

Identification of Dominant Factors Affecting the Successful Development of Highway Construction Projects

Darmawan Pontan, Ryan Faza Prasetyo, Tomi Adenugroho, Adhiriswa Nur Idatama,
Civil Engineering Department, Universitas Trisakti
Jakarta, 11440, Indonesia
darmawan@trisakti.ac.id, ryan@trisakti.ac.id, tominugr@gmail.com,
adhiriswatama@gmail.com

Abstract

The construction project, especially in the highway sector, is a highly expected construction project. Moreover, at this time, the world in the midst of COVID-19 pandemic which has limited the space for human movement as a form of preventing the spread of the epidemic. This creates a new factor that affects the success rate in the construction of highway projects. This research aimed to identify various dominant factors that influenced the success of highway construction projects. This research method used descriptive statistical methods and it was processed by the SPSS (Statistical Package for Social Science) application. From the results of data analysis using the index mean test, obtained the five most dominant factors that influenced the success of highway construction projects, they were workers discipline, good quality of equipment, productivity of equipment at work, availability of workers, availability of equipment according to work needs.

Keywords

Highway Project, Successful Project, Factor Identification.

1. Introduction

In line with the progress in the economic sector, consumer needs in the goods and services sector also grow and develop, so adequate infrastructure is needed to accommodate the movement from one place and another. The availability of existing toll road transportation infrastructure turns out to almost exceed the capacity of the number of vehicles per day planned. Road infrastructure plays a dominant role in the national transportation system. A data describes if the road infrastructure transports 70% of the total freight transport and 82% of the total passenger transport (World bank, 2012). Public roads that are still part of the road network system and become national roads and those that use them must pay are called toll roads (Pupr Ministerial Regulation No.10 of 2018).

Construction is a work activity that aims to build facilities and infrastructure. In a construction work, construction must be supervised by the project manager, design consultant, and project owner. As for supervision in the field is given responsibility to the project foreman as well as experts related to the building to help supervise workers involved in the construction.

According to Ginting, 2021, project management is a process that is implemented during the building construction project process including planning, organizing, and managing in achieving effective and efficient project goals. In the implementation of construction projects, construction management is divided into four general parts, namely planning, organizing, implementation (execution), and supervision (controlling).

Based on the statement, it can be concluded if the construction project, especially in the field of toll roads, is a construction project that is expected to succeed. Moreover, in this day and age, the world is faced with health problems, namely the COVID-19 pandemic that has limited human space as a form of prevention of the spread of the outbreak. This makes the existence of new factors that affect the success rate on the construction of toll road construction projects. Thus, some previous researchers concluded that factors that could affect the success of construction projects include human resources (Mursadin, 2017), equipment, materials (Natalia et al., 2017), managerial, financial (Deshariyanto, 2013), environment and weather (Natalia et al., 2017), Occupational Health and Safety (K3) (Pontan

& Christianto, 2019), and pandemic innovation (Purbaya, 2020). For this reason, the author is interested in researching the success factor on the construction of toll road construction projects.

1.1 Objectives

This research aimed to identify the various dominant factors that influenced the successful construction of toll road construction projects.

2. Literature Review

2.1 Definition of Toll Road

Based on PP No.15 of 2005 concerning toll roads, the definition of toll roads is a public road that is part of the road network system and becomes a national road whose use is required to pay. Toll is a sum of money spent on the use of toll roads. Toll rates are not equally affected based on the type of vehicle whose provisions have been determined according to the president's decision.

2.2 Definition of Construction

Construction is a work activity that aims to build facilities and infrastructure. In a construction work, construction must be supervised by the project manager, design consultant and project owner.

2.3 Definition of Project

Project is an effort or activity carried out in achieving targets at a certain time through using several resources such as workers, materials, tools, and cost budgets.

2.4 Project Success

Almost all construction projects will often face an important barometer on the work of the project that can be called the target of the construction project. This makes the success of a project can be assessed by looking at the final results of the completion of the project, whether the project can achieve time, cost, and quality in accordance with what has been designed in the previous project planning. According to Pontan & Christianto, 2019, the success of a project is if the project can be held based on the schedule and guidelines of the project, namely time, quality, and precise cost, zero accident, zero waste, satisfaction of all parties, and others.

