged to comply with the relevant regulations, including the obligation to submit financial reports, disclose relevant information, and undergo audits conducted by independent auditors. Consequently, a construction project owner who has changed its status to a public listed company will experience a significant impact, particularly in relation to the payment system to the contractor. In order to minimize this impact, it is necessary to evaluate the management and financing strategy for project implementation in the contractor in order to ensure the project runs well. This study analyses three scenarios, including structural; architectural; and mechanical, electrical, plumbing works, using Fuzzy Analytical Hierarchy Process. The strategy score is significantly influenced by the weight and rating of the strategy criteria. This study resulted in first ranking strategy obtained on structural work is supplier payment, then on architectural work is subcontractor payment, and finally on mechanical electrical plumbing work is bank loan.

Keywords— contractor financing, fuzzy AHP, multi criteria decision making, project payments.

I. INTRODUCTION

A public listed company (Tbk) is a type of company whose shares are traded on the Indonesian stock exchange [1]. As public-listed companies are obliged to provide financial and non-financial information to the public on a regular basis, shareholders and other stakeholders are able to access information on the company's performance. In accordance with Indonesian Financial Services Authority Regulation (OJK) No. 17 of 2020, a public listed company is defined as an issuer that has made a public offering of equity securities or a public company.

The conversion process involves several steps, including shareholder approval, fulfilment of certain requirements, and registration with the Indonesia Stock Exchange (IDX). As a public listed company, the company must comply with the applicable regulations, including the obligation to submit financial reports, disclose relevant information, and undergo audits conducted by independent auditors. Consequently, the conversion of a construction project's service users from a private to a public listed company (Tbk) will have an impact on the contractor's payment systems. In accordance with the provisions of OJK Regulation No. 17 of 2020, a construction project is required to comply with the applicable regulations, which include the obligation to submit financial statements, disclose relevant information, and undergo audits by independent auditors in one transaction or a sequence of transactions

for a specific purpose or activity must comply with the provisions set out in the OJK regulation.

A number of factors can lead to payment issues in construction projects. These include legal issues, changes in project scope, disputes between project owners and contractors, and financial problems among the parties involved. The change in the legal status of the owner has an impact on the payment system that is not in accordance with the initial contract. It is important to note that the fault in this case does not reside with the contractor. However, an alternative strategy still needs to be developed in order to ensure the project continues to run well. The main objective of this research is to identify the best strategy to deal with the phenomenon of changing the legal entity status of the project owner. Up to now, there is no topic that discusses the evaluation of the financing strategy of construction service providers due to changes in the legal entity status of construction service users, specifically using the multi-criteria decision making method.

II. LITERATURE REVIEW

A. Content Analysis

Content analysis techniques can be applied to any form of communication, including newspapers, radio news, television commercials, and other documented materials. It is a widely used research method in many social science disciplines. Therefore, there are three fields that use content analysis extensively, covering almost 75% of all empirical studies. These fields are

27.7% of socio-anthropological research, 25.9% of general communication, and 21.5% of political science. However, content analysis cannot be applied to all social research. Content analysis can be used if the available data consists mostly of documented materials (books, newspapers, tapes, manuscripts), there is complementary information or a certain theoretical framework that explains about and as a method to approach the data, the researcher has the technical ability to process the data he collects because some documentation is very specific [2].

B. Multi Criteria Decision Making (MCDM)

Multi-Criteria Decision Making (MCDM) is a branch of decision-making methods that employs a selection process based on the attributes of the various alternatives. A beneficial aspect of this approach is its capacity to navigate problems in the context of diverse conflicts of interest. In this method, the problem solution approach and model are highly dependent on the parties involved in the decision-making process, the desired goals, the available information, the time specified, and other factors [3].

C. Analytical Hierarchy Process

The AHP method is regarded as one of the multi-criteria decision-making (MCDM) methods. This method was

developed by Saaty with the intention of solving complex problems involving multiple criteria [4]. The fundamental tenet of this methodology is the integration of expert opinion in the assessment of the relative importance of each criterion, thereby facilitating the selection of the most suitable existing alternatives. The combination of the AHP method with other methods is due to its flexibility, which allows it to be used in determining priorities and weighting [3].

