Jurnal
Talenta Sipil

Vol 9, No 2 (2026): Agustus, 1526-1530
Publisher by Program Studi Teknik Sipil
Fakultas Teknik Universitas Batanghari
ISSN 2615-1634 (Online), DOI 10.33087/talentasipil.v9i2.1454

Strategic Analysis and Effectiveness of Productivity Improvement in the Construction Sector in Indonesia

Riki Adriadi, Nengah Tela, Nasril Sikumbang, Wahyudi Putra Utama
Faculty of Civil Engineering and Planning, Bung Hatta University, Padang, West Sumatra, Indonesia.

ARTICLE INFO

Keywords:
Productivity, inventory, IT, Analytical data integration, Competent human resources.

***Correspondence email:**
rikiadriadi7@gmail.com;

email:
nengahtela@bunghatta.ac.id;
nasrilsikumbang@gmail.com;
wahyudiPutra@bunghatta.ac.id.

Submitted: 13 Juli 2026
Revised: 06 Agustus 2026
Accepted: 06 Agustus 2026
Published: 09 Agustus 2026

ABSTRACT

Significant and highly complex issues in the construction sector are currently a special and very important concern in reviewing the resolution of ongoing construction conflicts. Poor planning, unclear objectives, ineffective communication, and management and resource issues are the main causes of failure in construction projects. The most common problems are a) unclear inventory, b) irregular workflows, c) lack of employee training and competency development, d) lack of analytical data integration for communication, e) immature planning, unclear environment, poor budgeting, and inadequate risk management, f) unmeasurable targets, and g) a large number of human resources who are not yet competent in their respective fields. This inefficiency will certainly affect construction performance productivity, both from internal and external factors, thereby affecting project implementation, which requires us to provide quality management for the construction project itself and the community. The results showed that inventory management, information technology, training and development, data integration, and competent human resources had positive and significant effects on construction productivity. The proposed SEM model demonstrated an acceptable overall fit.

INTRODUCTION

Increased productivity in the construction sector is currently the most important factor in determining the success of any construction project. In an increasingly developed construction world, time and cost efficiency are essential to achieving optimal results. Increased productivity in the construction sector is crucial to overcoming slow industry growth (an average of 1% per year) and high project costs. Productivity analysis is often measured by comparing work output to working hours or PUPR Ministerial Regulation standards.

Increasing construction project productivity does not only focus on cost reduction, but also on effective resource utilization and better time management (Kuutila & Adams, 2017; Lubis & Hayadi, 2016; Puyada et al., 2018).

Several strategies can be implemented, such as increasing trust, improving project management, and utilizing the latest technology to facilitate supervision and implementation. The use of advanced project management software can facilitate more accurate scheduling and cost estimates, thereby reducing the risk of delays and waste. In addition, training and skills development for workers also play an important role in increasing productivity because trained employees will work more efficiently and reduce errors that can hinder project progress (Ropianto & Candra, 2017; Saydam, 1996; Kozono, 2005; Løvsletten et al., 2016). Productivity describes how efficiently a company performs all tasks involved in a project within a certain time. Construction productivity is usually measured using KPIs and software that provide performance insights to improve it (Bondarev & Zashchitina, 2010; Martin et al., 2009; Sargent, Sullivan, & Hanna, 2003). Government regulations provide an institutional framework for workforce development and organizational management in the construction sector (Republik Indonesia (2023) *Undang-undang Nomor 6 Tahun 2023*; Kementrian PUPR (2025) *Peraturan Menteri Pekerjaan Umum dan Perumahan Rakyat Nomor 6 Tahun 2025*; Pemerintah Republik Indonesia (2021) *Peraturan Pemerintah Nomor 14 Tahun 2021)*. Worker productivity plays a crucial role in improving employee (worker) performance in construction projects. Competent and well-managed human resources have consistently been shown to influence organizational performance and reward systems (Swasto, 2003; Teguh & Rosidah, 2003).

