Available *online* at: http://journal.unj.ac.id

Jurnal Pensil Pendidikan Teknik Sipil

Journal homepage: http://journal.unj.ac.id/unj/index.php/jpensil/index

TIME RISK ANALYSIS OF IMPLEMENTATION SELF-MANAGED COMMUNITY PROJECT IN BANGIL – KALIANYAR VILLAGE

Luqman Cahyono[1], Mirna Apriani[2], Anggara Trisna Nugraha[3], Agung Prasetyo Utomo[4].*
[1,2,3,4] Politeknik Perkapalan Negeri Surabaya
*luqmancahyono24@ppns.ac.id

P-ISSN: 2301-8437
E-ISSN: 2623-1085

ARTICLE HISTORY

Accepted:
11 Januari 2022
Revision:
28 April 2022
Published:
20 Mei 2022

ARTICLE DOI:
10.21009/jpensil.v11i1.25294

Abstract

Self-managed project through of KOTAKU (Kota Tanpa Kumuh) program managed by Lembaga Keswadayaan Masyarakat Abdi Karya Amanah Bangil - Kalianyar Village received around 1 billion funds from Direktorat Jenderal Cipta Karya Kementrian Pekerjaan Umum Perumahan Rakyat. The implementation of self-managed projects is carried out entirely by the community with less knowledge regarding building construction. The research objective is to identify and analyze time risks in implementing community self-managed projects. The data analysis method used is literature study, observation, average analysis, risk analysis and risk matrix preparation. The results of the analysis show that there are 20 risk variables with the highest ranking being low labor productivity where the measurement scale is likely to occur >60–80% and the risk impact on time is >7-30 days from the duration of the project, then the risk response decision "Avoidance" risk should be avoided by means of increased supervision, doing overtime or changing workers.

Keywords: Self-Managed Project, Time Risk, KOTAKU

Introduction

Construction projects throughout the region continue to be developed in order to create facilities that can be utilized by the community (Sulaiman et al., 2017). Top-down development results in apathy from the community, so the government fosters idea that construction of existing construction projects involves community participation. One of the construction project development programs is KOTAKU (Slum Upgrading Project) which is held in stages and systematically starting from the preparation, planning, implementation, monitoring, control and utilization stages, all of which are carried out by the community. Generally various types of construction are carried out on a contractual basis which involves various service providers in the construction sector. A construction project is a series of activities to make a building, which generally includes main work in the fields of civil engineering and architectural engineering (Ismael, 2013). Arditi dan Patel (1989) success in executing the project on time affects the planning and scheduling of a complete and appropriate project.

A project will be considered successful if the product is produced according to quality standards, implementation time and budget limits that have been set, sometimes there are deviations between these three aspects (Oetomo et al., 2017). With a contractual project system, the implementation of development can be carried out effectively and can be accounted for, both in terms of quality and administration. Efforts in carrying out a construction project must have the possibility of various kinds of risks that will occur.

Business risk can be caused by natural or non-natural risks (Wibowo, 2010). Risk and uncertainty can potentially have detrimental consequences for construction projects (Flanagan and Norman, 1993). Risk is the variation in this that may occur naturally in a situation (Fisk, 1997). Risk is a threat to property life or financial gain due to the hazard that occurs (Duffeld & Trigunarsyah, 1999). In general, risk is associated with the possibility (probability) of an unexpected event occurring (Soeharto, 1995). Risk is an uncertain event, if it occurs it has a negative or positive impact on the project goals and objectives (Nurhuda et al., 2019). This risk is distinguished from business risk, which is a risk related to financial/economic decisions or policies that can result in loss or profit (Soeharto, 2001).

