The Correlation Value on Identification of Project's Risks under Small Construction Company

Ipak Neneng Mardiah Bukit
Civil Engineering Department, Faculty of Engineering, Samudra University, Langsa, Aceh, Indonesia
e-mail: ipakbukit@unsam.ac.id

Yusnawati
Industrial Engineering Department, Faculty of Engineering, Samudra University, Langsa, Aceh, Indonesia
e-mail: yuznanice@gmail.com

***Abstract*—Construction projects contain complexity in not only its activities, but also the matter of managing the whole project works. Risks occur in the project life cycle. Risk will cause negative impact to the project goal/s, and may result in project failure. Failure indicated from the cost performance, schedule performance and scope project whether they are implemented accordance to the plan or not. Thus, it will affect the deliverability of the project outcomes. The successful of project deliverability determines the construction process performance, which ultimately determines the company ability in managing project. Mostly those risks are uncertainty. That is why the construction industry is known as the most risky industry. To deal with the uncertain risks, people in the industry require having risk management system in their company. The system requires identification of risks under company responsibility. The purpose of this paper is to know characteristics of small construction company and their implementation of risks identification in their projects to be prioritized for analyzing and handling process. In this research, we assess the characteristics of small construction company and calculate the correlation value using Pearson correlation test to evaluate some major risks to be considered as priority risks. The data collection is using questionnaires that are distributed to 52 respondents from 60 companies. It is held in three districts; District Aceh Timur, District Aceh Tamiang and Kota Langsa,. The result is company characteristics/profile and priority risks under small construction company in the area.**

Keywords: Construction, Company, Characteristic, PPM, Project, Risks.

I. INTRODUCTION

Risks are uncertain logic in projects. Every project has its own risks, but construction industry's is the most risky one among others. Risks cannot be detected, but it should be planned since the first step of project life cycle. The best way to reduce or minimize risks is to plan better [1]. The greatest degree of uncertainty in the future is encountered in the early life of a new project [2]. Moreover, risks must be monitored during the whole project life cycle. Otherwise, risks can drive the project in to the path of failure. Companies have started to realize that risk management involves more in project planning since 1996 [1]. In 1980's, Kerzner states that people believe that the project failure is quantitative failure. Until 1990's this paradigm changed to qualitative failure due to poor morale, poor motivation, poor human relationship, poor productivity, no employee commitment, no functional commitment, delays in problems solving, too many unresolved policy issues and conflicting priorities between employer - employee [1].

Construction companies tend to be able to solve their project's problems thus they can avoid failure. Major company usually has a risk management system that is integrated with the company policy. The system helps company administrator in order to identify risks that will be manifested in risk management plan. Fortunately, a big company has enough resources to apply the system. What if the company is classified as a small business of constructor? Small constructor hardly has finance department to administer cost – time - quality problems. Their resources are limited, therefore their assets are optimized to deliver their obligatory contract. Usually, small contractors do small construction works, which eventually could be delivered to the client. However, small works in construction does not reduce the severity of failures. Therefore small company obliges to be aware of the threat. The research is held in 52 contractors reside in three districts in Aceh Province, namely District Aceh Timur, Aceh Tamiang and Kota Langsa, which is considered as small group contractors. Based on the background above, hence the research question is what risks are considered priority by the small contractors in the area?

This research aims to know the characteristics of small construction company and what risks are recognized that mostly affect their projects' performance based on their responses to the questionnaire; therefore we could spot the priority risks that should be organized in their risk management system. In order to reach that goal, we distribute questionnaire contains statements about company profiling and risk identification. The respondents of this research are 52 small companies that meet the criteria of Construction Service Development Board (CSDB), or in Indonesian, Lembaga Pengembangan Jasa Konstruksi (LPJK), as small company.

The result shows that the 3 highest ranking are costs, funding and project schedule. Those 3 highest ranking of risks according to the correlation value are considered as the most priority risks to be organized by the companies. The questionnaires are tested with Reliability test and gives Cronbach's Alpha coefficient 0.679. The risks priority is

obtained by calculating the value of Pearson correlation in 5% significant or and 95% confidence. Pearson correlation shows that all the risks contained in the questionnaire are valid, however we rank it within 3 highest ranking and the correlation value are respectively 0.842, 0.657 and 0.636, which is bigger than the $r_{table} = 0.274$.