D. Fuzzy Sets

Fuzzy sets are the basis of fuzzy logic and fuzzy systems. Fuzzy sets were introduced by Zadeh in 1965 through his paper entitled Fuzzy Sets published by the journal Information and Control. Zadeh has formalised and overcome the inaccuracy of human reasoning mathematically. Through fuzzy sets, the problem of uncertainty which means doubt, inaccuracy, lack of information and partial truth can be overcome. In fuzzy sets, there is a membership function. Membership functions are the building blocks of fuzzy set theory [5] that aim to represent problems and produce accurate decisions [6]. The likelihood and random appearance of membership functions assume more than one rater or repeated experiments. Therefore, fuzziness appears due to inconsistency or misjudgment. Membership functions are subjective and context bound [5].

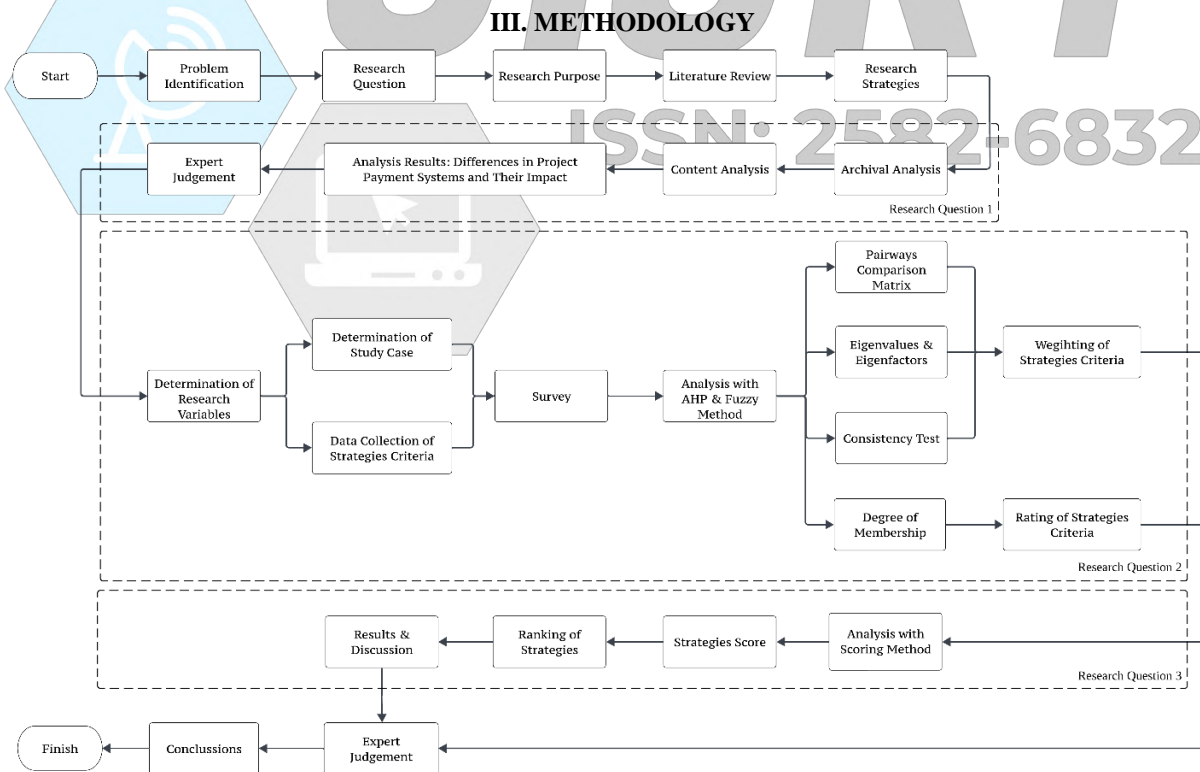


Figure 1. Research Flowchart

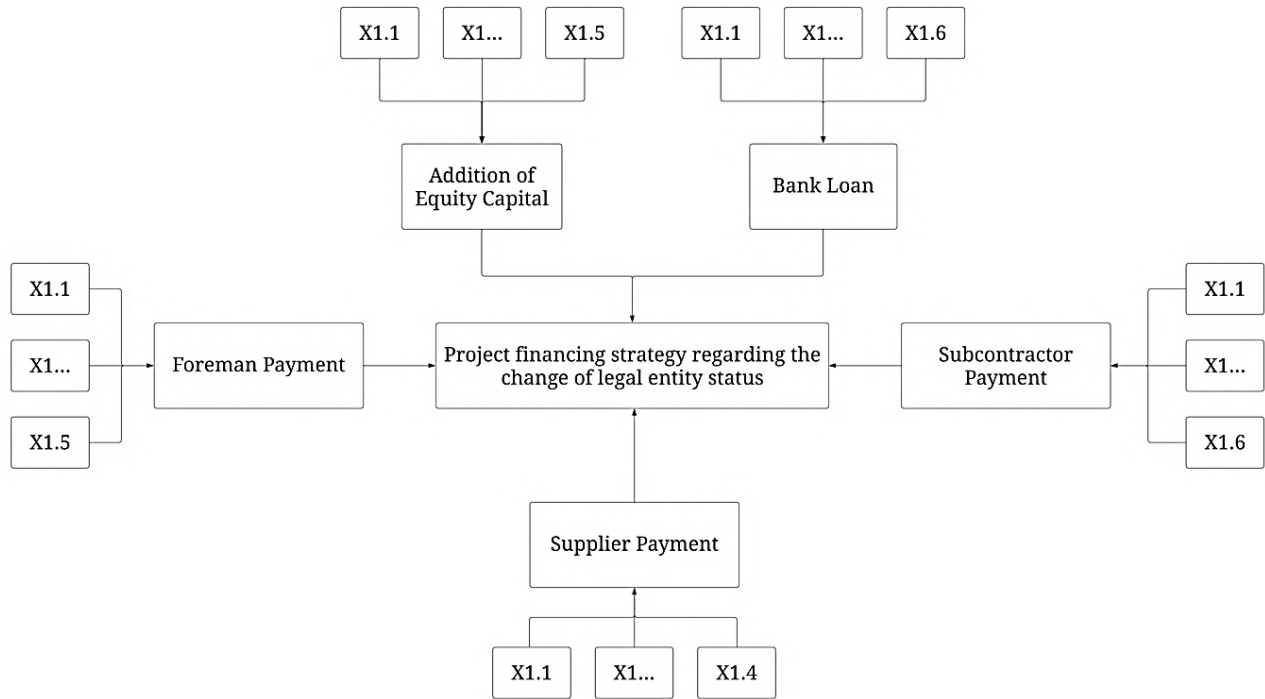


Figure 2. Conceptual Framework

This study will focus on five independent variables, namely: the addition of own capital (contractor), bank loans, subcontractor payments, supplier payments, and

foreman payments. These variables were selected based on the results of content analysis of previous journal literature. The criteria are presented in Table 1.