To improve efficient strategies, we must understand that effective time management can help increase performance productivity in every line of work. Employees must learn effective time management techniques to prioritize tasks, set clear goals, and allocate time wisely to maximize results. Time tracking tools such as Truein can be very effective in improving time management in the workplace.

Based on the proposed research model, the hypotheses were formulated as follows:
H1: Inventory management has a positive and significant effect on construction productivity.

H2: Information technology has a positive and significant effect on construction productivity.
H3: Training and development have a positive and significant effect on construction productivity.
H4: Data integration has a positive and significant effect on construction productivity.
H5: Competent human resources have a positive and significant effect on construction productivity.

METHOD

The analysis technique used in the quantitative approach is the Structural Equation Modeling (SEM) method, because SEM is capable of describing causal relationships between statistical data and providing quantitative assessments of the relationships between the variables studied.

The research subjects were employees (workers) in the construction industry in West Sumatra, consisting of private sector employees and state-owned enterprise employees. Data collection was carried out using several methods, namely: (a) questionnaires, (b) in-depth interviews, (c) observation, and (d) focus group discussions (FGD).

The research model consisted of six variables: Inventory, Information Technology, Training and Development, Data Integration, Competent Human Resources, and Productivity. The variables were measured using questionnaire items rated on a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Productivity was assessed through work efficiency, work effectiveness, achievement of targets, quality of work, and timely completion of work.

Data analysis was conducted in three stages: instrument reliability testing, preliminary multiple linear regression analysis, and Structural Equation Modeling to evaluate the relationships among the latent variables.

RESULT

Results of Testing with IBM SPSS Version 30

This reliability test was used to see the extent to which the measurement results were relatively consistent. It was considered reliable if the Cronbach's alpha value was greater than 0.5. The reliability test was conducted using IBM SPSS version 30, and the results are as follows:

Table 1. Reliability Statistics.

Cronbach's Alpha	Cronbach's AlphaBased on Standardized Items	NofItems
0.897	0.954	6

In Table 1, a total of 75 questionnaires were collected. However, only 40 questionnaires were included in the regression analysis after data screening and completeness checking.

Based on the 40 valid questionnaires included in the regression analysis, Cronbach's Alpha was 0.897, while Cronbach's Alpha Based on Standardized Items was 0.954.

Table 2. Summary Model Correlation.

Mode I	R	R Square	Adjusted R Square	Std. Error of the Estimue	Change Statistics					Durbin Watson
					R Suare Change	F Change	df1	df2	Sig.f change	
1	,954	,875	,867	2,321	,875	47,727	5	34	,000	1,856

Table 02 presents the results of the multiple linear regression analysis. The coefficient of determination (R^2) was 0.875, indicating that Inventory, Information Technology, Training and Development, Data Integration, and Competent Human Resources jointly explained 87.5% of the variance in Productivity. The remaining 12.5% was explained by other variables outside the regression model. This regression analysis was used as a preliminary analysis, while SEM was used to evaluate the relationships among the constructs.

A total of 75 questionnaires were collected. However, only 75 questionnaires were included in the regression analysis after data screening and completeness checking.

Table 3. SEM Results for Construction Productivity Strategies

Hypothesis	Relationship	Path coefficient	t-value	Critical value	Decision
H1	Inventory → Productivity	0.70	7.88	1.96	Supported
H2	Information Technology → Productivity	0.98	7.76	1.96	Supported
H3	Training and Development → Productivity	0.94	7.76	1.96	Supported
H4	Data Integration → Productivity	0.99	7.74	1.96	Supported
H5	Competent Human Resources → Productivity	1.00	8.90	1.96	Supported

Table 03 above explains that 1) Inventory → Productivity Path Coefficient (0.70) T-value(7.88) and Critical value (1.96), 2) Information Technology → Productivity Path Coefficient (0.98) T-value(7.76) and Critical value (1.96), 3) Training and Development → Productivity Path Coefficient (0.94) T-value(7.76) and Critical value (1.96), 4) Data Integration → Productivity Path Coefficient (0.99) T-value(7.74) and Critical value (1.96) and 5) Competent Human Resources → Productivity Path Coefficient (1.00) T-value(8.90) and Critical value (1.96)