According to (Nur Oktafia, 2017) in Purbaya, 2020, the success of a project can be defined into two factors, among others:

- a. Primary factors: The project is completed in a timely manner, competitive costs, and quality as expected.
- b. Secondary factors: Owner accept the project well and allow the name to be used as a reference.

3. Methods

Research instruments were carried out through the deployment of questionnaires to consultants, contractors, project owners and toll road users located in 3 different project locations.

To obtain research data identifying the success factors of the construction of toll road construction projects, 2 (two) types of research data are used, namely Primary Data, was data obtained from the dissemination of questionnaires and interviews which contained a collection of questions addressed to the relevant parties that should be answered by the party. Secondary data, was data obtained through literature studies, journals, regulations related to research topics and collections of writings conducted by previous researchers.

The variables used in this study were found in Table 1. Success Factors were as follows:

Table 1. Success Factors

Code	Description	References
Human Resource Factor (A)		
A1	Labor discipline	(A), (B), (C)
A2	Availability of manpower	(A), (B), (C)
A3	Labor expertise	(A), (B), (C)
A4	Workforce motivation	(A), (B), (C)
Equipment Factor (B)		
B1	Availability of equipment according to work needs	(B), (C), (D)
B2	Equipment productivity at work	(B), (C), (D)
B3	Good equipment quality	(B), (C), (D)
B4	Equipment maintenance on a regular basis	(B), (C), (D)
Material Factor (C)		
C1	Good quality material and according to specifications	(B), (E), (D)
C2	Availability of materials according to needs	(B), (E), (D)
C3	Material storage is strategically arranged on site	(B), (E), (D)
C4	Delivery of materials on time according to schedule	(B), (E), (D)
Managerial Factor (D)		
D1	Routine project supervision	(B), (F), (G)
D2	Field manager has good experience	(B), (F), (G)
D3	Good communication between consultants, contractors and owners	(B), (F), (G)
D4	Good management of tools and materials	(B), (F), (G)
D5	Give coffee break time to workers	(B), (F), (G)
D6	Management of work on schedule	(B), (F), (G)
Financial Factor (E)		
E1	Good funding from the owner according to the employment contract	(B), (F), (G)
E2	Payment of wages to workers on time	(B), (F), (G)
E3	Incentive money if the work is ahead of schedule	(B), (F), (G)
E4	Appropriate and organized allocation of funds	(B), (F), (G)
Environmental and Weather Factors (F)		
F1	Mobility of workers and materials is not disturbed	(K), (D), (C)
F2	No bad weather during construction	(K), (D), (C)
F3	Safe environment at the project site	(K), (D), (C)
F4	There is no residual construction material (zero waste)	(K), (D), (C)
Occupational Safety and Health Factors (G)		
G1	Good occupational health and safety procedures	(H), (I), (J)
G2	No accidents at the construction site	(H), (I), (J)
G3	Workers pay attention to safety at work	(H), (I), (J)
Covid-19 Pandemic Factors (H)		
H1	Limiting the number of workers at the project site by doing Work from Home (WFH)	(B), (F), (G)
H2	Reducing working hours by changing shifts	(B), (F), (G)
H3	Communicating indirectly using video conferencing in conveying work progress	(B), (F), (G)
H4	Improved K3 standards by checking body temperature, wearing masks, and maintaining distance between workers	(B), (F), (G)
H5	Vaccinate all workers involved in the project	
H6	Provide supplements or vitamins that function to strengthen the body's immunity	

References : (A) = (Ginting, 2021), (B) = (Purbaya, 2020), (C) = (Mursadin, 2017), (D) = (Natalia et al., 2017), (E) = (Najah & Pontan, 2018), (F) = (Ratno, 2013), (G) = (Deshariyanto, 2013), (H) = (Pontan & Christianto, 2019), (I) = (Christina et al., 2012), (J) = (Wulandani et al., 2015), (K) = (Akbar et al., 2020)

The data analysis used in descriptive statistical methods in this research was mean analysis. Mean analysis was used to obtain the average value of each questionnaire variable at the high low response of respondents..