Table 1. Sub Criteria of 5 Independent Variables

No.	Criteria	Reference
Additional equity capital		
1	Funding Availability	[7]
2	Commissioner Approval	[8]
3	Outstanding	[7]
4	Down Payment	[9]
5	Project Cost	Primary Data
Bank Loan		
1	Remaining Credit Limit	[8]
2	Achieved Milestones	[9]
3	Credit Duration	[10]
4	Regulation	[11]
5	Interest Rate	[11]
6	Non-Performing Financing	[11]
Subcontractor Payment		
1	Number of Subcontractors	[12]
2	Work Duration	[12]
3	Contract Value	[12]
4	Trust Level	[12]
5	Subcontractors Financial Condition	[13]
6	Term of Payment	[14]
Supplier Payment		
1	Price	[15]

2	Payment Method	[16]
3	Trust Level	[12]
4	Supplier Financial Condition	[17]
Foreman Payment		
1	Payment Term	[18]
2	Performance	[18]
3	Amount of Payment	[18]
4	Comparison with Other Person	[18]
5	Comparison with The Previous	[18]

The matrix of pairwise comparison results must first be converted into decimal numbers to facilitate further calculations of eigen values that consist of converting matrix into decimal numbers, sum each column in the matrix, dividing each column in the matrix by the sum of the columns, average each row to get the respective priorities.

