

## Evaluation of the Impacts of Design Changes on Construction Projects (Case Study: Architectural Works at the Christian Center)

Adriana Karundeng<sup>1</sup>\*, Dwars Soukotta<sup>2</sup>, dan Floren Agnesia Sinaga<sup>3</sup> <sup>1,2,3</sup>Civil Engineering, Politeknik Negeri Manado, Indonesia

#### Article History

Received	: 20 May 2025
Revised	: 26 May 2025
Accepted	: 27 May 2025
Published	: 27 May 2025

**Corresponding author\*:** adrianarhy21@gmail.com

#### Cite This Article:

Adriana Karundeng, Dwars Soukotta, and Floren Agnesia Sinaga, "Evaluation of Design Change Impacts on Construction Projects (Case Study: Architecture Work of Christian Center)".

DOI: https://doi.org/10.56127/juit .v4i2.2041 Abstract: This study aims to evaluate the impact of design changes on the implementation of construction projects, using the Christian Center Architecture project in Manado City as a case study. The primary focus of the research is to analyze changes from the perspectives of technical aspects, cost, time, and quality resulting from design revisions during project execution. The methods used include document review, structured and semi-structured interviews with relevant stakeholders, as well as field observations to compare plans with on-site realizations. The results indicate that the design changes were mainly caused by discrepancies between the initial planning drawings and actual site conditions, as well as the functional needs of the project owner. The impacts include an increase in the volume of technical work, adjustments to execution methods, an extension of the project duration from 210 to 250 calendar days, and an improvement in work quality without any change in contract value due to the fixed-budget system (APBD). Although some of the changes resulted in improvements in terms of function and aesthetics, overall, the design changes posed challenges in maintaining the effectiveness and efficiency of project implementation. Therefore, a systematic and well-documented design change management process is required to ensure effective project execution and the quality of the final outcome.

**Keywords**: Impact Of Design Change; Construction Project; Cos; Time; Quality

### **INTRODUCTION**

Every construction project generally begins with a series of stages that must be completed before physical work starts. These stages include initial planning, technical design, structural analysis, budget estimation, scheduling, and resource planning. These factors greatly influence the smooth execution of the project. Discrepancies between the initial design and field implementation can cause various problems, particularly related to cost overruns, project delays, and reduced work quality (Ervianto, 2023; Sulaksana, 2022).

In practice, construction projects often experience design changes at various stages, both during planning and execution. These changes may be caused by factors such as evolving trends, errors in the initial design, policy changes, adjustments to new regulations, material price increases due to inflation, or technical constraints on site. Although some design changes can bring positive benefits such as improved efficiency and quality, many in fact have negative impacts, especially on project costs and schedules (Manahan P. Tampubolon, 2020; Moh Nur Sholeh, 2025).

A civil engineering journal article on the control of time and cost in construction work as an impact of design changes explains that such changes affect the quantity and type of materials used, thereby influencing construction time and costs. As a consequence, the project experienced delays; the project completion deadline, originally set for October 14, 2012, with a planned duration of 210 days, had to be extended until November 17, 2012, which in turn affected the construction costs (Messah et al., 2013).

A relevant case study is the Architecture Work Project of the Christian Center, funded through the Regional Government Budget (APBD). During its implementation, this project underwent several design changes at the request of the project owner (Public Works Department) and adjustments to interior materials. These changes resulted in additional and reduced work as well as a change in the project duration from the original plan of 210 calendar days to 250 days. This case highlights the importance of a comprehensive evaluation of the impact of design changes on the execution of construction projects.

#### **Construction Project Management**

Management is the science and art of organizing the process of utilizing human resources and other resources effectively and efficiently to achieve specific objectives. This management consists of six elements (6 M): Men, Money, Method, Material, Machines, and Market (Hasibuan, 2013).

Project management is the entire process of planning, executing, controlling, and coordinating a project from its inception (idea) until its completion to ensure the project is carried out on time, within budget, and with the required quality (Ervianto, 2009).

## **Impact of Design Changes**

Design changes refer to modifications or revisions made to the technical planning elements of a construction project, occurring either during the planning phase or the execution phase. According to (Nasution, 2012), design changes may arise due to various reasons such as discrepancies between working drawings and site conditions, owner's requests, or resource limitations.