II. ASSESSMENT OF RISKS

Assessing uncertainty in the early project life will help the project manager to establish estimating and calculating the contingency funds [2]. It is done in the project planning phase and monitored during project life cycle. Estimating costs is based on assumption of risks that later have to be altered [3]. These assumptions are including weather, nature of the ground or groundwater condition. Moreover it is also assess the unforeseen risks.

On the other hand, the risk management component of failure is not readily identified [1]. When the actual performance of the contractor is significantly less than customer expectations, it hardly explains whether caused by poor risk management or lack of technical ability.

In Project Management Book of Knowledge (PMBOK) states there are 9 (nine) areas of Project Management [4] namely: Project Integration Management, Project Scope Management, Project Time Management, Project Cost Management, Project Quality Management, Project Human Resources Management, Project Communication Management, Project Risk Management and Project Procurement Management. Risk management system becomes an important aspect in project management since 1980's, and the implementation is suggested on the early stage of project life cycle. Project risk management includes some processes as follows: risk management planning, risk identification, risk analysis, risk handling and risk evaluation and monitoring [1].

Risk management is the most difficult aspect of project management; hence the project manager should be able to identify the root causes of the risks and how to trace these causes through the project to their consequences [5]. Kerzner [1] states that the new role of executive in project management requires including providing strategic information for risk management. Therefore, project manager must be able to assist in risk identification and evaluate or prioritize risk handling option.

Risk management process will include risk planning, risk identification, risk analysis, risk handling, risk monitoring and evaluation [1] and [4]. Risk planning is held in the early project phase. Small company hardly has the whole processes; however the next phase is not too hard to be planned. Risk identification will help project manager in small project to recognize risks that threaten.

III. CONSTRUCTION COMPANY CATEGORIES

Based on The decision letter of the Indonesian National Construction Development Services Board Number 75/KPTS/LPJK/D/X/2002 states the construction company is divided into several categories [6] and [7]. The categories are group classification and business entity qualification. Groups are divided to big group, medium group and small group. Groups are differed based on working capital.

TABLE I. CONSTRUCTION COMPANY GROUP CATEGORY

No.	Groups	Working capital (Rp.)
1.	Big	>10 billion
2.	Medium	1 – 10 billion
3.	Small	≤ 1 billion

Company qualification is determined with the depth of competence and potential business capability [6]. Small group is considered qualify and competence to handle work cost until 1 billion rupiahs under condition it has a corporate technical responsibility or a person in charge with expertise certificate. Qualification limit for small group has a maximum 6 capability areas of expertise.

IV. RESEARCH METHODOLOGY

The research methodology is descriptive method and data is analyzed by Pearson Correlation Product Moment (PPM). The data is collected using questionnaires. The questionnaire consists of company profiling questionnaire and PPM questionnaire. The collection data needs a month of time caused by the big area.

The process of data collection can be explained as follows:

1. We survey the area to gather companies in three districts. We collected 60 construction companies. Sampling is using Slovin formulation [8].

$$n = \frac{N}{1+Ne^2} \quad (1)$$

Where:
n = number of sample
N = population
e = error tolerance = 5%

$n = 60/(1+60 \times 0.05^2) = 52.17 \approx 52$ sample

2. We develop questionnaire for company's profile in order to get information about class of enterprises.
3. We develop questionnaire for identifying risks using Likert scale.
4. We distributed the questionnaires to 52 respondents/construction companies.

Furthermore, we test the questionnaire validity and reliability with Pearson correlation and Cronbach's alpha coefficient. Eventually we get priority risks to be handled. The research flowchart can be seen below.