The risks involved in construction projects are very large, but not all of these risks need to be predicted and considered in starting a project because it will take a long time (Huda, Miftahul, et al., 2018). Therefore, the parties involved in construction projects need to prioritize important and relevant risks that will have an impact on project losses (Labombang, 2011). Several previous studies related to the implementation of risk management projects have been carried out, including in the field of construction project management (Nasrul, 2015) (Yuliani, 2017) (Pertiwi et al., 2016) (Yetrina, 2018) (Pertiwi, 2017). In the field of housing development (Abdulah & Rahman, 2012) (Khamim & Riyanto, 2014) (Salimi et al., 2015) (Maina, 2016) (Bonander & Ulriksson, 2016) (Partamihardja, 2014) (Tjakra & Sangari, 2011). Research in the fields of multi-storey buildings (Marques et al., 2014). Toll road and bridge sector (Setiawan et al., 2014) (Sari, 2016) (Astiti, 2015) (Cahyono, 2017) (Harahap et al., 2015) (Gutteres et al., 2018) (Perera, 2010) (Irianto, 2017). Fields of railways, ports and docks and other civil fields (Tangdiembong et al., 2013) (Pratama, 2014) (Septiani, 2015) (Rustandi, 2017) (Soepriyono, 2013).

Construction project work, both contractual projects and projects that are self-managed for community empowerment, of course also have risks that hinder project implementation. Examples of risks that may arise include quite a lot of work, limited execution time, a fairly narrow construction process, difficult location, weather, material availability, lack of material storage space, material traffic to the project, dense residential locations. The population and conditions of the participants in this self-managed project have varied educational, occupational and experience backgrounds (Maddeppungeng & Aditya, 2019). Failure to understand the conditions of uncertainty that have the potential to cause risks can affect the construction project objectives, namely at the optimal cost but with quality that is in accordance with the desired concept and specifications of the housing project and with the right time implementation. Therefore, these risks and uncertainties must be analyzed so that the construction project targets can be achieved (Tjakra & Sangari, 2011).

The solution to answer these problems, the researchers took the initiative to examine the risk management of community self-managed projects in order to minimize the impact of delays in project implementation time. It is hoped that this research can identify existing risks, assess the magnitude of these risks and be able to control these risks so that project development activities can run according to the targeted schedule and are not too late.

Research methods

This research is an in-depth case study to identify and analyze time risk in the implementation of a self-managed project carried out by the Kalianyar village community. In this project, which is carried out by community self-management, the population is 91 villages and sub-districts in the program assisted areas of the Ministry of PUPR in Pasuruan district, but only 1 kelurahan received funding this year, therefore 1 village was taken as a sample. Respondents who were intended as samples were residents of Kalianyar village and 30 related parties.

The backgrounds of 30 respondents as resource persons include : from the Public Works Department as the Regulator (Commitment Making Officer, Head of PKP Division, Head of Urban Section, Head of Rural Section, Head of Self-Help Development Section, Head of Settlement Section, Head of Clean Water Section, Head of Sanitation Section , Head of Drainage Section, Head of Control and Supervision Section), from Consultants as program assistants (Coordinator, Assistant Infrastructure and Urban Planner, Facilitator Infrastructure and Urban Planner), and from the community as technical implementers of self-managed project development work (Community Self-help Institutions, Unit Environmental Management, and Non-Governmental Groups Abdi Karya Amanah). The respondents are experienced enough because they often handle and are directly involved in the implementation of this self-management project.

The stages in this research include the following:

1] Risk identification by means of literature studies, interviews and observations, so as to obtain risk variables that occur in self-managed projects

2] Measurement of risk by distributing questionnaires containing the identified risk variables are assessed with a measurement scale of possibility risk occurring and impact of time. For more details on the Risk Measurement Scale in the following table :

Table 1. Measuring Scale Risk of Probability

Term	Value	Probability
Very Low (SR)	1	≤ 20%
Low (R)	2	> 20–40%
Moderate (C)	3	> 40 – 60%
High (T)	4	> 60 – 80%
Very High (ST)	5	> 80 – 100%

(Source: Dewi dan Nurcahyo, 2013)

Table 2. Measuring Scale Impact for Time

Term	Value	Impact for Time
Very Low (SR)	1	≤ 1 day of project

		duration
Low (R)	2	> 1-3 day of project duration
Moderate (C)	3	> 3-7 day of project duration
High (T)	4	> 7-30 day of project duration
Very High (ST)	5	> 30 day of project duration

(Source: Dewi dan Nurcahyo, 2013)

Analyzing and evaluating risk there are 2 steps, namely : analysis of the mean by averaging the value of respondent's answer questionnaire and assessing the level of risk by multiplication probability of risk occurring with time of risk impact (R = P * I).