The next step is to perform consistency testing in accordance with the following procedure consist of, multiplying each priority value by the matrix of pairwise comparison results in the table that has been converted into decimal numbers, dividing the result in point a by the criteria weight, calculating λ max, calculating CI, calculating CR, RI value obtained from the table 2

Table 2. Rating Index

n	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.52	0.89	1.11	1.25	1.35	1.4	1.45	1.49

Source : [19]

The CR value is 0.033, which is below the consistency ratio of 0.1. This indicates that the degree of consistency in pairwise comparisons is acceptable.

overview of the stages in the billing process prior to the enactment of private Tbk.

IV. RESULTS AND DISCUSSIONS

In order to facilitate the identification and resolution of discrepancies that could impede the billing process. This billing procedure has been designed with several stages of the process in its explanation. There are nine process items that must be carried out. The following is an explanation of each item and the stakeholders responsible for its completion.

In this billing procedure, there are some differences with the pre-tbk. It is caused by differences in the status of legal entities that have become Tbk.

The nine items are the stakeholders who oversee and evaluate the process are listed in Table 3 Items 1 to 5 will be evaluated by the construction department after being declared feasible.

At the stage of the process in the explanation there are 10 process items that must be done. Of the 10 stages presented in table 3, it is evaluated and supervised by each stakeholder. Items number 1 to 6 are initially evaluated by the Construction Management Consultant if it is said to be feasible, then the next stage is checked again by the Construction Management Consultant team leader.

The document is submitted to the head of the department after it is signed by the hospital director. Items 6 to 8 are carried out by the contractor, who is responsible for the payment and the attachment of the necessary documents.

After the Team leader provides a recommendation, the next file or process is approved by the relevant party manager and the main director. At the next stage items 7 to 9 are carried out by the contractor where it is about the payment that will be made and attach the necessary documents.

Furthermore, the financial party provides an estimate of the disbursement of funds in accordance with applicable regulations. The following table provides a clear

Furthermore, the financial party provides an estimate of the disbursement of funds in accordance with applicable regulations. Table 3 can clarify the stages in the billing process after the implementation of the private Tbk.

Table 3. Duration and Stakeholder Tbk

Before Tbk			After Tbk		
Item	Stakeholder	Approval Duration (Days)	Item	Stakeholder	Approval Duration (Days)
Progress Report	Construction Department Supervisor – Structure, Architecture, and MEP (inhouse) Head of Construction Department Hospital Director	1	Daily Report	Construction Management Supervisor – Structure, Architecture, & MEP (inhouse)	3
Mapping Progress			Weekly Report	Construction Management Consultant Team Leader	4
Documentation		3	S Curve	Hospital General Manager	3
S Curve		3	Shop Drawing	Hospital Director	7
Shop Drawing			Mapping Progress	Head of Construction Department	3
			Certificate of Payment	Regional Director of Public Listed Company	7
				Operational Director of Public Listed Company	7
Invoice	Contractor	1	Invoice	Contractor	1
Tax Invoice			Tax Invoice		
Copy of Work Order			Copy of Work Order		
Duration of bill realization	Hospital Branch Finance Division	14	Duration of Bill Realization	Hospital Branch Finance Division	45
TOTAL DURATION		22			80

This change in the payment system is based on the change in legal entity status. This can also increase the stakeholders who give approval to the bills to be approved. Initially, the stakeholders who gave approval were only 5. However, when it has undergone changes, it will increase to 9 stakeholders. The difference is due to the existence of Construction Management Consultant who began to play a role in projects whose service users changed their status to Tbk. In essence, Construction Management has goals and stages to obtain good quality, appropriate time, and efficient costs as expected, but in its implementation, it is necessary to pay attention to the conditions of the development. The task of the Construction Management Consultant is to assist Service Users including controlling time, cost, achieving physical targets (quantity and quality), and orderly administration in development, starting from the preparation stage, planning stage, construction implementation stage to the maintenance period [20].

