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Risk Management on Villa Rodrigo Construction Project

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Abstract

Villa Rodrigo is one of the private ownership projects built in an environmentally friendly area that indicates the existence of risk factors that can affect project implementation. The risks that occur in this project, among others, are the result of the project owner who is less capable about the project, the existence of regulations related to the implementation of construction that applies in the project development area, and changes in design and material specifications during implementation. The research aims to identify risks, assess and determine the level of risk acceptance, determine dominant risks, mitigate risks and determine risk ownership. The research used a qualitative descriptive method. Data collection was carried out by brainstorming, interviews, and distributing questionnaires to respondents. The number of respondents was 17 people and selected by purposive sampling. The results showed there were 21 dominant risk identifications consisting of 8 unacceptable risks and 13 undesirable risks. One of these risks is that the project owner is not capable of the project so that it is difficult to communicate and coordinate project work. Mitigation actions taken for these risks are to conduct regular coordination with the owner regarding decisions that must be made before the work schedule is carried out, avoid excessive use of technical language by using language that is easily understood by all parties and, document all meetings, important decisions, and changes that occur in the project. Allocation of risk ownership is mostly the responsibility of the contractor because it is related to project implementation.

Keywords: Risk Management, Risk Identification, Risk Assessment, Dominant Risk, Risk Mitigation

Introduction

Villa Rodrigo is one of the private ownership projects located in an environmentally friendly community area called Taman Petanu Eco Neighborhood in Kemenuh Village, Sukawati District, Gianyar Regency, with the service provider CV. Kubu Bali. This project began in 2012 with the lower floor structural work and was halted due to issues from the project owner. In 2024, the project owner decided to resume the construction by directly appointing the service provider CV. Kubu Bali and the architectural planning team from the project owner.

The condition of the building structure has begun to show damage, such as beams and columns that have become hollow and some rebar that is visible and has corroded, thus it was decided to conduct a feasibility analysis of the existing structure while continuing the planning of the lower floor structure. Furthermore, the issue that arose was the project owner's lack of competence regarding the project, making coordination regarding necessary decisions require explanations in language that is easily understood by the project owner (Turner & Müller, 2004; Krane et al., 2012; Santos et al., 2012).

After the implementation of this project began in February 2025, there were indications of risk factors that could affect the project implementation. Livesey (2016) The first issue causing problems is the project owner's lack of competence regarding the project, making coordination regarding necessary decisions require explanations in language that is easily understood by the

project owner. Additionally, issues arose from the project development area, including regulations for the use of environmentally friendly materials, restrictions on project working hours and noise from work equipment, as well as narrow access to the work site (Ding, 2008; Hervani et al., 2005).

Other problems also emerged from the project owner, where after the implementation had started, the project owner made several changes to the room layout, changes to some finishing materials, and changes to the interior, which necessitated adjustments to the structural and architectural work to be done. Based on these issues, this research was conducted to identify the risk factors occurring in the project, analyze the dominant risk factors affecting project implementation, and find mitigation efforts for the dominant risk factors that can be undertaken, as well as the ownership of the dominant risks that occur.

Literature Review

According to the Ward & Chapman (2003) risk is an uncertain condition or event that, if it occurs, will have an impact on a project objective. Objectives may include scope, quality, schedule, and cost. A risk may have one or more causes, and if it occurs, it may have one or more impacts. According to (Saputro, 2021), in the implementation of construction projects, developers will be burdened by various uncertain situations that are consequences of risk. Therefore, there is a need for risk analysis that includes the processes of identifying, measuring, and determining the magnitude of the risk, followed by seeking several alternatives to face or mitigate the risk (Berg, 2010). To make decisions regarding these risks, (Flanagan, 1993) proposed a basic framework of steps as shown in Figure 1 below:

