



Analysis of Subcontractor Selection Criteria by the Main Contractor in the Implementation of Building Construction in Aceh

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ABSTRACT

The implementation of construction is greatly influenced by the role of the subcontractor chosen appropriately. The selection of inappropriate subcontractors can hinder the smooth running of the project. This process is controlled by many criteria. A total of 5 criteria that affect the selection of subcontractors by the main contractor based on previous research. Data collection by questionnaire survey of 74 building classification contractor companies with non-small qualifications. The results of this study show that the most influential criterion in the selection of subcontractors by the main contractor in the implementation of building construction in Aceh is the quality of performance with a percentage of 21.98%, followed by business and labor health 21.79%, then the previous performance of 21.61%, after that planning and control of 20.87%, and the lowest percentage is on safety performance 13.75 %.

INTRODUCTION

A construction project can be interpreted as a series of activities that have unique characteristics with limited time and resources, so they require management expertise in their management (Simanjuntak & Simandjorang, 2019). The series of activities consists of planning, designing, carrying out construction and maintenance (Trisnawati et al., 2018)

Success in project implementation is the main goal by companies engaged in construction services. In general, a project is said to be successful if the project or work carried out is in accordance with the plan, completed on time while still paying attention to cost elements and quality or guaranteed quality (Sadiq & Rizki, 2022). In construction projects, the responsibility is basically charged to the main contractor for the completion of the project work on time, quality and efficiency.

According to Tantarto et al., (2023) problems that sometimes arise in projects, the main contractor often experiences delays with work results that do not meet expectations and do not meet targets. Therefore, the main work executor as the construction executor requires subcontractors to do certain work with special skill needs.

Danang et al., (2023) stated that subcontractors are a solution to the uncertainty and complexity where trust, technical and financial risks are shared between the parties. Subcontractors have a very important role, responsible for part or all of the work in a construction project and can affect the smooth running and success of the construction project. One of the first steps in project planning is identifying the right subcontractor to create a good construction process. The more work a project does, the more subcontractors are needed. Therefore, every time a major construction project takes place, the number of subcontractors increases. Abbasianjahromi et al., (2018) stated that the challenge for the main contractor is to control and select competent subcontractors with the evaluation of prioritized criteria, to support the implementation of an activity carried out properly and correctly.

Marzouk et al., (2013) stated that cost is the most basic criterion in the contractor selection process. However, after the research conducted, more careful consideration must be given to the selection process with various criteria in selecting contractors. Many general contractors and owners only deal with the lowest bidder and ignore other criteria in their consideration. Based on the above explanation, this study was conducted to find out the criteria for selecting subcontractors by the main contractor in the implementation of building construction projects in Aceh.

THEORETICAL REVIEW

Previous Research

Karaman Ali Erkan & Sandal Koray (2022) "Karaman Ali Erkan & Sandal Koray (2022) Effect of Subcontractor Selection on Construction Project Success in Turkey". Data dari 94 responden hasil survei kuesioner perusahaan konstruksi yang mempekerjakan subkontraktor di Turki. Penelitian ini menghasilkan beberapa bobot untuk semua item pengukuran pada variabel Quality Performance (QP), Soundness of Business and Workforce (SBW), Planning and Control (PC), Past Performance (PP) ditemukan secara statistik positif kecuali untuk dampak kinerja

keselamatan (SP) pada keberhasilan proyek secara keseluruhan yang ditemukan negatif secara statistik dan tidak signifikan.

Lew Yoke-Lian, Hassim Salihudin, Muniandy Ratnasamy, Teik Hua (2018) Structural equation modelling for subcontracting practice: Malaysia chapter". Data obtained from a total of 162 contractors in Malaysia. The final model has found four main criteria that are considered during contractor selection namely, communication, relationships, general obligations and subcontractor resource management. The results of this study reveal that the four criteria used in monitoring subcontractors do affect the performance of a project.

Chandrakantan Subramaniam, Faridahwati Mohd. Shamsudin, Ahmad Said Ibrahim Alshuaibi (2017) conducted a study related to "Investigating Employee Perceptions Of Workplace Safety And Safety Compliance Using Pls-Sem Among Technical Employees In Malaysia" survey data was conducted in Malaysia of 135 technical employees. The measurement model results in five aspects of employee perception whose validity and reliability are confirmed. The analysis reveals that management safety practices are the most significant predictor of safety compliance, followed by coworker safety and occupational safety. However, no significant effects were found for supervisor safety and satisfaction with the safety program. The practical implications, limitations of the research, and future research directions are discussed.