Then after undergoing changes, the initial files such as daily reports, daily progress, s-curves, shop drawings, mapping progress, and bill receipts were initially evaluated by Construction Management Consultant staff

with a duration of approval for 3 days. After being evaluated and approved, the team leader then gives approval for 4 days. Furthermore, the file is given to the general support manager and known by the hospital director. This stage takes 10 days. After the file has been approved, all subsequent stages are provided to the hospital's head office from the Head of the Development Department, Regional Director to the Director of Operations. This approval takes 17 days. With all the file approvals signed, then submit the file to the hospital's finance department by attaching receipts, tax invoices and a copy of the work order to become a work progress bill. The finding that complex bureaucracy in applying for payment is the causal factor with the highest mean indicates that bureaucratic factors are still a major obstacle to timely payment. In other words, the bureaucratic payment system must be made clear, easy and systematic so that it is expected to make term payments on time and smoother [21].

Then there is a difference in the estimated duration of realization (disbursement) which starts from 14 days to 45 days. This is related to the Financial Services Authority Regulation Number 17 / POJK.04 / 2020,

which regulates that every public company is required to report every material transaction to the public.

Table 4. Rank of Subcriteria for 3 Works Scenario

Strategies Criteria	Sub Criteria	Structure Work				Architecture Work				MEP Work			
		Weighting (Wsi)	Rating (Rsi)	Score	Rank	Weighting (Wsi)	Rating (Rsi)	Score	Rank	Weighting (Wsi)	Rating (Rsi)	Score	Rank
Addition of Equity Capital	Fund Availability	0.252	0.639	0.161	3	0.360	0.450	0.162	2	0.255	0.560	0.143	3
	Commissioner Approval	0.133	0.815	0.109	5	0.122	0.766	0.093	5	0.124	0.646	0.080	5
	Down Payment	0.194	0.807	0.156	4	0.225	0.796	0.179	1	0.264	0.785	0.207	1
	Outstanding	0.208	0.785	0.164	1	0.151	0.768	0.116	3	0.159	0.830	0.132	4
	Project Cost	0.212	0.764	0.162	2	0.142	0.802	0.113	4	0.197	0.747	0.148	2
Bank Loan	Remaining Credit Limit	0.243	0.795	0.193	2	0.279	0.765	0.214	1	0.221	0.852	0.188	1
	Achieved Milestones	0.147	0.769	0.113	4	0.147	0.725	0.107	4	0.135	0.851	0.114	5
	Credit Term	0.243	0.842	0.204	1	0.215	0.658	0.141	2	0.213	0.730	0.155	3
	Regulation	0.116	0.862	0.100	5	0.097	0.870	0.084	6	0.126	0.929	0.117	4
	Interest Rate	0.098	0.807	0.079	6	0.125	0.768	0.096	5	0.117	0.808	0.095	6
	Non Performing Financing	0.153	0.886	0.136	3	0.137	0.883	0.121	3	0.188	0.880	0.166	2
Subcontractor Payment	Number of Subcontractors	0.166	0.666	0.111	4	0.119	0.723	0.086	4	0.212	0.923	0.196	1
	Duration of Work	0.076	0.727	0.055	6	0.108	0.649	0.070	6	0.114	0.678	0.078	6
	Contract Rate	0.185	0.612	0.113	3	0.144	0.530	0.076	5	0.209	0.480	0.100	4
	Term of Payment	0.258	0.855	0.221	1	0.211	0.965	0.203	2	0.156	0.699	0.109	3
	Level of Trust	0.102	0.886	0.090	5	0.172	0.874	0.151	3	0.098	0.876	0.086	5
	Financial Condition of Subcontractor	0.214	0.900	0.192	2	0.246	0.896	0.220	1	0.211	0.895	0.189	2
Supplier Payment	Price	0.190	0.770	0.146	4	0.253	0.748	0.189	3	0.315	0.743	0.234	1
	Payment Method	0.345	0.742	0.256	1	0.297	0.713	0.212	1	0.256	0.533	0.136	4
	Level of Trust	0.234	0.933	0.218	2	0.238	0.863	0.205	2	0.182	0.860	0.157	3
	Financial Condition of Supplier	0.231	0.919	0.212	3	0.212	0.889	0.189	4	0.248	0.880	0.218	2
Foreman Payment	Term of Payment	0.258	0.452	0.117	3	0.258	0.625	0.162	1	0.282	0.403	0.114	4
	Performance	0.174	0.796	0.138	2	0.174	0.084	0.015	5	0.176	0.694	0.122	3
	Amount of Pay	0.225	0.682	0.153	1	0.225	0.710	0.160	2	0.231	0.708	0.164	1
	Comparison with Others	0.192	0.446	0.086	4	0.192	0.775	0.149	3	0.170	0.793	0.135	2
	Comparison with Previous	0.151	0.558	0.084	5	0.151	0.776	0.117	4	0.141	0.671	0.094	5