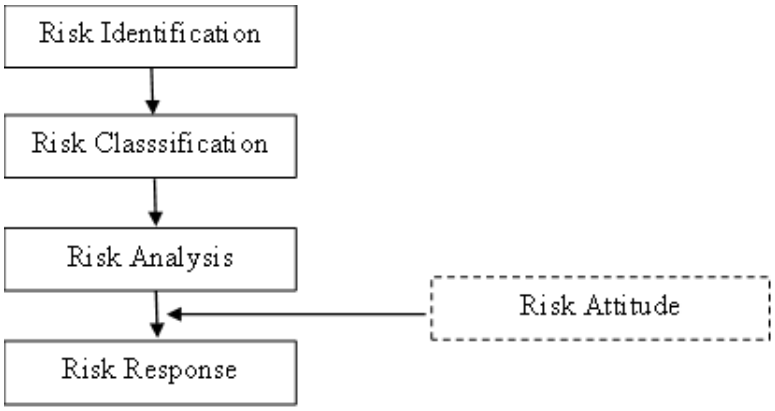

Figure 1. General Risk Management Framework
(Flanagan, 1993)

Risk Identification

Risk identification is the initial process in analysis that is determined systematically and continuously (Van et al., 2008). It can be identified from its source, event, and effect. The source of risk is conditions that can increase the likelihood of risk occurrence. An event is an occurrence that has an influence (effect) that can be detrimental or beneficial (Monaliza & Kustiani, 2021). The relationship among these three components can be seen in Figure 2 below:

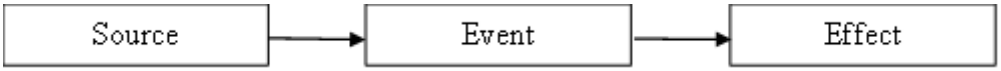

Figure 1. Risk Identification Process
(Flanagan, 1993)

Risk Assessment and Risk Acceptance

Risk assessment is essentially the calculation or evaluation of the impact of identified risks. The magnitude of the risk impact can be categorized into major risks, which have significant and broad impacts requiring management, or minor risks, which do not require special handling because the risk level is within acceptable limits.(Godfrey, 1996) describes the magnitude of risk impact as the product of frequency (likelihood) and consequence of the identified risk. Frequency (likelihood) is the probability of potential loss that could lead to investment failure. Meanwhile, consequence represents a value indicating the likelihood of the occurrence of that event as a risk. The scales of frequency (likelihood) and consequence can be seen in Table 1 and Table 2.

Table 1. Level and Scale of Frequency (Likelihood)

Frekuency Level	Scale	Explanation
Very Often	5	The percentage of likelihood is very high, which is more than 80%
Often	4	The percentage of likelihood is high, which is more than 60% to 80%
Sometimes	3	The percentage of likelihood is sufficient, which is more than 40% to 60%
Rarely	2	The percentage of likelihood is not significant, which is between 20 to 40%
Very Rare	1	The percentage of likelihood is insignificant, at up to 20%

Source : (Dewi et al., 2022)

Table 2. Level and Scale of Consequences (Consequences)

Level of Consequence	Scale	Explanation		
		Cost	Time	Quality
Very High	5	Cost increase >40%	Delay of more than 20%	The final project work cannot be used effectively
Large	4	Cost increase 20%-40%	Delay 10%-20%	Quality reduction is unacceptable
Medium	3	Cost increase 10%-20%	Delay 5%-10%	Quality reduction requires approval
Small	2	Cost increase <10%	Delay <5%	Quality decline can still be improved
Very small	1	Cost increase is not significant	Delay is not significant	Quality decline is not significant

Source : (Dewi et al., 2022)

Table 3. Risk Acceptance Scale

Acceptance Indicator	Risk Acceptance Scale
Unacceptable	$x > 12$
Undersirable	$5 \leq x \leq 12$
Acceptable	$2 < x < 5$
Negligible	$X \leq 2$

X: risk value (the product of frequency mode and consequence)

Sumber: (Godfrey, 1996)

From the table above, the level of risk acceptance can be outlined as follows: (1) Unacceptable, is a risk that cannot be accepted and must be eliminated or, if possible, transferred to another party; (2) Undesirable, is a risk that requires handling/risk mitigation to an acceptable level.; (3) Acceptable, is a risk that can be accepted because it does not have a significant impact and is still within acceptable limits; (4) Negligible, is a risk whose impact is so small that it can be ignored.