3] Compile the results of risk analysis into a matrix of Threshold of Risk Levels in order to assist decision making on the risks faced. Threshold of Risk Levels matrix as follows :

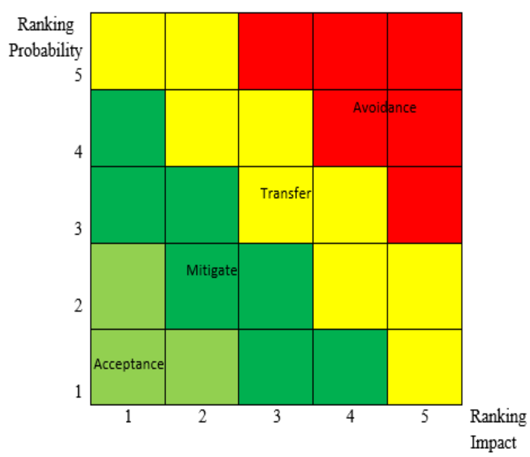

Figure 1. *Treshold of Risk Levels*
(Source: Wibowo, 2010)

Each risk source has a risk category including :

- ✓ High scale or called Avoidance (risks that must be avoided).
- ✓ Medium-scale risk or called Transfer (risk that must be transferred or insured).
- ✓ Medium-low scale risk or so-called Mitigate (risk that must be reduced).
- ✓ Small-scale risk or called Acceptance (risk that must be accepted).

4] The conclusion of the analysis above. For more details, the stages can be seen in the following flow chart :

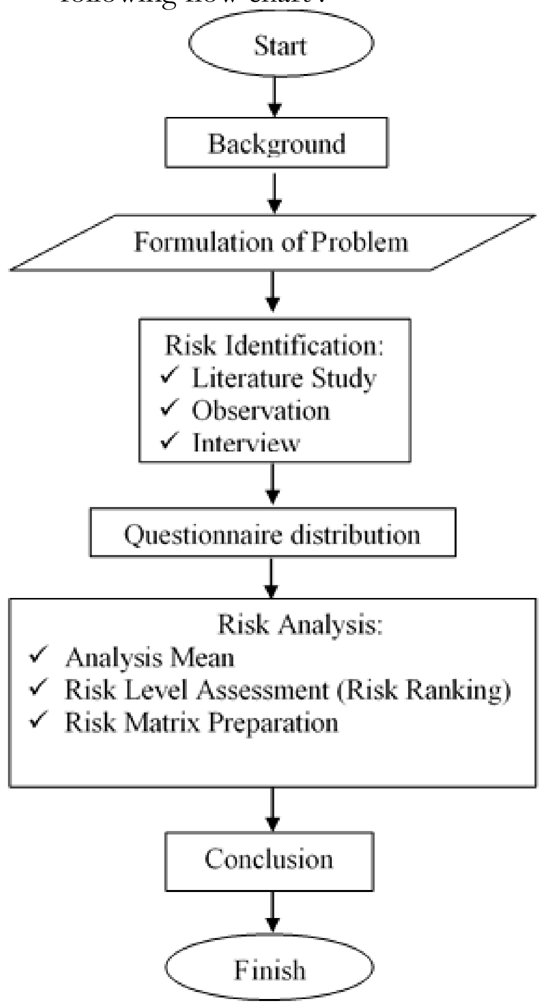

Figure 2. Research Flowchart

Research Results and Discussion

Based on the study of literature studies, interviews and direct observation, the risk variables that often occur in community self-managed projects are shown in the following table :