4. Data Analysis and discussions

Of the 100 questionnaires distributed at three different toll road project sites, 60 questionnaires were obtained and it could be seen in Table 2 and Figure (1) where from the contractor as many as 19 respondents, consultants as many as 17 respondents, and the project owner (owner) as many as 24 respondents.

Table 2. Profile of Research Respondents

Involvement	Frequency	Percentage (%)
Contractor	19	32
Consultant	17	28
Project Owner (Owner)	24	40
TOTAL	60	100

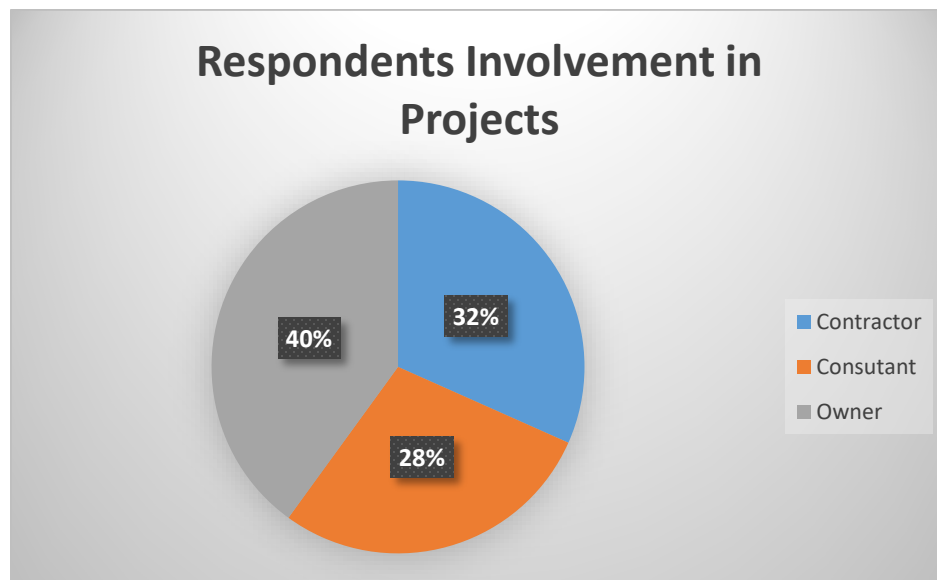


Figure 1: Respondents Background

4.1 Validity test

This test showed the level of truth of an instrument. This was done to find out the level of accuracy and feasibility in the next analysis. Validity testing was done using the SPSS program. The research was tested on 60 respondents. Results from the test can be seen in Table 3. Test Validity

Table 3. Validity Test

No	Variables	Explanation	No	Variables	Explanation
1	A1	Valid	19	E1	Valid
2	A2	Valid	20	E2	Valid
3	A3	Valid	21	E3	Valid
4	A4	Valid	22	E4	Valid
5	B1	Valid	23	F1	Valid
6	B2	Valid	24	F2	Valid
7	B3	Valid	25	F3	Valid
8	B4	Valid	26	F4	Valid
9	C1	Valid	27	G1	Valid
10	C2	Valid	28	G2	Valid
11	C3	Valid	29	G3	Valid
12	C4	Valid	30	H1	Valid
13	D1	Valid	31	H2	Valid
14	D2	Valid	32	H3	Valid
15	D3	Valid	33	H4	Valid
16	D4	Valid	34	H5	Valid
17	D5	Valid	35	H6	Valid
18	D6	Valid			

Based on Table 3, it could be concluded that all variables were declared valid and it could be further analyzed.

4.2 Reliability Test

This test was done to find out how consistent or relatively different the variables which were measured against the same subject or object in the time of the first measurement and next. Reliability could be measured by cronboach's alpha statistical test. Validity testing was done by the SPSS program. The research was tested on 60 respondents. The results of the test can be seen in table 4. Reliability test

Table 4. Reliability Test

No	Factore	Explanation
1	Human Resources	Very Reliable
2	Equipment	Reliable
3	Material	Reliable
4	Managerial	Reliable
5	Finance	Reliable
6	Environment and Weather	Reliable
7	Occupational Health and Safety	Reliable
8	Covid-19 pandemic	Reliable

Based on Table 4, it could be concluded that all factors were reliable and it could be further analyzed.