Risk Response Planning

Risk response planning is the process undertaken to minimize the level of risk faced to an acceptable limit. Actions taken to reduce the emerging risks are called risk mitigation actions. According to (Flanagan, 1993), several things can be done in handling risks, namely:

Risk Retention

The attitude of retaining risk is closely related to the gain present in a risk. The action of accepting/retaining this risk is because the impact of an adverse event is still acceptable.

Risk Reduction

Risk reduction is carried out by studying the risk itself in depth and taking preventive measures at the source of the risk or combining efforts so that the accepted risk does not occur simultaneously. By taking this action, there may still be residual risk that needs to be assessed.

Risk Transfer

The attitude of risk transfer is carried out by insuring the risk, which involves giving part or all of it to another party. High-risk businesses or activities are transferred to parties that have the capability to handle and control them.

Risk Avoidance

The attitude of avoiding risk is a way to prevent losses by avoiding activities that have a high level of loss. Risk avoidance can be achieved by rejecting certain activities. One example of risk avoidance in construction projects is by terminating the contract (breach of contract).

Risk Ownership

According to (Saputro, 2021), risk ownership is a stage in the risk management process that allocates risk responsibility to parties capable of managing the risk or taking risk mitigation actions, using the following principles of risk allocation: (1) The actor who has the best control over the events that cause the risk; (2) The actor who can mitigate the risk if it arises/occurs; (3) The actor who is responsible if the risk cannot be controlled. If the risk cannot be controlled by all actors, then the risk is considered a shared risk

Methods

Research Design

The research method used is descriptive qualitative by conducting brainstorming, interviews, and surveys aimed at obtaining opinions from experts and respondents to identify potential risks, assess risks to analyze dominant risks that occur so that risk handling actions can be taken during the implementation process of the Villa Rodrigo construction.

Location and Time of Research

The location used in the research is the Villa Rodrigo construction located in Taman Petanu Eco Neighborhood, Kemenuh, Sukawati District, Gianyar Regency, Bali, which will be conducted in 2025.

Determination of Data Sources

Primary data is obtained from respondents by distributing questionnaires to respondents who are selected according to specific criteria or characteristics. In this study, primary data is obtained from respondents through brainstorming and interviews related to risks that may occur in the Villa Rodrigo Construction Project and survey questionnaires. Secondary data is obtained from literature studies in the form of books, journals, and from construction service providers interested in this research, namely service providers/contractors.

Research Instruments

In this study, the researcher utilizes questionnaires as a data collection tool. This questionnaire is applied in risk assessment to obtain the frequency or probability and impact scale from the respondents. The quality of the data collection tool is assessed in terms of its validity and reliability. A questionnaire is considered valid if it can accurately measure the variables being studied (both probability scale and impact scale). A questionnaire is considered reliable if it provides consistent data when re-measured on the same object. The measurement scale in this questionnaire uses a Likert scale. This scale is used to evaluate respondents' views on the likelihood and impact of the identified risks, providing a range of values from 1 to 5. The selection of respondents is done through Purposive Sampling. This technique is used to select respondents based on the consideration that they have relevant knowledge and experience in road improvement projects, thus ensuring the accuracy of the data obtained.To test validity, this research uses Construct Validity Test with product moment correlation technique. Statistically, the product moment correlation value obtained must be compared with the critical value in the correlation table r, with degrees of freedom (df) = N-2, at a significance level of 5%. If the calculated r value > r table, then the measurement is valid; however, if r calculated < r table, then the measurement is invalid. The calculation of the product moment correlation value can also be found using the IBM SPSS 30.0 computer program. The reliability test of the questionnaire in this study uses the Cronbach Alpha formula. The minimum reliability that must be met by a measuring instrument based on the established criteria is ≥ 0.7 (Ghozali, 2018). The reliability calculation is sought using the IBM SPSS 30.0 program. The risk identification list can be seen in Table 4.