Table 4. Goodness-of-Fit Results for the SEM Model

Fit index	Result	Recommended criterion	Decision
RMSEA	0.073	≤ 0.08	Acceptable fit
NFI	0.96	≥ 0.90	Good fit
TLI/NNFI	0.93	≥ 0.90	Good fit
CFI	0.95	≥ 0.90	Good fit
IFI	0.95	≥ 0.90	Good fit
RFI	0.97	≥ 0.90	Good fit
SRMR	0.012	≤ 0.08	Good fit
GFI	0.85	≥ 0.90	Marginal fit
AGFI	0.82	≥ 0.90	Marginal fit
CN	150.56	≥ 200	Marginal

Most goodness-of-fit indices met the recommended criteria, while GFI, AGFI, and CN indicated marginal fit. Therefore, the proposed model can be considered acceptable, although further model refinement may be required.

Test Results with SEM (Structural Equation Modeling).

Model Testing using SEM

In this test, the measurement model was obtained from the results of the The standardized solution of the SEM measurement model is presented in Figure 1.

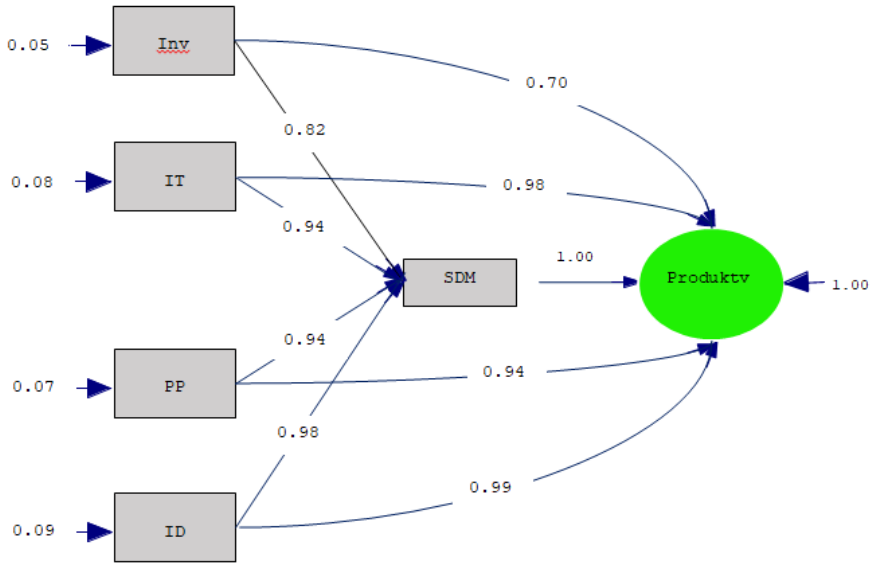

Figure 1. SEM Model of Strategies Affecting Construction Productivity

Inventory (Inv) has a productivity coefficient of 0.70; Information Technology (IT) has a productivity coefficient of 0.98; (PP) has a productivity coefficient of 0.94; and (ID) has a productivity coefficient of 0.99. Human Resources (HR) is correlated with: IT at 0.94, PP at 0.94, and ID at 0.98.