Vivian W.Y. Tam, L.Y. Shen, Joseph S.Y. Kong, (2011) conducted a study related to "Impacts of multi-layer chain subcontracting on project management performance" investigating the impact of the implementation of the multi-layer chain subcontracting system on project management performance with reference to Hong Kong's construction industry. Based on the survey results, the implementation of a multi-layer chain subcontracting system contributes greatly to poor performance in all key aspects including quality and time management, cost control, and communication and coordination performance. The relationship exists between poor project management performance and an increase in the number of layers in the subcontract management chain. The long communication chain due to the increasing layer of subcontractors results in various problems such as miscommunication, poor supervision of contractors. As a result, cost and time overruns, as well as failed work and repairs are frequent.

Doloi Hemanta (2009) conducted research related to "Analysis of pre-qualification criteria in contractor selection and their impacts on project success". In this study, 43 attributes were adopted. Based on statistical correlation analysis that produces 7 factors, namely, (1) soundness of business and workforce, (2) planning and control, (3) quality management, (4) past performance, (5) risk management, (6) organizational capability, and (7) commitment and dedication. The results of the linear regression model reveal that past performance, soundness of business and workforce, planning and control, quality management have a significant influence on achieving project success.

Subcontractor

Danang et al., (2023) states that a subcontractor is a party appointed by the main contractor to perform part or all of the work in a construction project and has a very important role in the construction project. Subcontractors are responsible for

some or all of the work in a construction project and can affect the overall smooth and successful running of the project.

Fachrurrazi et al., (2017) states that the implementation and work of a project is inseparable from the right subcontractor and meets the applicable criteria and provisions so that all factors are met. The application of all criteria is consistent and according to each other's needs.

Subcontractor Selection Process

In working on a project, of course, it is necessary to choose the right subcontractor so that it meets the specified criteria and follows the stages. If the criteria are applied consistently, the results obtained by the subcontractor can be relied on according to their expertise.

Muhendra & Hasibuan, (2018) stated that, the subcontractor selected by the main person in charge of the project is carried out in 2 ways, namely:

- a) Direct appointment where the work on a project is carried out by a subcontractor and has been approved and mutually agreed to carry out the work on a project based on mutual terms and understanding.
- b) Tender is a project auction that is carried out and participated in by more than one project candidate.

METHODOLOGY

This research was carried out in several stages as seen in Figure 1.

