



Time Control Analysis on a Single-Story Type 91 House Construction Project Using Microsoft Project

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Abstract

This study aims to analyze the effectiveness of using Microsoft Project in time control for a single-story residential construction project, Type 91, in Samarinda. Using a descriptive qualitative approach, data were collected through participatory observation, in-depth interviews, and project documentation review. The findings indicate that utilizing Microsoft Project features such as Change Working Time, Tracking Gantt Chart, and Critical Path Method significantly improves scheduling accuracy, resource allocation efficiency, and timely project completion. The project was designed using a bottom-up planning approach, encouraging full team involvement, while work calendars and overtime hours were adjusted to meet strict deadlines. Project performance evaluation was conducted using the Schedule Performance Index (SPI) and Cost Performance Index (CPI), which provide an objective foundation for managerial decision-making. This study concludes that Microsoft Project is an effective tool for managing small to medium-scale construction projects, particularly in time control and comprehensive project performance evaluation.

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Keywords: Time control, Microsoft Project, critical path, residential project, Type 91 house

Introduction

The construction of residential housing remains one of the most dynamic sectors within the construction industry, in line with the increasing demand for proper housing. Among the various types of houses developed by contractors, Type 91 houses single-story residences with a floor area of 91 square meters have become a common choice. Although categorized as small to medium-scale projects, the construction of such homes still requires meticulous planning and control to ensure timely completion and adherence to the budget. Effective management is essential for ensuring efficiency, time control, and cost management. However, housing projects often face financial constraints, especially when budgets are poorly managed, which hampers the project's progress (Sigit *et al.*, 2024) ^[16].

In developing cities like Samarinda, the construction of single-story houses faces additional challenges due to the predominance of conventional methods and the limited use of digital technologies. To address this issue, project management software such as Microsoft Project serves as a suitable solution (Abdallah *et al.*, 2009) ^[1]. This application supports systematic scheduling, resource allocation, and project progress monitoring and evaluation (Hartono & Handayani, 2022) ^[2]. Research has shown that Microsoft Project can enhance the effectiveness of planning and control in construction projects (Kerzner, 2017) ^[5]. This aligns with the view of (Santoso *et al.*, 2014) ^[14], who emphasize that project success relies on achieving three key aspects time, cost, and quality which must be managed in an integrated manner to ensure that the project runs according to its targets.

In project control, a systematic approach is essential. According to (Mockler, 1972) ^[9] control involves systematic efforts to establish standards, design information systems, compare actual performance with standards, analyze deviations, and take corrective actions. This view highlights the importance of integrating planning and control in project management. Microsoft Project also supports the application of the Earned Value Analysis (EVA) method, which is effective in providing accurate information on project performance in terms of both time and cost (Jazir Alkas *et al.*, 2023) ^[3].

Additionally, critical path analysis using Microsoft Project can identify key activities that may cause delays, thus aiding timely decision-making (Tahrir *et al.*, 2023)^[19].

Thus, the implementation of Microsoft Project in single-story house construction projects not only improves managerial efficiency but also serves as a vital strategy to ensure that projects are executed according to plan with measurable control. In practice, projects are bound by the "triple constraints" of budget, schedule, and performance, which serve as primary parameters for evaluating project success (Soehartono, 2015)^[17]. The harmony between these three factors must be maintained to achieve optimal project outcomes, and the use of Microsoft Project has proven effective in managing construction project resources and improving scheduling efficiency and workforce distribution compared to traditional methods (Kamble & Patil, 2025)^[4]. Research by (Sunatha, *et al.*, 2023)^[18] also shows that Microsoft Project helps compare planning and resource realization, which in road construction projects significantly contributed to cost efficiency.

Although Microsoft Project has been widely used in construction project management, most previous research has focused on large to medium-scale projects, such as multi-story buildings and road infrastructure. For instance, a study by (Saputra, 2020)^[15] discusses project rescheduling in residential developments in general, but does not emphasize any specific house type. Similarly, (Jazir Alkas *et al.*, 2023)^[3] focused more on the application of Earned Value Analysis (EVA) in large-scale construction, without thoroughly discussing its effectiveness in small-scale housing projects. Currently, there is still a lack of studies specifically examining the use of Microsoft Project in small-scale housing construction projects, despite its potential in improving field activity efficiency and accuracy (Marbun, 2024)^[7]. In developing areas like Samarinda, the adoption of digital technologies in construction remains low, and project management continues to rely heavily on traditional methods. This situation highlights a gap in both academic literature and practical application, which this research aims to address.

This research seeks to evaluate the effectiveness of using Microsoft Project in planning and supervising the construction of a single-story Type 91 house in Samarinda. The main focus is on improving efficiency in scheduling, resource management, as well as monitoring and assessing project development. Therefore, this study is expected to provide practical contributions to housing project management in developing regions and expand the understanding of Microsoft Project's effectiveness in small to medium-scale construction projects.

2. Literature Review

1. A project is a series of activities planned and executed as a single unit. In the implementation of a project, funding sources are sought and utilized to achieve profit. The resources used in a project can include capital goods, land, semi-finished materials, raw materials, labor, and time. These resources, either partially or entirely, are used now with the hope of gaining greater benefits in the future (Wowor *et al.*, 2013)^[20].

2. The Role of Microsoft Project in Construction Project Scheduling has proven to be a highly effective tool in construction project management, especially in terms of scheduling and critical path identification. (Tahrir *et al.*,

2023)^[19] used Microsoft Project 2016 to analyze the critical path in a residential construction project. The use of this tool helps them identify tasks that require special attention to avoid delays. whereas (Maskur *et al.*, 2023)^[8] used Microsoft Project 2019 in the construction project of service rooms and a business center at SMK Muhammadiyah Kawali. This study reveals that the application of the Critical Path Method (CPM) through Microsoft Project can optimize the project duration from 182 days to 181 days, thereby increasing the efficiency of the execution time. According to (Mudhoffar & Prafitasiwi, 2024)^[10], control is necessary to anticipate the risk of delays and cost increases due to schedule adjustments. This is crucial for maintaining the efficiency of small and medium-scale projects, such as residential construction projects.