Table 4 The Risk Identification

Sources of Risk	No Risiko	Risk Identification
Human	1	Incompetent contractor labor resulting in unsatisfactory work outcomes
	2	Limited number of field workers leading to suboptimal work
	3	Low labor productivity
	4	Lack of skilled labor capable of operating specific work tools
	5	Delays in labor arrival due to holiday breaks
	6	Poor communication and coordination of the contractor with other parties
	7	Poor teamwork among contractors
Project	8	Less effective working hours due to the project's remote location
	9	Insufficient storage space for materials

	10	Narrow access to the work site, requiring time for mobilization of work equipment
	11	Insufficient storage space for work equipment
	12	Incompatibility of material quality with the specifications in the contract
	13	Changes in material specifications by the project owner
	14	Difficulty in finding materials desired by the project owner
	15	Placement of materials far from the work site, requiring time for mobilization
	16	Narrow access to the work site, requiring time for mobilization of materials
	17	Restrictions on the use of work equipment, necessitating effective time management for project execution
	18	Overtime cannot be applied during the project
	19	The project owner's lack of competency leads to difficulties in communication and coordination of work
	20	Scheduling conflicts with subcontractors and suppliers in completing work
	21	Low discipline level of contractor management
	22	Lack of commitment to the planned time schedule that has been established
	23	Adjustment of work schedules due to holiday breaks
Technical	24	Limitations in the use of heavy equipment resulting in suboptimal work productivity
	25	Delays in mobilizing work equipment leading to suboptimal work productivity
	26	Suboptimal condition of work equipment disrupting work productivity
	27	Delays in material delivery by suppliers disrupting the work schedule
	28	Delay in material ordering by the contractor, disrupting the work schedule
	29	Rework occurs due to errors in the work execution method
	30	Insufficient field supervision leading to reduced work quality
	31	Measurement of work volume in the BQ differing from field conditions
	32	Inability of the subcontractor to complete the work
	33	Changes in the scope of work by the project owner during execution
	34	Delay in approving working drawings and material samples by the project owner
	35	Delay in material decision-making supplied by the project owner

	36	Errors in the work execution method that hinder other work processes
Planning	37	Delay in the provision of planning documents
	38	Error in estimating the cost and time of work
	39	Changes in design due to adjustments in the field
Finance	40	Delays in the payment process for work progress by the project owner
	41	Fluctuations in currency exchange rates
Natural	42	Severe weather around the project site (heavy rain/floods/natural disasters) hindering the execution of work
Criminal	43	Damage or loss of materials
Economy	44	The occurrence of escalation or increase in building material prices during the project implementation period
Environment	45	Damage to roads around the project due to the passage of project material transport trucks
	46	Waste generated during the project due to work and labor
	47	Air pollution and noise disturbances occurring during the construction process

Data Collection Technique

Data collection at the risk identification stage uses literature study and brainstorming methods. The literature used is research journals on risks in construction projects. Risk identification is continued by conducting brainstorming techniques. Data collection at the risk assessment stage uses a questionnaire. This questionnaire contains the identification of risks as well as the scale of possibility and the scale of consequences of the risk. Collecting data at the stage of risk mitigation, and risk ownership involving experienced and competent parties in road improvement projects.