In Table 4, the results of the sub-criteria ranking based on the score are presented. The ranking of sub-criteria is of great importance in the context of objective and structured decision-making processes. The scoring method plays a pivotal role in quantifying and managing the results of the information used, thus enabling the generation of a ranking that is aligned with the requirements of the decision-making process.

Sub criteria of five independent variables has different ranking results when conditioned on 3 scenarios. In the "Own Capital Increase" Criteria, the ranking 1 sub-criteria is obtained in the Architecture and MEP scenarios, namely "Down Payment". While in the scenario Structure obtained ranking 1 sub-criteria is "Outstanding". Furthermore, in the "Bank Loan" criteria, the ranking 1 sub-criteria obtained in the structural scenario is "Credit Duration", while in the

Architecture and MEP scenarios, the ranking 1 sub-criteria obtained is "Remaining Credit Ceiling". Moreover, in the "Supplier Payment" criterion, ranking 1 sub-criteria is obtained in the structural scenario, namely "Term of Payment", in the architecture scenario ranking 1 sub-criteria is "Subcontractor Financial Condition", and in the MEP scenario ranking 1 sub-criteria is "Number of Subcontractors". Then, in the "Supplier Payment" criterion, the ranking 1 sub-criteria obtained in the Structure and Architecture scenarios is "Payment Method", while in the MEP scenario the ranking 1 sub-criterion obtained is "Price". Last, in the "Foreman Payment" criterion, the ranking of 1 sub-criteria is obtained in the Structure and MEP scenarios, namely "Amount of Wages", while in the Architecture scenario the ranking of 1 sub-criteria is obtained, namely "Payment Time".

Table 5. Rank of 5 Criteria's for 3 Works Scenario

Strategies Criteria	Structure Work		Architecture Work		MEP Work	
	Score	Rank	Score	Rank	Score	Rank
Addition of Equity Capital	0.752	4	0.664	4	0.710	4
Bank Loan	0.825	2	0.763	3	0.836	1
Subcontractor Payment	0.782	3	0.807	1	0.757	2
Supplier Payment	0.833	1	0.795	2	0.745	3
Foreman Payment	0.578	5	0.602	5	0.629	5

The results of the criteria ranking can be found in Table 5. This ranking is obtained by summing the scores of all sub-criteria for each criterion. The greater the score obtained for the strategy criteria, the higher the ranking obtained for strategic decision-making.

Structure work scenario payment strategies from change of legal entity status

In this structural scenario, a ranking order is established based on the results of the analysis using AHP and fuzzy sets. As illustrated in Table 5, the criterion "Supplier Payment" may be renegotiated between the contractor and the supplier to obtain flexibility or payment due facilities. Nevertheless, it is essential that the contractor demonstrates a high level of commitment.

This is beneficial for maintaining positive relations with suppliers. Timely or faster payments can enhance relationships with suppliers, which may lead to priority services or better prices. However, late payments can damage relationships with suppliers, which could result in delivery delays or more restrictive payment terms in the future [21].

In the ranking order, it is also known that "payment of foremen," which has a ranking of 5, is one of the criteria that cannot be delayed in payment. This occurs during the implementation period. Late payment of foremen can cause decreased motivation of workers, which in turn affects job performance [18].