States that design changes are one of the primary causes of delays and cost overruns in construction projects in Indonesia. These changes can originate from various parties, including the owner, consultants, or contractors (Siregar, 2018).

Design changes have a direct impact on three key aspects of construction project performance (Gunawan, 2015):

- Cost: Design modifications may lead to increased costs resulting from rework, procurement of additional materials, and deployment of supplementary equipment.
- Time: Delays are often inevitable, as design changes necessitate adjustments to work schedules, approval of revised documents, and renewed coordination efforts.
- Quality: Project quality may be compromised due to accelerated implementation aimed at compensating for time lost as a result of the changes.

Wibowo found that construction projects undergoing design changes during execution exhibited a 35% higher probability of delay compared to projects without design changes (M. A. , & K. H. Wibowo, 2016).

# **Project Performance Evaluation**

States that the performance of a construction project reflects the effectiveness of project management processes, and the primary indicators of success can be assessed through the achievement of cost, time, and quality targets (M. A. Wibowo, 2011).

According to research by Gunawan, the main indicators for evaluating construction project performance in Indonesia are as follows (Gunawan, 2015):

- Cost Performance: The project's ability to complete the work within the planned budget. Design changes may result in cost overruns.
- Time Performance: The timeliness of project completion according to the established schedule. Design changes often lead to delays due to rework and the need for re-coordination.
- Quality Performance: The extent to which the project outcomes conform to the planned technical specifications. Uncontrolled design revisions may compromise the quality of the final results.

According to (Pribadi, 2010), several common methods used for project performance evaluation in Indonesia include:

- Earned Value Analysis (EVA): Applied to measure cost and schedule efficiency of the project.
- Key Performance Indicators (KPI): Such as the Cost Performance Index (CPI) and the Schedule Performance Index (SPI).
- Stakeholder Satisfaction Surveys: Used to assess stakeholder perceptions of project performance, particularly in public sector projects.

# **Change Management in Construction Projects**

Change management in construction projects is a systematic process of identifying, evaluating, approving, and implementing changes. (Sutrisno, 2009) emphasizes that the application of effective change management is essential to minimize the negative impacts of design changes on project success.

According to Pribadi and Wijaya, an effective change management process involves proper documentation of changes, technical and economic justification, as well as transparent communication among all parties involved (K. S. , & W. I. M. Pribadi, 2013).

# **Factors Contributing to Design Changes**

A study conducted by Yulianto and Rahmat, categorizes the causes of design changes into three main groups (Yulianto, 2014):

- Technical factors (design discrepancies, miscalculations, specification changes)
- Administrative factors (delayed approvals, incomplete documentation)
- External factors (regulatory changes, environmental conditions, client requests)

Case studies from various government projects in Indonesia indicate that the most common causes of design changes are evolving user requirements and errors in the initial design.

# **Research Objectives**

The objectives of this study are as follows:

- To identify the underlying factors that lead to design changes in the Christian Center architectural construction project.
- To analyze the impact of design changes on the three critical dimensions of project performance: cost, time, and quality.

- To evaluate the extent to which design modifications influence the overall effectiveness of project execution.
- To propose strategic mitigation measures aimed at minimizing the adverse effects of design changes.

# **RESEARCH METHOD**

Research Implementation Procedures:

## **Problem Identification**

- Examine the project background and identify the primary issues associated with design changes, particularly those related to technical aspects, scheduling, and cost implications.
- Collect preliminary data including planning documents, design change reports, and project coordination records.

# **Data Collection Techniques**

- Conduct on-site observations at the construction location.
- Perform interviews with key stakeholders such as the main contractor, project management team, supervising consultants, design planners, and the project owner.
- Gather secondary data including working drawings, initial contracts, construction schedules, and documented design modifications.

# Data Analysis

- Analyze the data using both qualitative and quantitative methods, based on interview findings and supporting documents, to identify the types and root causes of design changes.
- Assess the correlation between design changes and their impacts on schedule delays, cost overruns, quality performance, and technical challenges encountered on-site.
- Create tabular representations to clearly illustrate the relationship between specific types of design changes and their corresponding impacts, based on the analytical findings.