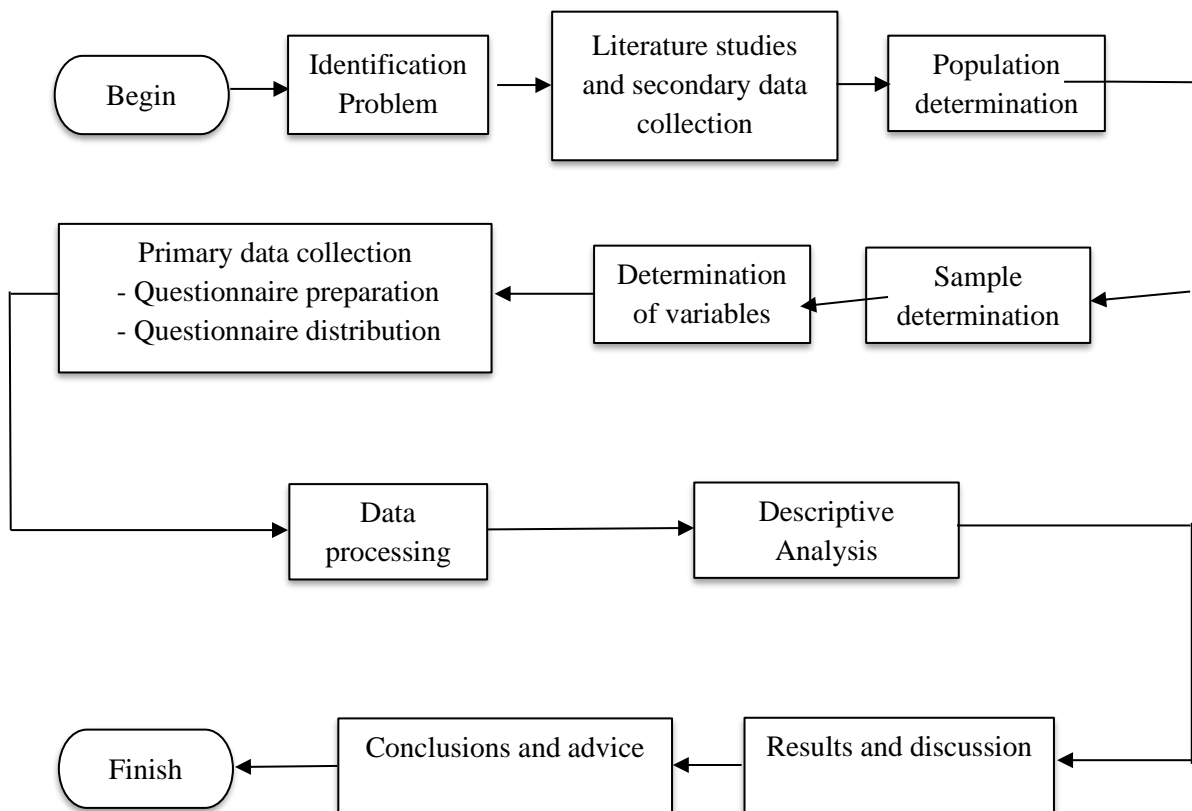


Figure 1. Research Flow Chart

Population and Sample

The population, namely *project managers* from building qualification companies with a non-small classification in 2019-2023, totals 96 companies.

Primary data was obtained from a questionnaire survey using a Likert scale with criteria of "strongly agree" to "strongly disagree". The respondents to the study were *project managers* as many as 74 people. The research variables were obtained from previous research, as seen in Table 1.

Table 1. Research variables

Criterion	Indicator	Source					
		a	b	c	d	and	
Business and Workforce Health (X1)	X1.1	Technical expertise	√				
	X1.2	Attitude of Responsibility	√				
	X1.3	Implementation of Standard Operating Procedures (SOPs)	√				
	X1.4	Successful past projects	√				
	X1.5	Relevant work experience		√	√		
	X1.6	Working capital		√	√		
Planning and Control (X2)	X2.1	Statement of working methods		√			
	X2.2	Record of the quality of work	√		√		
	X2.3	Work flexibility		√			
	X2.4	Comply with quality specifications		√			
	X2.5	On-time project completion		√			
Performance Quality (x3)	X3.1	Quality of work	√				√
	X3.2	Project timeliness	√				√
	X3.3	Occupational safety initiative note	√				
	X3.4	Quality control and quality assurance programs		√	√		√
	X3.5	Timeliness of project response		√	√		
Previous Performance (x4)	X4.1	Length of working relationship	√		√		
	X4.2	Regulatory knowledge	√		√		
	X4.3	Fluctuations in turnover		√			
	X4.4	Time in business engagement		√			
	X4.5	Overall business experience		√			
Safety Performance (x5)	X5.1	Safety handling		√		√	
	X5.2	Investigation of the cause of the accident			√		
	X5.3	Safety training		√		√	
	X5.4	High safety motivation		√	√		

Source: Doloi, (2009), Karaman & Sandal (2022), Lew et al., (2018), Subramaniam et al., (2017), Tam et al., (2011).

The following is the operational definition of each criterion can be seen in Table 2.

Table 2. Operational definition Subcontractor selection criteria

Code	Criterion	Definition
X1	Business and Workforce Health (KB)	KB refers to the company's performance, the success of the project team, goal-oriented achievements, and continuity in achieving the goals of the Karaman & Sandal (2022), Kasabreh & Tarawneh (2021), and Doloi et al (2011) projects.
X2	Planning and Control (PP)	PP is the process of how a company implements good project management and achieves overall success in running a project Karaman & Sandal (2022), Kasabreh & Tarawneh (2021), and Doloi et al (2011).
X3	Quality of Performance (KK)	KK is the performance achieved by the company in meeting the specifications that are the basis for the implementation of the Karaman & Sandal (2022), Kasabreh & Tarawneh (2021), and Doloi et al, (2011) projects.
X4	Previous Performance (KT)	KT is the performance made by the company in the past in completing the projects Karaman & Sandal (2022), Kasabreh & Tarawneh (2021), and Doloi et al (2011).
X5	Safety Performance (KKE)	KKE is the performance achieved by the company in upholding the level of worker safety in the implementation of the Karaman & Sandal project (2022) and Doloi et al, (2011).

RESEARCH RESULTS

An overview of the characteristics of respondents as seen in Table 3.