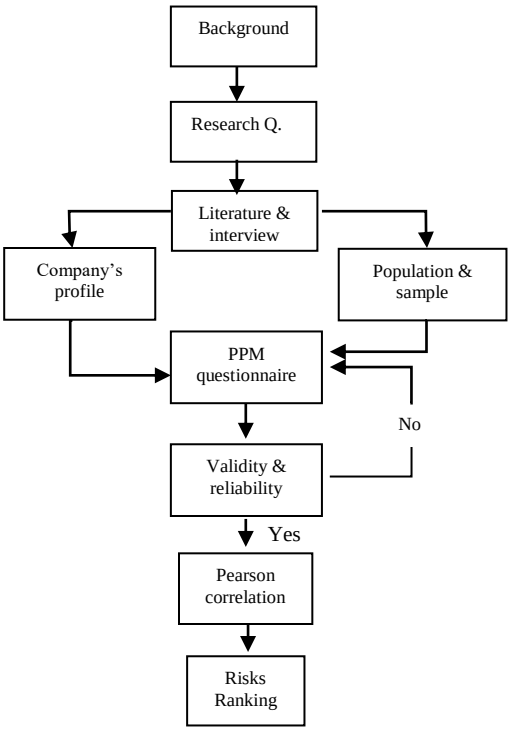

Figure 1. Research flow chart

Validity and reliability is obtained using the formulations below respectively:

$$r_{yx_i} = \frac{\sum(x-\bar{x})(y-\bar{y})}{\sqrt{\sum(x-\bar{x})^2 \sum(y-\bar{y})^2}} \quad (2)$$

Where:
r = correlation
x = independent variable
y = dependent variable

$$r = \left[\frac{k}{(k-1)}\right]\left[1 - \frac{\sum {\sigma_b}^2}{{\sigma_t}^2}\right] \quad (3)$$

Where:
r = reliability coefficient Cronbach alpha
k = number of statements/questions
$\sum {\sigma_b}^2$ = total variance of statements
${\sigma_t}^2$ = total variance

V. RESULT AND DISCUSSION

A. *Company's profile and characteristics*

The companies profiling describes 4 aspects, namely:

1. Personnel aspect
2. Financial aspect
3. Experiences
4. Equipment ownership

Personnel aspect is person in charge education, certificate of expertise, human resources, total manpower and expertise status.

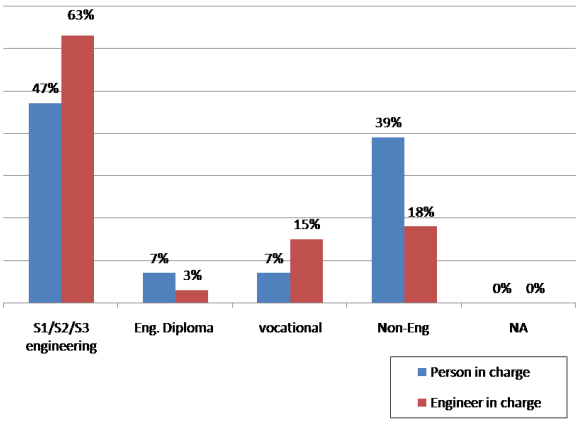

Figure 2. The education of th responsible personnels

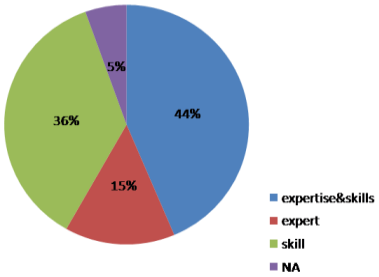

Figure 3. Personnel certificate of expertise

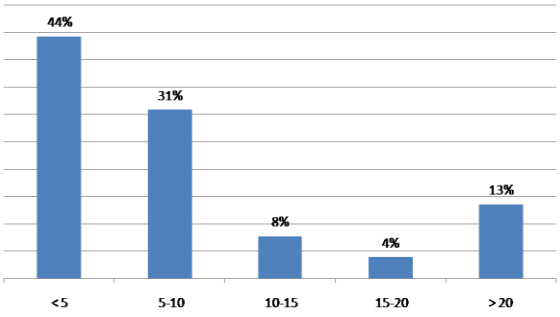

Figure 4. Total manpower

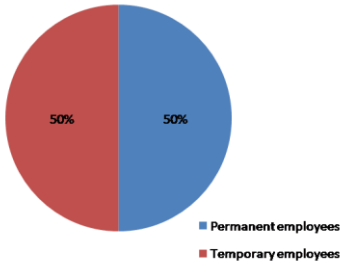

Figure 5. Expertise status

Financial aspect is capital origin, net worth, and value of works in the last seven years.