Table 3. Risk Variables for Self-Managed Projects

No Item	Variable Risk

S1	Flood
S2	Material availability
S3	Damage or loss (theft) of materials
S4	Material delivery delay
S5	Material price increase
S6	Inappropriate quality and volume of material
S7	Cost estimation error
S8	Time estimation error
S9	Wage increase request
S10	Incomplete documents (RAB, drawings, RKS and other documents)
S11	Late payment / disbursement
S12	Survey error
S13	Damage during maintenance
S14	Changes to the work schedule
S15	Design error
S16	There is a design change
S17	Low labor productivity
S18	Poor quality of work
S19	Changes in scope of work
S20	Changes to the finished construction

Based on the table above, there are 20 risk variables that should be considered in the implementation of self-managed projects.

The next step after obtaining the risk item.variable is the distribution of the questionnaire. From the results of the processed questionnaire answers obtained the mean value. The mean value is used to average the answers to the questionnaire questions that have been distributed to respondents. The mean results can be seen in the following table :

Table 4. Mean Value Results (Probability of Risk and Impact of Risk)

No. Item	**Mean Probability Risk**		**Mean Time Impact**		**N**
	Value	Round	Value	Round	
S1	3.60	4.00	3.37	3.00	30
S2	1.37	1.00	1.67	2.00	30
S3	1.37	1.00	1.57	2.00	30
S4	3.37	3.00	3.07	3.00	30
S5	3.07	3.00	1.57	2.00	30
S6	1.67	2.00	3.47	3.00	30
S7	3.30	3.00	3.17	3.00	30
S8	1.50	2.00	3.17	3.00	30
S9	1.50	2.00	1.37	1.00	30
S10	1.50	2.00	3.30	3.00	30
S11	1.57	2.00	3.57	4.00	30
S12	1.40	1.00	1.50	2.00	30
S13	1.43	1.00	3.40	3.00	30
S14	1.43	1.00	3.53	4.00	30
S15	3.47	3.00	3.37	3.00	30
S16	3.40	3.00	3.57	4.00	30
S17	3.53	4.00	3.50	4.00	30
S18	3.30	3.00	1.50	2.00	30
S19	3.30	3.00	3.57	4.00	30
S20	3.57	4.00	3.37	3.00	30

The rounded mean value for each question item variable will be used for further analysis that is assessment of the risk level on variable Possibility Risk and Time Impact variable.

The next step after finding mean value of 2 variables is likely to occur and impact is then carried out risk ranking. The risk ranking results were obtained from mean value of questionnaire item risk probability × time impact (P×I). This value is used as a reference to determine which risks are likely to occur and have a significant impact on time. The table of possible risk × impact on time is described as follows:

Table 5. Possibility of Risk × Impact for Time

No Item	**Probability Risk**	**Time Impact**	**Risk Level**	**Risk Ranking**
	P	**I**	**P * I**	
S1	4	3	12	2
S2	1	2	2	8
S3	1	2	2	8
S4	3	3	9	3
S5	3	2	6	5
S6	2	3	6	5

S7	3	3	9	3
S8	2	3	6	5
S9	2	1	2	8
S10	2	3	6	5
S11	2	4	8	4
S12	1	2	2	8
S13	1	3	3	7
S14	1	4	4	6
S15	3	3	9	3
S16	3	4	12	2
S17	4	4	16	1
S18	3	2	6	5
S19	3	4	12	2
S20	4	3	12	2

Based on the table above, it shows the value of the risk rating which is divided into eight ranks including::

1] The first rank of Item S17 is low labor productivity, when referring to the risk probability measurement scale > 60 – 80 % and risk impact for time > 7 - 30 days of the project duration

2] The second rank of S1 Item is Flood, when referring to the risk probability measurement scale > 60 – 80 % and risk impact for time > 3 - 7 days of the project duration, Item S16 is the existence of a design change, when referring to the risk probability measurement scale > 40 – 60 % and risk impact for time > 7 - 30 days of the project duration, Item S19 is Changes in the scope of work, when referring to the risk probability measurement scale > 40 – 60 % and risk impact for time > 7 - 30 days of the project duration, and Item S20 is Changes to finished construction, when referring to the risk probability measurement scale > 60 – 80 % and risk impact for time > 3 - 7 days of the project duration.