Table 3. Characteristics of Respondents

No	Information	Total	Percentage %
1	Gender		
	Man	74	100
	Woman	0	0
	Sum	74	100
2	Age		
	20-29 years old	24	32
	30-39 years old	38	51
	40-49 years old	10	14
	> 50 years	2	3
	Sum	74	100
3	Last education		
	D4/S1	69	93

No	Information	Total	Percentage %
S2		5	7
	Sum	74	100
4	Background of Civil Engineering Education Already	74	100
	Sum	74	100
5	Experience in building construction		
	1-5 Years	3	4
	6-10 Years	36	49
	11-15 Years	28	38
	16-20 Years	4	5
	21-25 Years	3	4
	Sum	74	100
6	Types of Subcontractors		
	Specialist	66	89
	Common	8	11
	Sum	74	100

Analysis of Subcontractor Selection Criteria

Business and Workforce Health

In the business and labor health criteria, the instruments used were 6 indicators, in the X1.1 indicator of technical expertise, had the highest empirical score of 275 while the X1.6 indicator of working capital, got the lowest score of 241. The recapitulation is seen in Table 4.

Table 4. Business and workforce health criteria

Criterion	Indicator	STS	TS	KS	S	SS	N	Empirical Score	Ideal Score
		1	2	3	4	5			
Business and Workforce Health (X1)	X1.1 Technical expertise	0	10	15	35	14	74	275	370
		0	20	45	140	70			
	X1.2 Attitude of Responsibility	0	8	40	25	1	74	241	370
		0	16	120	100	5			
	X1.3 Implementation of Standard Operating Procedures (SOPs)	0	9	38	22	5	74	245	370
		0	18	114	88	25			
	X1.4 Successful past projects	0	4	41	28	1	74	248	370
		0	8	123	112	5			
	X1.5 Relevant work experience	0	8	39	22	5	74	246	370
		0	16	117	88	25			
	X1.6 Working capital	0	9	40	22	3	74	241	370
		0	18	120	88	15			
Total								1496	

Planning and Control

In the planning and control criteria, the instruments used were 5 indicators, in the X2.1 indicator of the work method statement, obtained the highest empirical score of 300, while the X2.5 indicator of on-time project completion, obtained the lowest score of 275. The recapitulation is seen in Table 5.

Table 5. Planning and control criteria

Criterion	Indicator	STS	TS	KS	S	SS	N	Empirical Score	Ideal Score	
		1	2	3	4	5				
Planning and Control (X2)	X2.1	Statement of working methods	1	2	11	38	22	74	300	370
			1	4	33	152	110			
	X2.2	Record of the quality of work	0	4	13	48	9	74	284	370
			0	8	39	192	45			
	X2.3	Work flexibility	1	2	20	44	7	74	276	370
			1	4	60	176	35			
	X2.4	Comply with quality specifications	0	2	14	38	20	74	298	370
			0	4	42	152	100			
	X2.5	On-time project completion	1	7	14	42	10	74	275	370
			1	14	42	168	50			
Total								1433		

Quality of Work

In the work quality criteria, the instruments used were 5 indicators, in the X3.5 indicator of the timeliness of the project response, achieving the highest empirical score of 317, while the X3.2 indicator of project timeliness, got the lowest score of 282. The recapitulation is seen in Table 6.

Table 6. Performance quality criteria

Criterion	Indicator	STS	TS	KS	S	SS	N	Empirical Score	Ideal Score	
		1	2	3	4	5				
Performance Quality (x3)	X3.1	Quality of work	3	1	8	24	38	74	315	370
			3	2	24	96	190			
	X3.2	Project timeliness	2	3	21	29	19	74	282	370
			2	6	63	116	95			
	X3.3	Occupational safety initiative note	0	6	9	29	30	74	305	370
			0	12	27	116	150			
	X3.4	Quality control and quality assurance programs	0	3	23	25	23	74	290	370
			0	6	69	100	115			
	X3.5	Timeliness of project response	0	2	7	33	32	74	317	370
			0	4	21	132	160			
Total								1509		

Previous Performance

In the previous performance criteria, the instrument used as many as 5 indicators, on the X4.4 indicator of time in business engagement, achieved the highest empirical score of 313, while the X4.2 indicator of regulatory knowledge, received the lowest score of 272. The recapitulation is seen in Table 7.