## **Conclusion and Recommendations**

- Formulate conclusions based on the analyzed research findings.
- Provide practical recommendations that may serve as guidelines for managing design changes effectively in similar future construction projects.

# **RESULT AND DISCUSSION**

# **Problem Identification**

In the initial stage of the research, a review was conducted on the background of the Christian Center architectural construction project, located on Ring Road Street, Malendeng Sub-district, Paal Dua District, Manado City, North Sulawesi Province. The initial contract stipulated a project completion period of 210 calendar days. Based on project documentation and interview findings, several design changes occurred during the implementation phase, which had significant impacts on the technical aspects, timeline, costs, and overall quality of the construction work.

# Technical Aspects

Based on the initial planning documents and the design change report, the following findings were identified:

- There was a change in the planning of the parking area. Initially, the parking structure consisted of a reinforced concrete upper floor with an area of 1,224 m<sup>2</sup>, which was later expanded to 1,824 m<sup>2</sup>. This expansion included the addition of shear walls to retain backfilled soil in the parking area. This change required recalculations and adjustments to the construction methods applied in the field.
- The contract volume for brick wall installation was initially 1,788.38 m<sup>2</sup>. However, after recalculating based on the original design drawings, it was found that the actual volume of brick wall work amounted to 4,886.65 m<sup>2</sup>.
- Due to the increase in volume for the brick wall installation, other related works were also affected, such as plastering, smoothing, painting, and the construction of practical columns and beams.

# Cost Aspect

As a result of additional work, there was an increase in the project budget. For the Christian Center architectural works package funded by the Regional Budget (APBD), the contract value is fixed. Therefore, if there are additional work items, they must be offset by a reduction in other items, so that the total budget remains unchanged.

## Time Aspect

Since the work package is funded by a fixed-value APBD contract, certain work items had to be adjusted to match the available budget. Consequently, the design changes led to an extension of the construction period, in line with the time required for design revisions, selection of new materials to suit the revised work, and preparation of contract documents or contract addendums. These processes resulted in a time extension of 40 calendar days—from the original duration of 210 calendar days to a total of 250 calendar days.

## **Quality** Aspect

Based on interviews with the project owner (Public Works Department), supervisory consultants, and contractors, as well as field observations, it was found that the design changes were made to improve the overall project quality. The added work items were deemed essential and beneficial; for example, the increased parking area was necessary to meet parking capacity requirements.

All such changes were documented in the contract addendum and in the official records of additional and omitted works.

## **Data Collection Techniques**

This research employed three main data collection techniques:

## **Documentation Study**

Data were collected from various project documents, including:

- Original and revised design drawings
- Contracts and contract addendums
- Initial and revised time schedules (S-Curves)
- Daily and weekly project implementation reports
- Recapitulation of additional and omitted works
- Official documentation of work changes

## Structured and Semi-Structured Interviews

Interviews were conducted with stakeholders directly involved in the project, namely

• The project owner (Public Works Department)

- Planning and supervisory consultants
- Executing contractors
- Field supervisors

The objective of the interviews was to explore the background of the design changes, the decision-making processes, and the impact on project execution.

# Field Observation

Site visits were carried out to:

- Observe the physical conditions of the ongoing work
- Examine the implementation of design changes on-site
- Record any discrepancies between the planned and actual execution

## Data Analysis

Table 1. Comparison Between Initial Contract and Actual Conditions

Aspect	Initial Plan	Actual After Changes	Impact
Time	210 days (7 months)	250 days (8.3 months)	Extension of work duration by 40 calendar days
Cost	IDR 38,529,949,091.30 Details: Addendum 1 (Increase & decrease balanced): IDR 9,173,407,630.53 Addendum 2 (Increase & decrease balanced): IDR 5,158,595,569.16	Contract value remains unchanged	None
Quality	Technical Standards	Higher (Structural & Aesthetic improvements)	Quality enhancement

This study aims to evaluate the impact of design changes on construction projects, particularly focusing on the architectural works of the Christian Center project. The findings indicate that design changes have direct implications on technical aspects, project duration, costs, and the quality of work based on Table 1. The following discussion elaborates on these findings within a theoretical framework and compares them with similar studies.