3] The third rank of Item S4 is Delay in material delivery, when referring to the risk probability measurement scale > 40 – 60 % and risk impact for time > 3 - 7 days of the project duration, Item S7 is Cost estimation error, when referring to the risk probability measurement scale > 40 – 60 % and risk impact for time > 3 - 7 days of the project duration, and Item S15 Design Eror, when referring to the risk probability measurement scale > 40 – 60 % and risk impact for time > 3 - 7 days of the project duration.

4] The fourth rank of Item S11 is Late payment / disbursement, when referring to the risk probability measurement scale > 20 – 40 % and risk impact for time > 7 - 30 days of the project duration

5] The fifth rank of Item S5 is increase in material prices, when referring to the risk probability measurement scale > 40 – 60 % and risk impact for time > 1 - 3 days of the project duration, Item S6 is Inappropriate quality and volume of material, when referring to the risk probability measurement scale > 20 – 40 % and risk impact for time > 3 - 7 days of the project duration, Item S8 is Error of time estimation, when referring to the risk probability measurement scale > 20 – 40% and risk impact for time > 3 - 7 days of the project duration, Item S10 is incomplete documents (RAB, drawings, RKS and other documents), when referring to the risk probability measurement scale > 20 – 40 % and risk impact for time > 3 - 7 days of the project duration, and Item S18 is Poor quality of work, when referring to the risk probability measurement scale > 40 – 60 % and risk impact for time > 1 - 3 days of the project duration.

6] The sixth rank of Item S14 is Changes in the work implementation schedule, when referring to the risk probability measurement scale ≤ 20 % and risk impact for time > 7 - 30 days of the project duration.

7] The seventh rank of Item S13 is Damage during maintenance, when referring to the risk probability measurement scale ≤ 20 % and risk impact for time > 3 - 7 days of the project duration.

8] The eighth rank of Item S2 is Availability of materials, when referring to the risk probability measurement scale ≤ 20 % d and risk impact for time > 1 - 3 days of the project duration, Item S3 is Damage or loss / theft of material, when referring to the risk probability measurement scale ≤ 20 % and risk impact for time > 1 - 3 days of the project duration, Item S9 is a request for a wage increase, when referring to the risk probability measurement scale > 20 – 40 % and risk impact for time ≤ 1 days of the project duration, and Item S12, namely Errors in the survey, when referring to the risk probability measurement scale ≤ 20% and risk impact for time > 1 - 3 days of the project duration.

The next step compiling risk in a matrix aims to measure and classify the magnitude of the possible value of risk events with an impact on time and cost into a criterion that will describe the level of risk. The following is the risk matrix of this research:

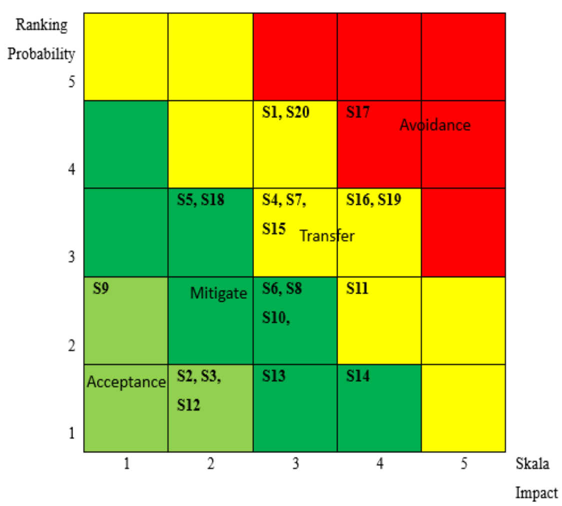

Figure 3 Threshold of Risk Levels (Risk Probability that Time Impact)

Based on the Threshold of Risk Levels Figure (possibility of risk events against the impact of time) above, it can be seen that :

1] The high scale or called Avoidance (risks that must be avoided) is the risk of item S17.