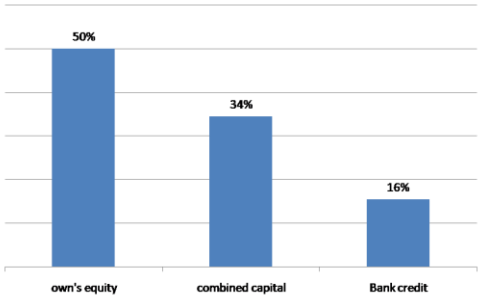

Figure 6. Company's capital origin

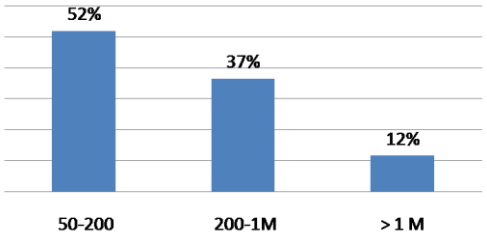

Figure 7. Company's net worth

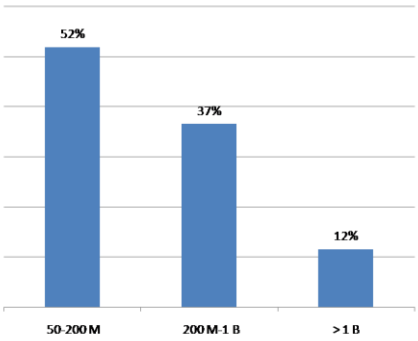

Figure 8. The value of works in last 7 years

Company experience aspect is including number of jobs done in last 7 years, company's clients, construction experience, jobs location, and company's field of work.

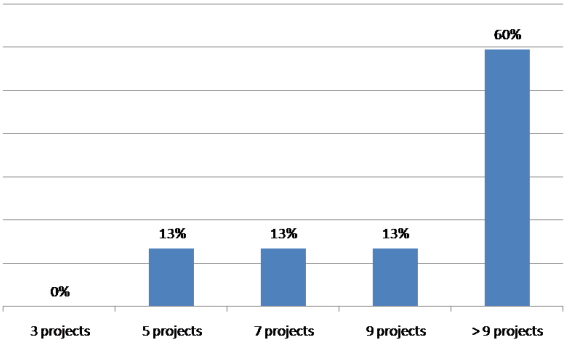

Figure 9. Number of jobs in last 7 years

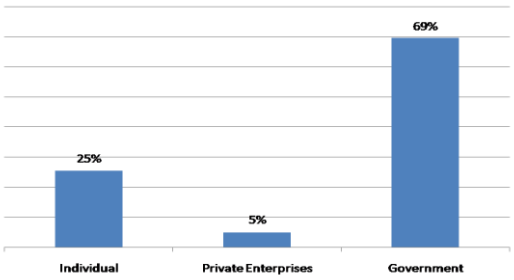

Figure 10. Company's clients

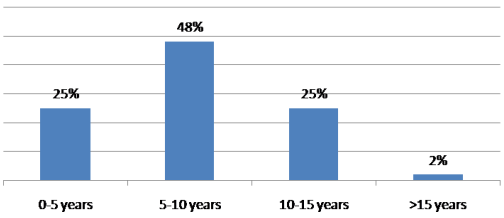

Figure 11. Company's experience in construction work

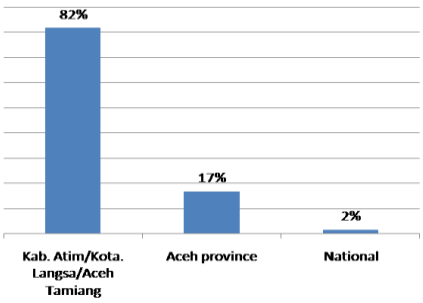

Figure 12. Jobs locations

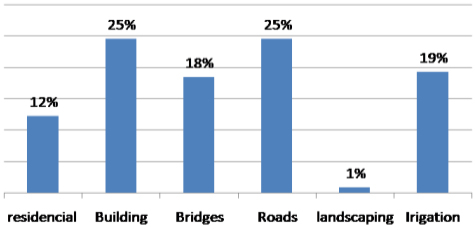

Figure 13. Company's workfield

The ownership of equipments is showed as follows:

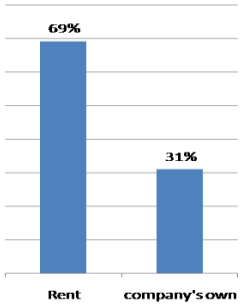

Figure 14. Equipment ownership

The figures inform that the characteristics of construction companies that are resided in the areas are as follows:

1. Person in charge holds engineering degree, so does the Engineer in charge.
2. Person in charge holds expertise and skills certificate.
3. Company with owner's equity is 50%, the other 50% combined capital (joint venture with other company) and bank creditor .
4. Having permanent employees.
5. The work value mostly 50-200 million rupiahs.
6. The number of projects in last 7 years more than 9 projects or at least one project a year.
7. Working area mostly in their district.
8. Having experience 5-10 years in building and civil works (building, road, bridges, and irrigation).
9. Mostly rent equipment.

B. *Validity and reliablity test*

In order to get the validity of the questionnaire, we test it using formulation (2), and the result of the validity test is shown in table below.

TABLE II. VALIDITY TEST

No	r_c	r_t	Validity
1	0.735	0.274	Valid
2	0.460	0.274	Valid
3	0.415	0.274	Valid
4	0.488	0.274	Valid
5	0.461	0.274	Valid
6	0.468	0.274	Valid

Moreover, we test the reliability using formulation (3), and the result is as follow:

TABLE III. RELIABILITY TEST

Reliability Statistics	
Cronbach's Alpha	r table
0.679398219	0.274

The results give a reliable and valid questionnaire to be used in data analysis.

C. *Risk identification*

Risk identification description is held in 52 construction companies in the area by distributing questionnaire consists of questions/statements about risks assessment.

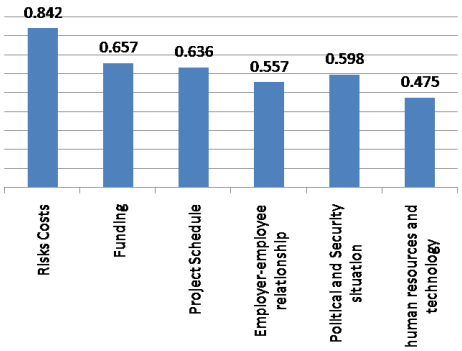

Figure 15. Correlation value of risk identification

D. *Discussion*

There are 60 companies in the areas, and 89% of them are small qualification company according to their work value. Refer to the company profiling, the small construction companies in the areas have interesting characters such as they are mostly new enterprises in construction works. They experience about 5-10 years. The project they handle usually small, the value ranges between 50-200 million rupiahs. According to [6], these small contractors are included K3 and K2 (small contractor with qualification that has ability to handle project value respectively ≤ 100 million and 100 to 400 million rupiahs).. They are local contractors because their work area is within their district.

Risk assessment shows that 6 potential risks are commonly recognized by the companies. They are:

1. Risks cost. Construction company in the area concern with the costs arising from risks.
2. Funding. Construction company understand if there is a risk then it will affect the company funding.
3. Project schedule. If there is a risk then it will cause the breach of the project completion time.

4. Employer-employee relationship. A good achievement in a project determine by a good teamwork.
5. Political issue. Sometimes this matter, but mostly it doesn't.
6. Human resource and technology. Lack of technology has little effect to project success in the area.

Correlation value describes the risks concern above. Figure 15 shows that the value is slightly different between 6 statements. All risks are valid, according Pearson correlation coefficient. However the 3 highest ranking of risks are risks cost, funding and project schedule get company priority attention. The value is respectively 0.842, 0.657 and 0.636. Whilst the other risks range between 0.475 to 0.598. All value is valid compared to the r_{table} = 0.274.

VI. CONCLUSION

We conclude that the companies' characters as follows:

1. Small Construction Company in District Aceh Timur, Aceh Tamiang and Kota Langsa is K3 and K2 qualification.
2. They are young company, with educated and qualified leader and also having engineer in charge for their project with expertise and skills certificate.
3. Financially healthy, they work with working capital of owner's equity.
4. Having experiences in civil works only in local area.
5. Using rent equipments.

They identify 6 risks as priority risks to be handled, namely: risks' cost, funding, project schedule, political issue, employer-employee relationship and human resources and technology.

The 6 risks will affect their project performance and the Pearson correlation value ranks the three highest influential risks i.e. risks cost = 0.842, funding = 0.657 and project schedule = 0.636.

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