#### **Relevance of Findings to Research Objectives**

The main objective of this research is to identify the factors causing design changes in the Christian Center architectural project and analyze their impact on cost, time, and project quality. Based on the findings, it is evident that the design changes were primarily due to discrepancies between the initial design and actual field requirements—particularly in technical aspects such as work volume and structural specifications. This indicates that technical factors play a significant role in driving planning revisions. These results align with Yulianto and Rahmat (2014), who stated that technical factors are among the primary triggers for design changes in construction projects.

These design adjustments directly affected project duration, resulting in additional and omitted work, and ultimately led to an extension of the project timeline. This finding directly addresses the research question regarding how design changes impact project performance and emphasizes the need for structured change management.

### Scientific Interpretation of Findings

The design changes in the Christian Center project—such as the expansion of the parking area and adjustments to brick wall volume—reveal a lack of accuracy during the initial planning phase or a lack of synchronization between construction drawings and actual field conditions. According to Nasution (2012), one of the main causes of design changes is the mismatch between planning documents and field realities, often due to insufficient coordination in technical documentation.

The revision process required additional time, leading to a 40-calendar-day extension of the project timeline. This is consistent with the view of Gunawan and Setiawan (2015), who argued that design changes significantly affect project schedules due to the need for timeline adjustments, additional work execution, and renewed coordination among stakeholders. While the project budget did not increase—owing to the fixed funding structure under the Regional Government Budget (APBD)-managing the changes still required additional time, effort, and administrative work, thereby increasing the indirect burden of execution.

From a quality perspective, the design changes aimed to enhance the overall quality of the building. For instance, the expansion of the parking area and the improvement of structural specifications were implemented to meet higher functional and aesthetic standards. This demonstrates that design changes do not always lead to negative outcomes, provided they are grounded in clear technical and functional considerations. These findings support Sutrisno (2009), who noted that effective change management can minimize negative impacts and enhance project outcomes.

#### **Consistency with Previous Research**

The findings of this study are consistent with several previous studies. For example, research by Yunita A. Messah indicates that design changes in construction projects contribute to project delays and cost overruns. Although this study did not record an increase in contract value due to budget constraints, the adjustments in schedule and resource allocation reflect delays as a consequence of design changes.

Moreover, Wibowo and Kurniawan (2016) also reported that the likelihood of delays is higher in projects that undergo design changes. This is reflected in the Christian Center case, where the project duration increased from 210 to 250 days.

However, this study also presents significant differences from the findings of Gunawan and Setiawan (2015), who stated that design changes often result in reduced quality due to rushed implementation. In contrast, the quality of work in this project improved because the design changes were made to meet higher functional and aesthetic standards. This shows that quality can be maintained—or even enhanced—if design changes are managed through a well-planned process.

### Comparative and Unique Aspects of the Case Study

The Christian Center architectural project has distinctive characteristics compared to previous studies, particularly because it was funded by the APBD under a fixed contract value. This made project management more complex, as it required balancing additional and reduced work without altering the overall budget. Such conditions necessitated more stringent management strategies and effective coordination among all involved parties.

The documentation of changes, preparation of contract addendums, and the involvement of all stakeholders in decision-making represent good practices in change management, as described by Pribadi and Wijaya (2013). This demonstrates that administrative and technical challenges arising from design changes can be mitigated through transparent and structured management mechanisms.

### **Practical Implications**

By comparing field findings-based on observations, data, and interviews-with theories and previous studies, this research offers significant implications for construction project management, particularly for government-funded projects. Although design changes are sometimes unavoidable, they must be managed through systematic approaches to prevent significant adverse effects.

This study demonstrates that changes do not necessarily have negative impacts if properly managed. It also reinforces the importance of early-stage design evaluation, the establishment of clear change procedures, and the active involvement of all stakeholders. These are critical steps to maintain overall project effectiveness, especially for projects bound by strict budgetary constraints, such as government-funded developments.