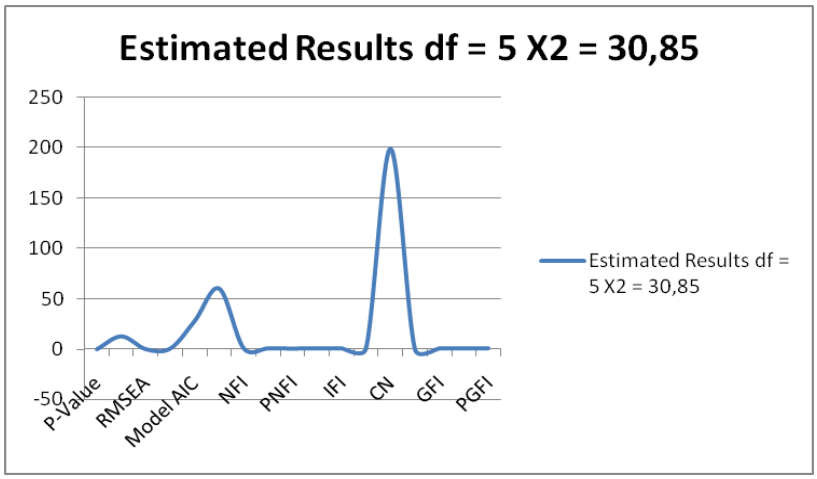

Figure 2. Goodness-of-Fit Profile of the SEM Model

Figure 02 shows the goodness-of-fit results for the SEM model with the following key information:
Degrees of Freedom (df) = 5 and Chi-square (χ^2) = 30.85. The results are as follows:
P-value > 0.05, RMSEA (Root Mean Square Error of Approximation) = < 0.08, NFI (Normed Fit Index) = ≥ 0.90, PNFI (Parsimony Normed Fit Index) = ≥ 0.90, IFI (Incremental Fit Index) = ≥ 0.90, GFI (Goodness of Fit Index) = ≥ 0.90, PGFI (Parsimony Goodness of Fit Index) = ≥ 0.50

Goodness of Fit Statistics
Degrees of Freedom = 5
Minimum Fit Function Chi-Square = 30.85 (P = 0.052)
Normal Theory Weighted Least Squares Chi-Square = 30.235 (P = 0.055)
Estimated Non-centrality Parameter (NCP) = 12.80
90 Percent Confidence Interval for NCP = (12.80; 30.43)
Minimum Fit Function Value = 0.32
Population Discrepancy Function Value F0 = (0.0 ; 0.50)
Root Mean Square Error of Approximation (RMSEA) = 0.073
90 Percent Confidence Interval for RMSEA = (0.050 ; 0.080)
P-Value for Test of Fit (RMSEA > 0.05) = 0.05454
Expected Cross-Validation Index (ECVI) = 0.74
90 Percent Confidence Interval for ECVI = (0.64 ; 1.14)
ECVI for Saturated Model = 0.76, ECVI for Independence Model = 9.08
Chi-Square for Independence Model with 10 Degrees of Freedom = 344.11
Independence AIC = 354.11, Model AIC = 28.20, Saturated AIC = 31.42
Independence CAIC = 367.56, Model CAIC = 60.24, Saturated CAIC = 64.90
Normed Fit Index (NFI) = 0.96, Non-Normed Fit Index (NNFI) = 0.93
Parsimony Normed Fit Index (PNFI) = 0.70
Comparative Fit Index (CFI) = 0.95, Incremental Fit Index (IFI) = 0.95
Relative Fit Index (RFI) = 0.97, Critical N (CN) = 150.56
Root Mean Square Residual (RMR) = 0.022
Standardized RMR = 0.012, Goodness of Fit Index (GFI) = 0.85
Adjusted Goodness of Fit Index (AGFI) = 0.82
Parsimony Goodness of Fit Index (PGFI) = 0.94

Figure 3. Goodness-of-Fit Statistics for the Construction Productivity Model

Overall, the SEM model can be considered a good fit and is suitable for further analysis, as most of the goodness-of-fit indicators meet the required criteria. Although the chi-square value and P-value are quite ideal, other indicators such as RMSEA, CFI, IFI, NFI, and RMR indicate that the model has a good level of fit.

CONCLUSION

The results showed that Inventory, Information Technology, Training and Development, Data Integration, and Competent Human Resources had positive and significant effects on construction productivity. Therefore, H1–H5

were supported. Among the examined variables, Competent Human Resources showed the strongest effect on Productivity, based on the final verified SEM output. The goodness-of-fit indices indicated that the proposed model was generally acceptable, although several indices showed marginal fit.

Research Limitations

This study was limited to construction workers employed by private companies and state-owned enterprises in West Sumatra. Therefore, the results may not fully represent construction workers in other regions of Indonesia. In addition, productivity was measured using respondents' perceptions rather than direct project productivity records.