2] Upper-medium scale risk or called Transfer (risk that must be transferred or insured) is the risk of items S1, S20, S16, S19, S4, S7, S15 and S11.

3] Lower-medium scale risk or called Mitigate (the risk that must be reduced) is the risk of points S5, S18, S6, S8, S10, S13 and S14.

4] Small-scale risk or called Acceptance (risk that must be accepted), namely the risk of items S2, S23, S12 and S9

Conclusion

The results of analysis and discussion it was found that analysis of the most influential risk variables based on the assessment risk level on Probability and time impact of the implementation community self-managed project, namely item S17 (low labor productivity risk) where the measurement scale is likely to occur > 60-80% and risk impact on time > 7 - 30 days of project duration. In addition, decisions that can be made based on Threshold of Risk Levels matrix most risk is item S17 (low labor productivity risk) with a risk response "Avoidance" risk should be avoided by means of increased supervision, doing overtime or changing workers..

Bibliography

Maddeppungeng, A., & Aditya, R. A. (2019). Analisis Risiko Biaya Dan Waktu pada Pelaksanaan Pekerjaan Struktur Atas Proyek Gedung Bertingkat Tinggi (Studi Kasus : Proyek Bangunan Gedung Bertingkat Tinggi di DKI Jakarta dan Sekitarnya). *Jurnal Fondasi*, *8*(2), 109–119.

Nurhuda, D. S., Sutrisno, W., & Galuh, D. L. C. (2019). Analisis Risiko Keterlambatan Waktu Pada Pelaksanaan Proyek Pembangunan SPBU (Studi Kasus di Kabupaten Bantul, Yogyakarta). *Bangun Rekaprima*, *05*(2), 19–28.

Oetomo, W., Priyoto, & Uhad. (2017). Analisis Waktu Dan Biaya Dengan Metode Crash Duration Pada Keterlambatan Proyek Pembangunan

Jembatan Sei Hanyu Kabupaten Kapuas. *MEDIA ILMIAH TEKNIK SIPIL*, *6*(1), 8–22.

Risdianto, E. (2019). Analisis Pendidikan Indonesia di Era Revolusi Industri 4.0. *Repository Universitas Bengkulu*.

Sulaiman, M., Munirwansyah, & Azmeri. (2017). Analisis Penyebab Keterlambatan Pelaksanaan Proyek Ditinjau Dari Waktu Pelaksanaan Di Provinsi Aceh. *Jurnal Teknik Sipil Universitas Syiah Kuala*, *1*(2), 405–418.

Flanagan, R dan Norman, G. 1993. Risk Management and Construction. Oxford: Blackwell Publishing. 224

Wibowo, 2010, Intisari Kuliah Manajemen Resiko, Program Magister Teknik Sipil, Universitas Diponegoro, Semarang.

Huda, Miftahul, Soepriyono, Azizah, S., 2018. Implementation of PMBOK 5th Standard to Improve the Performance andCompetitiveness of Contractor Companies. International Journal of Civil Engineering and Technology (IJCIET).Volume 9, Issue 6, June2018, pp. 1256–1266.