Architecture work scenario payment strategies from change of legal entity status

This scenario payment strategy has a ranking order known from the results of the analysis using AHP and Fuzzy sets. It can be seen in table 5 that the "Subcontractor Payment" criteria can be stated, which means that renegotiations can be made regarding leeway or payment facilities from contractors to subcontractors.

The same thing as "Supplier Payment" requires a good commitment from the contractor, this is also useful for maintaining good relations with subcontractors. Timely or faster payments can improve relationships with those subcontractors, which may lead to priority of service or better pricing [16].

In the ranking order, it is also known that "Payment of foremen" which has a ranking of 5 is a criterion that cannot be delayed because it will affect the motivation of workers in completing the work [18].

MEP work scenario payment strategies from change of legal entity status

In this context, the "Bank Loan" option is the most advantageous, as it has the highest score value and the highest ranking in the strategy. This is due to the relatively high prices of MEP materials, which are generally paid for in cash. The process of submitting terms by service users to the implementing contractor is a significant factor in determining the timeliness of the work completion process. Consequently, the slowness of the term disbursement process will have a direct impact on the work completion process. The availability of working capital has a significant impact on the quality of work, as it enables the expeditious disbursement of funds, which in turn improves contractor performance and ensures the timely completion of work. Consequently, project capital can be procured through the utilisation of bank loans [22].

Of the three scenarios, the ranking of the five alternative strategies (lowest ranking) obtained is "Foreman Payment." This is because the payment of labour for all work items cannot be delayed, as it also affects the motivation of workers in completing the work [18].

Research is needed regarding the right regulations regarding the number and "who" of Stakeholders who have the right to inspect and approve so that every construction project classified as Medium to Large qualifications has the right standards without harming the parties. Research is needed regarding the regulation of the duration of payment for construction services in Indonesia as applicable in other countries. Thus, it can be developed by changing the point of view of construction service users.

V. CONCLUSIONS

The article discusses the impact of a change in the status of a legal entity on payment processes. Originally, there were 8 requirements for payment, but with the change, it increased to 9 requirements, including the addition of a "Receipt of Bill / Certificate of Payment" file. The number of stakeholders evaluating and providing recommendations also increased from 6 to 10, with a change in supervisors from the internal Development Department to Construction Management Consultant personnel. Additionally, the bill disbursement timeline

increased from 14 days to 45 days, resulting in the total duration of the bill process increasing from 22 days to 80 days. The study examines three strategy scenarios for the construction service user, namely "Supplier Payment" as structural work alternative strategy, "Payment of subcontractors" as architectural work alternative strategy, and "Bank Loan" as MEP work alternative strategy scenarios based on the top priority strategy. Among the three scenarios, the 5th ranking alternative strategy (lowest ranking) obtained is "Foreman Payment". This is because the payment of labor for all work items cannot be delayed, because it also affects the motivation of workers in completing the work.

REFERENCES

- [1] S. Johan, "Definisi Perseroan Terbuka atau Publik Menurut Peraturan Perundang-undangan Indonesia," *Jurnal Mercatoria*, vol. 14, no. 1, pp. 38-45, 2021.
- [2] I. T. Asfar and I. Taufan, "Analisis naratif, analisis konten, dan analisis semiotik (Penelitian kualitatif)," no. January, pp. 1-13, 2019.
- [3] A. Mardani, A. Jusoh, K. Nor, Z. Khalifah, N. Zakwan, and A. Valipour, "Multiple criteria decision-making techniques and their applications—a review of the literature from 2000 to 2014," *Economic research-Ekonomska istraživanja*, vol. 28, no. 1, pp. 516-571, 2015.
- [4] D. R. Anderson, D. J. Sweeney, T. A. Williams, J. D. Camm, and J. J. Cochran, *An introduction to management science: quantitative approach*. Cengage learning, 2018.
- [5] T. Bilgiç and I. B. Türkşen, "Measurement of membership functions: theoretical and empirical work," in *Fundamentals of fuzzy sets*: Springer, 2000, pp. 195-227.
- [6] S. Suyanto and M. Sc, "Artificial Intelligence: Searching, Reasoning, Planning and Learning," Penerbit Informatika, Bandung, Indonesia, 2007.
- [7] D. Y. D. Mahulae, "Analisis pengaruh efisiensi modal kerja, likuiditas, dan solvabilitas terhadap profitabilitas," *Jurnal Manajemen Dan Akuntansi Medan*, vol. 2, no. 1, pp. 1-11, 2020.
- [8] R. Ryamirzad and G. F. Prawinda, "Karakteristik Persetujuan Dewan Komisaris terhadap Kewenangan Direksi Menjamin Aset Perusahaan," *Perspektif*, vol. 25, no. 2, pp. 84-91, 2020.