REFERENCES

Bondarev, M., & Zashchitina, E. K. (2017). High involvement innovation: Analysing employee involvement and HR performance in the construction industry. In 2017 International Conference "Quality Management, Transport and Information Security, Information Technologies" (IT&QM&IS) (pp. 488–491). IEEE. https://doi.org/10.1109/ITMQIS.2017.8085868

Kementerian Pekerjaan Umum dan Perumahan Rakyat. (2025). Peraturan Menteri Pekerjaan Umum dan Perumahan Rakyat Nomor 6 Tahun 2025 tentang Standar Kegiatan Usaha dan Produk pada Penyelenggaraan Perizinan Berusaha Berbasis Risiko Sektor Pekerjaan Umum dan Perumahan Rakyat.

Kozono, K. (2005). Pendekatan baru dalam pelatihan informasi di fakultas pendidikan guru (hlm. 7–10).

Kuutila, M., & Adams, B. (2017). Jam kerja abnormal: Dampak pelepasan cepat dan implikasinya terhadap isi pekerjaan.

Løvsletten, P. A., Kiønig, L., & Galtung, A. (2016). Meeting the demand of research based education in higher education and training: A case from real estate education. In 2016 15th International Conference on Information Technology Based Higher Education and Training (ITHET) (pp. 1–4). IEEE. https://doi.org/10.1109/ITHET.2016.7760749

Lubis, A., & Hayadi, B. H. (2016). Desain arsitektur sistem dashboard informasi untuk memantau kinerja pelaksanaan Sensus Ekonomi 2016 di Badan Pusat Statistik Indonesia. Proceedings of the 2016 4th International Conference on Information and Communication Technology, 1–5.

Martin, S., Gil, R., Lopez, E., Oliva, N., Monteso, S., Martinez, S., & Peire, J. (2009, October). Work in progress: A mobile performance support system for vocational education and training. In Frontiers in Education Conference, 2009. FIE '09. 39th IEEE (pp. 1–2). IEEE. https://doi.org/10.1109/FIE.2009.5350860

Pemerintah Republik Indonesia. (2021). Peraturan Pemerintah Nomor 14 Tahun 2021 tentang Perubahan atas Peraturan Pemerintah Nomor 22 Tahun 2020 tentang Peraturan Pelaksanaan Undang-Undang Nomor 2 Tahun 2017 tentang Jasa Konstruksi.

Puyada, D., Ganefri, G., Ambiyar, A., Wulansari, R. E., & Hayadi, B. H. (2018). Efektivitas media instruksional interaktif pada sirkuit listrik. Jurnal Internasional Teknik dan Teknologi, 7(2.14), Edisi Khusus 14.

Republik Indonesia. (2023). Undang-Undang Nomor 6 Tahun 2023 tentang Penetapan Peraturan Pemerintah Pengganti Undang-Undang Nomor 2 Tahun 2022 tentang Cipta Kerja Menjadi Undang-Undang. https://doi.org/10.32528/nms.v2i4.312

Ropianto, M., & Candra, O. (2017). Optimasi perencanaan strategis organisasi dalam kerangka pencapaian tujuan pendidikan (Vol. 149, Icest, hlm. 149–151).

Sargent, S. R., Sullivan, K. T., & Hanna, A. S. (2003). Absenteeism and turnover impact on labor productivity for electrical contractors. In K. R. Molenaar & P. S. Chinowsky (Eds.), Construction Research Congress 2003. Honolulu, HI. https://doi.org/10.1061/40671(2003)8

Saydam, G. (1996). Manajemen sumber daya manusia (hlm. 16–17). Jakarta.

Swasto, B. (2003). Pengembangan sumber daya manusia pengaruhnya terhadap kinerja dan imbalan. FIA UB.

Teguh, & Rosidah. (2003). Manajemen sumber daya manusia: Konsep teori dan pengembangan dalam konteks organisasi publik (Cet. 1). PT. Graha Ilmu.