Labombang, M. 2011. Manajemen Risiko Dalam Proyek Konstruksi. Jurnal SMARTek, Vol. 9 No. 1. Pebruari 2011, pp. 39 - 46

Nasrul. 2015. Manajemen Risiko Dalam Proyek Konstruksi Ditinjau Dari Sisi Manajemen Waktu. Jurnal Momentum. Vol. 17, No. 1. Pp 50-54

Yuliani, C. 2017. Manajemen Risiko Kontrak Untuk Proyek Konstruksi. Jurnal Rekayasa Sipil. Vol 11, No.1, pp. 9-16.

Pertiwi et. al., 2016. Manajemen Resiko Proyek Pembangunan Underpass Gatot Subroto Denpasar, Jurnal Akutansi Ekonomi & Bisnis. Vol. 4, No. 1, pp. 1-6 Yetrina, M. 2018. Pengembangan Algoritma Manajemen Risiko Proyek Konstruksi. Jurnal Optimasi Sistem Industri. Vol 17, No. 1, pp. 101-122.

Pertiwi, H. 2017. Implementasi Manajemen Risiko Berdasarkan PMBOK Untuk Mencegah Keterlambatan Proyek Area Jawa Timur (Studi Kasus : PT. Telkom). Jurnal Studi Manajemen Dan Bisnis. Vol. 4 No. 2, pp. 96 -108.

Abdulah, A.A. & Rahman, H.A. 2012. Identification of Relevant Risk in Abandoned Housing Project in Malaysia : A Qualitative Study. Procedia - Social and Behavioral Sciences Journal.Vol. 62. Pp. 1281-1285.

Khamim, M & Riyanto, S. 2014. Analisa Risiko Pada Pembangunan Gedung Perumahan Terhadap Pencapaian Sasaran (Studi Kasus Pada Developer Malang). Jurnal PROKONS Politeknik Negeri Malang. Pp.103-110

Salimi, R., Yarmohammadi, Y., Farasani, H.H., 2015. Risks Evaluation of Sahand New Town 1226 Housing Project and Exploring Their Effects on Time and Cost of the Project. Journal of Service Science and Management, Vol. 8, pp. 754-765

Maina, N.P. Mbabazize, M. Kibachia, J. 2016. Evaluation of Factors Affecting Effectiveness of Risk Management in Public Housing Construction Project in Rwanda. Case of Batsinda Housing Project. European Journal of Business and Social Sciences. Vol. 5, No. 01, pp. 85 – 101

Bonander, J. & Ulriksson, H. 2016. Risk Management in Residential Construction. An Analysis of The Risk Management Process of a Swedish Construction Company. ThesisMaster of Science. Real Estate and Construction Management, Stockholm-Sweden.

Partamihardja, P. 2014. Persepsi Risiko Pengembang Perumahan di Kabupaten Banyumas. Jurnal Teknik Sipil & Perencanaan. Vol. 16, No. 2, pp. 105-116.

Tjakra, J. & Sangari, F. 2011. Analisa Risiko Pada Proyek Konstruksi KSI Perumahan di Kota Malang. Jurnal Ilmiah Media Engineering. Vol 1., No. 1., pp. 29-37.

Marques, O.P.M., Salain, A.K., Yansen, I.W., 2014. Manajemen Risiko Pada Pelaksanaan Proyek Konstruksi Gedung Pemerintah di Kota Dili – Timor Leste. Jurnal Spektran. Vol.2, No. 2, pp. 1-9

Setiawan, A., Walujodjati, E., Farida, I., 2014. Analisa Manajemen Risiko Pada Proyek Pemba-ngunan Jalan Tol Cisumdawu (Studi Kasus : Development of Cileumyi-Sumedang Dawuan Toll Road Phase 1). Jurnal Konstruksi Sekolah Tinggi Teknologi Garut. Vol 11, No. 1, pp. 1-11

Sari, E. 2016. Analisa Risiko Proyek Pada Pekerjaan Jembatan Sidamukti-Kadu di Majalengka Dengan Metode FMEA dan Decision Tree. Jurnal J-Ensitec. Vol.3, No. 01. Pp. 38-46.