## **CONCLUSION**

The research on the construction project, with a case study of the Christian Center Architecture Project, demonstrates a significant impact on the overall project performance. The factors causing design changes are driven by several elements, with the dominant and primary causes being the mismatch between the planning drawings and actual field conditions, as well as requests from the project owner (Public Works Department). The impact of the design changes is reflected in the increased volume of work, the need for technical structural revisions, and the adjustment of the project implementation schedule from 210 calendar days to 250 calendar days.

Although the contract value remained unchanged due to the project being funded by the Regional Government Budget (APBD) under a fixed budget system, the design changes still required work adjustments through an additional and reduced work system. This indicates that design changes affect not only the time aspect but also highlight the importance of resource management and project administration accuracy. Nevertheless, this study shows that from the quality perspective, the design changes led to improved building quality, as the added work items were functional and prioritized, such as the expansion of the parking area and structural reinforcement.

Based on the findings of this research, it is recommended that construction projects, particularly those funded by government sources, implement systematic and well-documented change management. Mitigation strategies that can be applied include increasing accuracy during the initial planning phase, aligning technical documents with field conditions, and ensuring intensive coordination among stakeholders. Further research is recommended to explore the effectiveness of project performance evaluation methods in the context of design changes in similar projects in other regions.

### REFERENCES

Ervianto, W. I. (2009). Manajemen Proyek Konstruksi.

- Ervianto, W. I. (2023). Manajemen Konstruksi: Konsep dan Aplikasi dalam Proyek Konstruksi.
- Gunawan, A., & S. R. (2015). Pengaruh Perubahan Desain terhadap Kinerja Proyek Konstruksi di Indonesia. Jurnal Teknik Sipil dan Perencanaan. Pengaruh Perubahan Desain Terhadap Kinerja Proyek Konstruksi Di Indonesia. Jurnal Teknik Sipil Dan Perencanaan.
- Hasibuan, M. S. P. (2013). Manajemen: Dasar, pengertian, dan masalah.
- Manahan P. Tampubolon. (2020). Change Management, Manajemen Perubahan; Individu, Tim Kerja, Organisasi.
- Messah, Y. A., Waktu, P., Biaya, D., Konstruksi, P., Dampak, S., Desain, P., Waktu, P.,
  Perubahan Desain, D., Kasus, S., Oenaem, E. I., Selatan, K. B., & Messah, Y. A.
  (2013). Kabupaten Timor Tengah Utara). In *Jurnal Teknik Sipil: Vol. II* (Issue 2).
- Moh Nur Sholeh. (2025). Manajemen Kontrak Proyek Konstruksi.
- Nasution, A. (2012). Manajemen Proyek Konstruksi: Perencanaan, Penjadwalan, dan Pengendalian Proyek.
- Pribadi, K. S., & K. P. F. (2010). Evaluasi Kinerja Proyek Konstruksi Berdasarkan KPI dan Earned Value Analysis.
- Pribadi, K. S., & W. I. M. (2013). Manajemen Perubahan dalam Proyek Konstruksi: Studi Kasus di Proyek Pemerintah.
- Siregar, H. (2018). Analisis Penyebab dan Dampak Perubahan Desain pada Proyek Konstruksi Gedung.

- Sulaksana, I. P. S. P. (2022). Analisis Perbandingan Waktu dan Biaya Pelaksanaan Proyek Metode Fast Track dengan Metode Konvensional (Studi Kasus: Proyek Pembangunan Gedung Kelas SMAN 9 Denpasar).
- Sutrisno, B. (2009). Manajemen Proyek: Konsep, Metodologi dan Aplikasi di Bidang Teknik dan Bisnis.
- Wibowo, M. A. (2011). Manajemen Proyek Konstruksi dan Evaluasi Kinerja Biaya dan Waktu.
- Wibowo, M. A., & K. H. (2016). Evaluasi Keterlambatan Proyek Akibat Perubahan Desain Menggunakan Metode Time Impact Analysis.
- Yulianto, T., & R. A. (2014). Klasifikasi Faktor Penyebab Perubahan Desain pada Proyek Konstruksi di Indonesia.