Data Analysis

Data analysis is conducted after collecting data from all respondents or other data sources. The data analysis activities consist of calculations, data tabulation, data grouping, and data presentation to answer the problem formulation. The risks identified from the literature study and brainstorming are grouped according to their sources. After obtaining the probability scale and consequence scale data, calculations are performed to obtain the risk acceptance scale by multiplying the probability scale and the consequence scale. The value of this multiplication is used to determine the risk acceptance indicators using Table 3. Subsequently, brainstorming can be conducted to obtain handling actions for dominant risks and ownership of the dominant risks.

Results and Discussion

Risk Indentification

Risk identification based on literature studies from previous research shows that the total number of risks identified is 35 (thirty-five) risks, and identification based on field observations and brainstorming indicates that 12 (twelve) risks have been identified. Risks from project risk sources have the highest percentage at 34.04%. The sources of risk in project risks are the most numerous because the research was conducted during the project implementation phase, making risks related to resources, quality control, and implementation standards very

influential in achieving the expected project outcomes. The total percentage of risks based on risk sources can be seen in Table 5.

Table 5. Total Risk Percentage Based on Risk Source

No.	Sources of Risk	Number of Risks	Percentage
1	Human	7	14.89%
2	Project	16	34.04%
3	Technical	13	27.66%
4	Planning	3	6.38%
5	Finance	2	4.26%
6	Natural	1	2.13%
7	Criminal	1	2.13%
8	Economy	1	2.13%
9	Environment	3	6.38%
Total		47	100.00%

Dominant Risks

Based on the results of this study, there are 21 (twenty-one) dominant risks out of 47 (forty-seven) identified risks. According to Table 6, the number of risks with an unacceptable risk acceptance level (Unacceptable) is 8 (eight) risks, with a percentage of 17.02%. The number of risks with an undesirable risk acceptance level (Undesirable) is 13 (thirteen) risks, with a percentage of 27.66%. The number of risks with an acceptable risk acceptance level (Acceptable) is 23 (twenty-three) risks, with a percentage of 48.94%. The number of risks with a negligible risk acceptance level (Negligible) is 3 (three) risks, with a percentage of 6.38%.

Tabel 6. Risk Acceptance Distribution Based on Risk Sources

Sources of Risk	Risk Identification	Risk Acceptance Level			
		Unacceptable	Undesirable	Acceptable	Negligible
	(%)	(%)	(%)	(%)	(%)
Human	14,89	0,00	2,13	8,51	4,26
Project	34,04	10,64	12,77	10,64	0,00
Technical	27,66	6,38	6,38	14,89	0,00
Planning	6,38	0,00	4,26	2,13	0,00
Finance	4,26	0,00	0,00	4,26	0,00
Natural	2,13	0,00	0,00	2,13	0,00
Criminal	2,13	0,00	0,00	0,00	2,13
Economy	2,13	0,00	2,13	0,00	0,00
Environment	6,38	0,00	0,00	6,38	0,00
Percentage	100,00	17,02	27,66	48,94	6,38

Table 7. Unnacceptable Risk

Risk Assessment	Sources of Risk	Risk	Risk Acceptance
20	Technical	Delay in approving working drawings and material samples by the project owner	*Unacceptable*

16	Project	Insufficient storage space for materials	*Unacceptable*
	Project	Narrow access to the work site, requiring time for mobilization of work equipment	*Unacceptable*
	Project	Insufficient storage space for work equipment	*Unacceptable*
	Project	Changes in material specifications by the project owner	*Unacceptable*
	Project	The project owner's lack of competency leads to difficulties in communication and coordination of work	*Unacceptable*
	Technical	Changes in the scope of work by the project owner during execution	*Unacceptable*
	Technical	Delay in material decision-making supplied by the project owner	*Unacceptable*