4.3 Index Mean Method

Data analysis using the Index Mean method aimed to obtain the average value of all answers given by respondents when filling out a research questionnaire organized in the distribution of data. The results of the Mean Index method can be seen in table 5.

Table 5. Index Mean Total

Rank	Variables	Mean	No	Variables	Explanation
1	A1	4.82	19	C2	4.43
2	B3	4.75	20	E1	4.42
3	B2	4.72	21	F1	4.42
4	A2	4.7	22	D3	4.4
5	B1	4.68	23	G2	4.37
6	C4	4.65	24	E3	4.28
7	C1	4.62	25	F3	4.28
8	D2	4.62	26	E2	4.25
9	B4	4.62	27	F2	4.25
10	A3	4.6	28	E4	4.22
11	G3	4.57	29	F4	4.22
12	A4	4.55	30	D4	4.22
13	D5	4.55	31	H1	4.18
14	G1	4.52	32	H2	4.03
15	D1	4.52	33	H6	4.03
16	H5	4.48	34	H4	3.97
17	D6	4.47	35	H3	3.83
18	C3	4.45			

Based on Table 3, the authors took the top five rankings as the dominant factors affecting the construction of toll road construction projects with the first rank was variable A1 i.e. workforce discipline with a Mean Index score of 4.82, the second rank was variable B3 i.e. good equipment quality with An Index Mean score of 4.75, third rank was variable B2 i.e. equipment productivity at work with a Mean Index score of 4.72, The fourth rank was variable A2, it was the availability of labor with an Index Mean score of 4.7, and the fifth rank was variable B1, it was the availability of equipment according to work needs and the Index Mean score of 4.68.

4.4 Discussion

Based on the results of the mean index calculation on all factors obtained that the dominant factor that influenced the success of the construction of toll road construction projects was a variable with a rank of one to five with the following description:

Labor discipline became the first rank because discipline was the main benchmark of whether workers had the accuracy to do work according to the specified schedule and also a high level of obedience in maturing. The rules that applied.

The quality of the equipment which was ranked second was due to the good condition of the equipment, the work done did not experience obstacles, so the time used in work could be optimal. Equipment productivity at work was ranked third because of the optimal use of equipment in accordance with the capacity of each equipment, making the work could be completed in accordance with the targets which had been determined in accordance with the quality of good equipment.

The availability of labor became the fourth rank, because the availability of enough labor made the working time could be in accordance with the plan which had been set.

The availability of equipment in accordance with work needs became the fifth rank because the availability of equipment in accordance with the needs of work on the ground made work time effective and efficient which could affect the success rate in the work.

The variables contained in the equipment factor dominate in the top five rankings in influencing the success of the construction of toll road construction projects, it was good equipment quality (B3), productivity of equipment at work (B2), and availability of equipment in accordance with work needs (B1) because these factors were related to each other in supporting the work process on the construction of toll road construction projects. This was the same as the

opinion (Putri et al., 2020) which stated that the quality and state of the tool was one of the dominant factors which influenced the success of construction projects.

In addition, the interview conducted by (Putri et al., 2020) to the executor on the ground was that one of the causes of the hampering of work on the ground was due to the lack of available equipment. It could be concluded that the availability of adequate equipment on the ground could prevent construction work from being hampered so as to increase success in the construction of construction projects, especially on toll road construction projects.

The latest variable contained in the covid-19 pandemic factor was to vaccinate all workers involved in the project and provide supplements or vitamins which served to strengthen the body's immunity was not the dominant factor which affected success in the construction of toll road construction projects because of vaccinations and provided supplements or vitamins which affected workers not easily exposed to covid-19. However, a development project should continue to run as scheduled with the covid-19 pandemic or the absence of the covid-19 pandemic.

In addition, if a company had to provide supplements or vitamins to all workers involved in toll road construction projects on a regular basis will result in very high budget expenditures. This could happen because in the preparation of the budget in the construction of the project did not consider providing supplements and vitamins as a form of prevention of covid-19.

5. Conclusion

Based on the results of the mean index calculation on all factors obtained five of the most dominant factors which affected the success of the construction of toll road construction projects, they were labor discipline, good equipment quality, productivity of equipment at work, availability of labor, availability of equipment according to work needs.