Table 7. Previous performance criteria

Criterion	Indicator	STS	TS	KS	S	SS	N	Empirical Score	Ideal Score
		1	2	3	4	5			
Previous Quality (x4)	X4.1 Length of working relationship	1	2	9	41	21	74	301	370
		1	4	27	164	105			
	X4.2 Regulatory knowledge	0	6	23	34	11	74	272	370
		0	12	69	136	55			
	X4.3 Fluctuations in turnover	0	1	4	43	26	74	316	370
		0	2	12	172	130			
	X4.4 Time in business engagement	2	0	4	41	27	74	313	370
		2	0	12	164	135			
	X4.5 Overall business experience	0	6	16	38	14	74	282	370
		0	12	48	152	70			
Total								1484	

Safety Performance

In the safety performance criteria, the instruments used were 4 indicators, in the X5.2 indicator the investigation of the cause of the accident obtained the highest empirical score of 238 while the X5.3 indicator for safety training, got the lowest score of 231. The recapitulation is seen in Table 8.

Table 8. Safety performance criteria

Factor	Indicator	STS	TS	KS	S	SS	N	Empirical Score	Ideal Score	
		1	2	3	4	5				
Safety Performance (x5)	X5.1 Safety handling	0	6	47	21	0	74	237	370	
		0	12	141	84	0				
	X5.2 Investigation of the cause of the accident	0	5	48	21	0	74	238	370	
		0	10	144	84	0				
	X5.3 Safety training	0	12	42	19	1	74	231	370	
		0	24	126	76	5				
	X5.4 High safety motivation	0	6	47	20	1	74	238	370	
		0	12	141	80	5				
	Total								944	

Recapitulation of the percentage of subcontractor selection criteria in the implementation of building construction in Aceh. As seen in Table 9.

Table 9. Percentage of Subcontractor Selection Criteria

Factor	Total Empirical Score	Percentage
Business and Workforce Health (X1)	1496	21.79%
Planning and Control (X2)	1433	20.87%
Performance Quality (x3)	1509	21.98%
Previous Quality (x4)	1484	21.61%
Safety Performance (x5)	944	13.75%
Total	6866	100%

Based on the results of data processing in Table 9, several things that can be discussed are as follows.

1. Business and workforce health had a significant effect with a percentage value of 21.79%. These results are consistent with the research of Karaman & Sandal (2022), Kasabreh & Tarawneh (2021), and Doloji et al., (2011) which found a positive influence on business and labor health criteria on the implementation of building construction.
2. Planning and control had a significant effect with a percentage value of 20.87%. These results are consistent with the research of Karaman & Sandals (2022), Kasabreh & Tarawneh (2021), and Doloji et al., (2011). which found a positive influence on planning and control criteria on the implementation of building construction.
3. Quality of Work had a significant effect with a percentage value of 21.98%. This result is consistent with the research of Karaman & Sandal, (2022) and which found a positive influence of performance quality criteria on the implementation of building construction Tam et al., (2011)
4. Previous performance had a significant effect with a percentage value of 21.61%. These results are consistent with the research of Karaman & Sandal (2022), Kasabreh & Tarawneh (2021), and Doloji et al., (2011) which found a positive influence of previous performance criteria on the implementation of building construction.
5. Safety Performance had a significant effect with a percentage value 13.75%. This result is different from the research Karaman & Sandal (2022), Subramaniam et al., (2017). This study found a significant simultaneous effect of safety performance on the implementation of building construction in Aceh.

CONCLUSION

The results of the study show that the most influential criterion in the selection of subcontractors by the main contractor in the implementation of building

construction in Aceh is the quality of performance with a percentage of 21.98%, followed by business and labor health at 21.79%, then the previous performance at 21.61%, after that planning and control at 20.87%, and the lowest percentage at safety performance at 13.75%.

RECOMMENDATION

Based on the study results showing that performance quality is the most influential criterion in selecting subcontractors by the main contractor in building construction projects in Aceh, it is recommended that the main contractors focus more on evaluating and improving the performance quality of subcontractors. This is essential to ensure that the work meets the required standards and is completed on time. Furthermore, a balanced attention to other factors, such as business and labor health, previous performance, planning and control, and safety performance, should still be maintained, even though they have lower percentages, to create a safe and efficient working environment.

FURTHER STUDY

For further study, it is recommended to explore the impact of integrating modern technologies, such as Building Information Modeling (BIM) or digital project management tools, in improving the overall performance and efficiency of subcontractors in construction projects. Additionally, research could be conducted to analyze how the dynamics of local regulations, cultural factors, and economic conditions in Aceh influence subcontractor selection criteria. Understanding the long-term effects of subcontractor performance on project outcomes, including cost-effectiveness and stakeholder satisfaction, would provide valuable insights for enhancing construction project management practices in the region.

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