Table 8. Undesirable Risk

Risk Assessment	**Sources of Risk**	**Risk**	**Risk Acceptance**
12	Human	Delays in labor arrival due to holiday breaks	*Undesirable*
	Project	Difficulty in finding materials desired by the project owner	*Undesirable*
	Project	Restrictions on the use of work equipment, necessitating effective time management for project execution	*Undesirable*
	Technical	Rework occurs due to errors in the work execution method	*Undesirable*
9	Project	Placement of materials far from the work site, requiring time for mobilization	*Undesirable*
	Project	Overtime cannot be applied during the project	*Undesirable*
	Technical	Measurement of work volume in the BQ differing from field conditions	*Undesirable*
	Technical	Errors in the work execution method that hinder other work processes	*Undesirable*
	Planning	Delay in the provision of planning documents	*Undesirable*
	Planning	Changes in design due to adjustments in the field	*Undesirable*
	Economy	The occurrence of escalation or increase in building material prices during the project implementation period	*Undesirable*
8	Project	Narrow access to the work site, requiring time for mobilization of materials	*Undesirable*
	Project	Scheduling conflicts with subcontractors and suppliers in completing work	*Undesirable*

Risk Mitigation

The presence of dominant risks (major risk) will significantly affect the implementation of the Villa Rodrigo Development Project. Risks categorized as unacceptable and those classified as undesirable require the application of mitigation actions to reduce the effects caused. Based on the interview results, 17 (seventeen) mitigation actions were obtained for 8 (eight) Unacceptable risks and 30 (thirty) mitigation actions for 13 (thirteen) Undesirable risks.

Risk Ownership

The stage of risk ownership is a phase in the risk management process that allocates risk responsibilities to parties capable of managing the dominant risks in the implementation of the Villa Rodrigo Development Project. These parties have the best control over events that cause risks or can mitigate risks if they occur. The parties involved are the project owner, the executing contractor, and the planning consultant. The ownership of risk for dominant risks (major risk) categorized as unacceptable is as follows: (1) Project Owner's risk ownership consists of 4 risks; (2) Contractor risk ownership of 4 risks Risk ownership for dominant risks (major risk), which are categorized as undesirable, is as follows: (1) Consultant Planner risk ownership of 2 risks; (2) Contractor risk ownership of 11 risks.

Conclusion

In the implementation stage of the Villa Rodrigo construction project, 47 (forty-seven) risks were identified. These risks consist of 35 (thirty-five) risks from literature studies and 12 (twelve) risks from field observations and brainstorming. Among the identified risks, there are 7 (seven) human risks, 16 (sixteen) project risks, 13 (thirteen) technical risks, 3 (three) planning risks, 2 (two) financial risks, 1 (one) natural risk, 1 (one) criminal risk, 1 (one) economic risk, and 3 (three) environmental risks. From the identified risks, a risk acceptance analysis was conducted, revealing 21 (twenty-one) dominant risks out of the 47 (forty-seven) identified risks. Based on the level of unacceptable risk, there are 8 (eight) risks with a percentage of 17.02%. Risks with an undesirable acceptance level amount to 13 (thirteen) risks with a percentage of 27.66%. Risks with an acceptable acceptance level total 23 (twenty-three) risks with a percentage of 48.94%. Risks with a negligible acceptance level consist of 3 (three) risks with a percentage of 6.38%. Risk mitigation actions for dominant risks need to be implemented to prevent any loss of life and to serve as a basis for decision-making by the relevant parties if these risks indeed occur during the implementation of the Villa Rodrigo construction project. For risks categorized as unacceptable, 17 (seventeen) mitigation actions were taken, and for risks categorized as undesirable, 30 (thirty) mitigation actions were taken. The responsibility and ownership of risks in the Villa Rodrigo Construction Project lie with the project owner, the planning consultant, and the contractor. The largest allocation of risk ownership is borne by the contractor, as they play the most crucial role in the execution of the construction project.

Suggestion

The existence of risks categorized as unacceptable must receive more attention to reduce the negative impacts they may cause. All parties involved must pay special attention to the unacceptable and undesirable risks to minimize the impact of these risks. The results of this research are expected to serve as a guideline for identifying risks and taking mitigation actions for future studies, and can also provide input for the relevant parties in the implementation of similar construction projects.

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