The variables contained in the equipment factor dominate in the top five rankings in influencing the success of the construction of toll road construction projects where the quality of equipment was good, productivity of equipment at work, and the availability of equipment in accordance with work needs.

References

- BPJT, B. P. J. T. (2021). *Tujuan Dan Manfaat Jalan Tol*. <https://bpjt.pu.go.id/konten/jalan-tol/tujuan-dan-manfaat> diakses 27 April 2021
- Budiyani, S., & Kertohardjono, A. (2015). Penyebab Utama Keterlambatan Pelaksanaan Konstruksi Jalan Bebas Hambatan Akses Tanjung Priok. *Jurnal Konstruksia*, 6(2), 79–89.
- Deshariyanto, D. (2013). Faktor – Faktor Yang Mempengaruhi Waktu Pelaksanaan Proyek Konstruksi Di Dinas Pu. Bina Marga Kabupaten Sumenep. *Jurnal Ilmiah MITSU*, 1(2), 1–11. <https://doi.org/10.24929/ft.v1i2.59>
- Ginting, D. pindonta. (2021). *Identifikasi faktor-faktor yang mempengaruhi keterlambatan pembangunan proyek jalan tol*.
- B.-G. Hwang, X. Zhao, and M. J. Shu Gay, “ublic private partnership projects in Singapore Factors, critical risks and preferred risk allocation from the perspective of contractors,” *Int. J. Proj. Manag.*, vol. 31, pp. 424–433, 2013.
- Maddeppungeng, A., Intari, D. E., & Oktafiani, A. (2020). Studi Faktor Penyebab Keterlambatan Proyek Konstruksi Studi Kasus Proyek Pembangunan 6 Ruas Jalan Tol Dalam Kota Jakarta. *Konstruksia*, 11(1), 89. <https://doi.org/10.24853/jk.11.1.89-96>
- Mhd. Reza Adhiputra¹, Syahrizal², dan A. P. R. (2015). Analisis Faktor Penyebab Keterlambatan Proyek Konstruksi Jalan Tol. *Jurnal Hasil Riset*.
- Najah, A., & Pontan, D. (2018). Identifikasi Peringkat Faktor Penyebab Keterlambatan Konstruksi Pada Pelaksanaan Pembangunan Jalan Tol. *Seminar Nasional Cendekiawan, Buku 1*, 133–140.
- Natalia, M., Partawijaya, Y., . M., & . S. (2017). Analisis Critical Success Factors Proyek Konstruksi Di Kota Padang. *Jurnal Fondasi*, 6(2). <https://doi.org/10.36055/jft.v6i2.2632>
- Pontan, D., & Christianto. (2019). Identifikasi Faktor Keberhasilan Penerapan Sistem Manajemen Kesehatan dan Keselamatan Kerja (SMK3) pada Proyek Konstruksi Bangunan Gedung Bertingkat di Jakarta. *Sains Dan Teknologi*, 1, 1–5.
- Putri, M. K., Hartono, W., & Sugiyarto, S. (2020). Pengaruh Rantai Pasok Peralatan Terhadap Keberhasilan Proyek Konstruksi Bangunan Gedung Di Wilayah Surakarta *Matriks Teknik Sipil*, 152–159. <https://matriks.sipil.ft.uns.ac.id/index.php/MaTekSi/article/view/1082>