Astiti N., P., M. 2015, Analisa Resiko Pelaksanaan Pembangunan Jalan Tol BenoaBandara-Nusa Dua), Jurnal Teknik Sipil. Vol 3, Nomor 2, Juli 2017

Cahyono, N., B., 2017, Analisis Manajemen Resiko Pada Proyek Pembangunan Jalan Tol (Studi Kasus Proyek Pembangunan Jalan Tol Solo-Ngawi-Kertosono Ruas NgawiKertosono Paket 3), Jurnal Teknik Sipil (1-15), Universitas Muhammadiyah Surakarta

Duffield, C & Trigunarsyah, B. 1999. Project Management- Conception to Completion. Australia: Engineering Education Australi (EEA).

Fisk, E. R. 1997. Construction Project Administration (5th ed.), New Jersey: Prentice HallA Guide to the Project Management Body of Knowledge (PMBOK® Guide)-2000 Edition.

Harahap, K., Bintang, C., & Eka, P.Y. 2015. .Jurnal Analisa Resiko Pada Proyek Pembangunan Jalan Tol Nusa Dua – Ngurah Rai - Benoa, Bali, Fakultas Teknik, Institut Teknologi Sepuluh Nopember (ITS).

Guterres, G.A.V. Zaika, Y. Suharyanto, A. 2018. Risk Management in Suai Highway Construction Project, Município Covalima - Timor Leste. International Research Journal of Advanced Engineering and Science, Volume 3, Issue 4, pp. 33-38.

Perera, B.A.K.S.; Dhanasinghe I.; Rameezdeen, R. 2010. Risk Management in Road Construction: the case of Sri Lanka, International Journal of Strategic Property Management 13(2): pp. 87–102.

Irianto. 2017, Study On Risk Handling Strategy Of Road Construction Project In Jayapura City, International Journal Of Scientific & Technology Research Vol 6, Issue 08 august 2017.

Tangdiembong, O. Sompie, B.F. Timboeleng, J.A. 2013. Resiko Pada Proyek Dermaga di Sulawesi Utara. Jurnal Ilmiah Media Engineering. Vol.3, No.2, pp.115-119

Pratama, I.A. 2014. Identifikasi Risiko Pada Pelaksanaan Proyek Pembangunan Dermaga / Pelabuhan di Nusa Penida. Jurnal Media Bina Ilmiah. Vol. 8, No. 1, pp. 24-29

Septiani, H., 2015. Aplikasi Manajemen Risiko pada Pembangunan Sistem Penyediaan Air Minum (SPAM) Regional Jawa Tengah (Studi Kasus pada Pembangunan Jaringan Transmisi SPAM Regional Bregas). Jurnal Media

Komunikasi Teknik Sipil. Vol. 21, No. 2, pp. 123-132

Rustandi, T. 2017. Kajian Risiko Tahap Pelaksanaan Konstruksi Proyek Peningkatan Jaringan Irigasi Bendung Leduwigoong. Jurnal Infrastruktur. Vol.3, No. 01, pp. 1-19.

Soeharto, I. 1995. Manajemen Proyek dari konseptual sampai operasional. Jakarta: Erlangga.

Soeharto, I. 2001. Manajemen proyek jilid 2: Dari konseptual sampai operasional. Jakarta: Erlangga.

Soepriyono. Huda, M. Rini, T. S. 2013. Rsk Analysis Using State Budget Changes (APBNP) In the Implementation of Construction Projects in Indonesia (Case Study). Journal of Basic and Applied Scientific Research. Vol 3, No. 10, pp. 465-472.

Arditi, D. and Patel, B.K., "Impact Analysis of Owner-Directed Acceleration", Journal of Construction Engineering and Management, ASCE, vol. 115, no. 1, 1989, pp. 144-157.

Tjakra, J., & Sangari, F. (2011). Analisis Resiko Pada Proyek Konstruksi Perumahan Di Kota Manado. Jurnal Ilmiah Media Engineering, 1(1), 29–37.