- [9] C. Z. Pricilia, "Analisis Cash Flow dengan Variasi Sistem Pembayaran terhadap Keuntungan Kontraktor," Universitas Andalas, 2021.
- [10] G. Utari, T. Arimurti, and I. N. Kurniati, "Pertumbuhan kredit optimal," *Bulletin of Monetary Economics and Banking*, vol. 15, no. 2, pp. 3-36, 2012.
- [11] M. T. L. Buana, S. Halim, and M. Muhyarsyah, "Analisis Faktor Eksternal Dan Internal Pembiayaan Bank Syariah Pada Sektor Konstruksi," *Techno-Socio Ekonomika*, vol. 16, no. 1, pp. 94-106, 2023.
- [12] E. Manu, N. Ankrah, E. Chinyio, and D. Proverbs, "Trust influencing factors in main contractor and subcontractor relationships during projects," *International Journal Of Project Management*, vol. 33, no. 7, pp. 1495-1508, 2015.
- [13] H. Muhendra and S. Hasibuan, "Seleksi Sub-Kontraktor Proyek Konstruksi Jalan Layang," *Jurnal Manajemen Transportasi & Logistik (JMTRANSLOG)*, vol. 5, no. 1, pp. 43-54, 2018.
- [14] R. Januardi and K. S. Pribadi, "Kajian aturan pembayaran subkontraktor oleh kontraktor utama di Indonesia," *Dinamika Rekayasa*, vol. 16, no. 1, pp. 21-31, 2020.
- [15] F. Raharjo, "Kajian Faktor Yang Dipertimbangkan Kontraktor Dalam Memilih Pemasok Material," *Jurnal Teknik Sipil Universitas Atma Jaya Yogyakarta*, vol. 7, no. 2, pp. 119-130, 2009.
- [16] S. Lagiman, "Improvement of relationship between main contractor and subcontractor for successful construction project implementation," *Universiti Tun Hussein Onn Malaysia*, 2017.
- [17] D. A. Ratnasari, "Pemilihan Supplier Bahan Baku Kayu Menggunakan Metode Fuzzy Analytic Network Process (Studi Kasus di PT. Yogya Indo Global)," *Perpustakaan UIN Sunan Kalijaga*, 2012.
- [18] A. R. Halida and M. Abduh, "Studi pengaruh sistem pembayaran tenaga kerja terhadap motivasi pekerja konstruksi," 2016.
- [19] G. Kou, D. Ergu, Y. Peng, and Y. Shi, *Data Processing for the AHP/ANP*. Springer, 2013.
- [20] Siswandi, "Model Pelaksanaan Design and Build Sesuai Peraturan Menteri Pekerjaan Umum dan Perumahan Rakyat Republik Indonesia Nomor 12/PRT/M/2017 Tahun 2017 di Proyek PT. Yodya Karya (Persero)," *Universitas Narotama*, 2022.
- [21] J. U. D. Hatmoko, A. Hidayat, M. Zachari, and S. S. H. Merukh, "Investigasi Pengaruh Keterlambatan Pembayaran Proyek Konstruksi dari Owner kepada Kontraktor," *TEKNIK*, vol. 43, no. 2, pp. 168-177, 2022.
- [22] L. Anggraini, D. Rahmawati, and T. Widorini, "Analisis Pengaruh Kualifikasi Kontraktor Terhadap Kualitas Pekerjaan Proyek Konstruksi di Kota Semarang," *Jurnal Pengembangan Rekayasa dan Teknologi*, vol. 1, no. 2, pp. 72-28, 2017.