- Purbaya, S. E. (2020). *Identifikasi faktor penentu keberhasilan proyek konstruksi gedung bertingkat pada masa pandemi*.
- Prayitno, E. (2020). ANALISIS PENYEBAB KETERLAMBATAN PELAKSANAAN PROYEK KONSTRUKSI JALAN DI KABUPATEN KEBUMEN (STUDI KASUS JALAN LINGKAR UTARA KABUPATEN KEBUMEN). *Composites Part A: Applied Science and Manufacturing*, 68(1), 1–12. <http://dx.doi.org/10.1016/j.ndteint.2014.07.001><https://doi.org/10.1016/j.ndteint.2017.12.003><http://dx.doi.org/10.1016/j.matdes.2017.02.024>
- L. Qiao, S. Q. Wang, R. L. K. Tiong, and T.-S. Chan, “Framework for Critical Success Factors of BOT Projects in China,” *J. Struct. Financ.*, vol. 7, no. 1, pp. 53–61, 2001, doi: 10.3905/jsf.2001.320244.
- Ramang, R., Frans, J. H., & Djahamouw, P. D. K. (2017). Faktor-faktor keterlambatan proyek jalan raya di kota kupang berdasarkan persepsi stakeholder. *Jurnal Sipil Statik*, VI(1), 103–116.
- Ratno, D. (2013). *PENGARUH FAKTOR-FAKTOR DALAM KOMUNIKASI ANTARA KONTRAKTOR, KONSULTAN DAN PIHAK PEMILIK TERHADAP KEBERHASILAN SEBUAH PROYEK DI KOTA MALANG*.
- Rusito, R. (2019). Analisis Kajian Faktor-Faktor Yang Dapat Mempengaruhi Keterlambatan Proyek Jalan Di Jalan Raya Rancaekek - Cileunyi Nagreg. *Techno-Socio Ekonomika*, 12(1), 61–91. <https://doi.org/10.32897/techno.2019.12.1.6>
- Sufa, M. F. (2012). Identifikasi Kriteria Keberhasilan Proyek. *Identifikasi Kriteria Keberhasilan Proyek*, 11(1), 19–22.
- Syarkani, S. (2017). Pengaruh Disiplin Kerja Terhadap Kinerja Karyawan Pada Pt. Panca Konstruksi Di Kabupaten Banjar. *Jurnal Ilmiah Ekonomi Bisnis*, 3(3), 365–374. <https://doi.org/10.35972/jieb.v3i3.136>
- World bank. (2012). Investing in Indonesia’s Roads: Improving Efficiency and Closing the Financing Gap. *Road Sector Public Expenditure Review 2012*, 1–87. www.worldbank.org/id

Biographies

Pontan Darmawan is a Lecturer and Head of the Master's Program in Civil Engineering at Universitas Trisakti, Jakarta, Indonesia. Co-Leaders of the Civil Engineering Consultant "Pontan & Partners". Graduated with an Ir (Engineering) and MT (Master of Engineering) degree from Universitas Trisakti, Jakarta, Indonesia. Graduated with an SE (Bachelor of Economics) degree from the Universitas Terbuka, Indonesia. He holds an MM (Master of Management) degree from Sekolah Tinggi IMMI, Jakarta, Indonesia. Received a DR (Doctorate) from Universitas Tarumanegara, Jakarta, Indonesia. He has published several journals and conference papers, and is interested in building maintenance and maintenance research including its relation to the green building environment. A member of HAKI (Association of Construction Experts), and a reviewer of the CONTEXT 15 conference.

Ryan Faza Prasetyo is a young construction management lecturer in Civil Engineering & Planning Faculty in Trisakti University, Jakarta. Earned bachelor degree in Institut Teknologi Sepuluh Nopember Surabaya, Indonesia (ITS) in 2013 and master degree in same institute in 2015. Before join lecturing team in Trisakti University, he spent 6 years' experience in state-owned contractor company with speciality in commercial building project. His research interest include project operational, value engineering, optimization, automation, BIM implementation and sustainability.

Tommi Adenugroho holds a degree in Civil Engineering from Universitas Trisakti, Jakarta, Indonesia. Member of the Internal PR Department of the Universitas Trisakti Civil Engineering Association, Member of the Department of Student Potential Development of the Universitas Trisakti Civil Engineering Association. He was an intern in one of the toll road projects in Indonesia. Interested in the world of building construction and love to learn new things about building construction.

Adhiriswa Nur Idatama is a student of the Faculty of Civil Engineering, Universitas Trisakti, Jakarta, Indonesia. Graduated from (elementary school) SDN 09 Kubu Raya, Pontianak, West Kalimantan. (Junior High School) SMPN 03 Pontianak, West Kalimantan. (Senior High School) at SMAN 01 Tambun Selatan, Bekasi Regency, West Java. Member of the Household and Social Department of the Universitas Trisakti Civil Student Association Cabinet for the 2018/2019 period of the #Kolaborasi cabinet.