3. Project Management Construction is a complex process that involves planning, execution, and control to achieve the set objectives. According to (Kerzner, 2017)^[5], the application of effective project management can reduce the risk of delays and cost overruns. In the context of house construction, the use of project management tools such as Microsoft Project is very beneficial for designing realistic schedules and managing resources more efficiently.

4. The Importance of Time and Cost Control Analysis.

Time and cost control analysis not only serves to keep the project on track but also provides insights into operational efficiency. (Sari 2024)^[3] states that by routinely analyzing project performance, managers can identify issues earlier and take the necessary corrective actions. The selection of heavy equipment is carried out during the planning stage, where the type, quantity, and capacity of the equipment become determining factors. Not all heavy equipment can be used for every construction project; therefore, selecting the right equipment is very important. Mistakes in selecting heavy equipment can result in delays in project execution (Rostiyanti, 2002)^[12].

5. The Microsoft Project application uses basic concepts such as barcharts, CPM (Critical Path Method), and PDM (Precedence Diagram Method). Therefore, a scheduler needs to understand these three concepts before using this application. A good understanding will help prevent errors in using the application, which could have fatal consequences for project scheduling (Luthan, 2017)^[6]. In his research titled "Resource Management in Construction Project," (Othman *et al.*, 2014)^[11] explains that the construction industry has unique characteristics and always faces risks and uncertainties at every stage of its activity cycle. Therefore, resource management becomes very important in construction projects in order to achieve the set targets and objectives. The allocation of resources for project activities is crucial in order to meet the planned targets and schedule.

3. Research Method

This research uses a qualitative-descriptive approach aimed at deeply and systematically describing phenomena according to the context being studied. This approach was chosen because it is capable of capturing the nuanced, contextual, and complex nature of the data, and analyzing the application of the bottom-up approach in residential project planning as well as its impact on project supervision, time control, and budgeting. This approach was chosen because it

focuses on a deep understanding of real field practices as explained by (Salim *et al.*, 2023) ^[13]. This research was conducted on a single-story residential construction project of type 91 located in Samarinda. The project location is situated in a densely populated residential area. This construction project is part of an individual housing development designed to meet the needs of small families with a modern and functional design.

1. Research Subject Project manager, who is responsible for planning and supervising residential projects. The planning team, including architects and engineers involved in schedule preparation and cost estimation. Field workers who participate in the construction process.
2. Data Collection Techniques In-depth interviews: Conducted with project managers, planning teams, and field workers to explore their understanding of the bottom-up approach and their experiences in managing time, cost, and project supervision. Participatory observation: The researcher will be directly involved in the planning and execution process of the project to see the direct application of the bottom-up approach. Documentation study: Collecting project-related documents such as project schedules, cost budgets, and evaluation reports to analyze the alignment between project planning and execution.
3. Data Analysis Technique Coding: Marking interview and observation data based on main themes such as time management, project oversight, and budgeting. Categorization: Grouping relevant information for each theme to understand how the bottom-up approach is applied and its impact. Interpretation: Connecting the

findings with existing theories on project management and bottom-up planning, and drawing conclusions about the effectiveness of this approach in managing residential projects.

4. Validity and Reliability Source triangulation: Using various data sources (interviews, observations, documentation) to ensure the consistency of findings. Member checking: Presenting preliminary results to respondents to obtain confirmation or clarification regarding the findings that have been obtained.

4. Result

One of the important elements in project time management is setting a work calendar that aligns with the actual conditions on the ground. In the construction project of a single-story house type 91, the work calendar was prepared using Microsoft Project, taking into account effective working hours and national holidays. Based on the arrangements used, the working hours last for 8 hours per day, namely from 08:00–12:00 and 13:00–17:00. Effective working days are set from Monday to Saturday, while weekends (Sunday) and national holidays are designated as non-working days.

The use of the Change Working Time feature in Microsoft Project is utilized to include holidays and overtime hours, among others, into the project calendar. There are 9 national holidays that affect the progress of the project. These days are automatically avoided in the scheduling of activities, thereby reducing the risk of delays due to timing discrepancies. The existence of this configuration ensures that the project duration is more realistic and accurately reflects the available working time (Irianto *et al.*, 2024).

Here is the list of holidays included in the project calendar:

Change Working Time

For calendar: Microsoft Project Rumah 1 Lantai (Project Calendar) Create New Calendar ...

Calendar 'Microsoft Project ...' is a base calendar.

Legend:

- Working
- Nonworking
- 31 Edited working hours
- On this calendar:
- 31 Exception day
- 31 Nondefault work week

Click on a day to see its working times: Working times for 06 May 2025:

M	T	W	Th	F	S	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

Based on: Default work week on calendar 'Microsoft Project ...'.

Exceptions Work Weeks

	Name	Start	Finish
1	Maulid Nabi	16/09/2024	16/09/2024
2	Natal	25/12/2024	25/12/2024
3	Tahun Baru	01/01/2025	01/01/2025
4	Isra Miraj Nabi Muhammad SAW	27/01/2025	27/01/2025
5	Imlak	29/01/2025	29/01/2025
6	Nyepi	29/03/2025	29/03/2025
7	Idulfitri	30/03/2025	01/04/2025

Details... Delete

Fig 1.1: Holiday arrangements

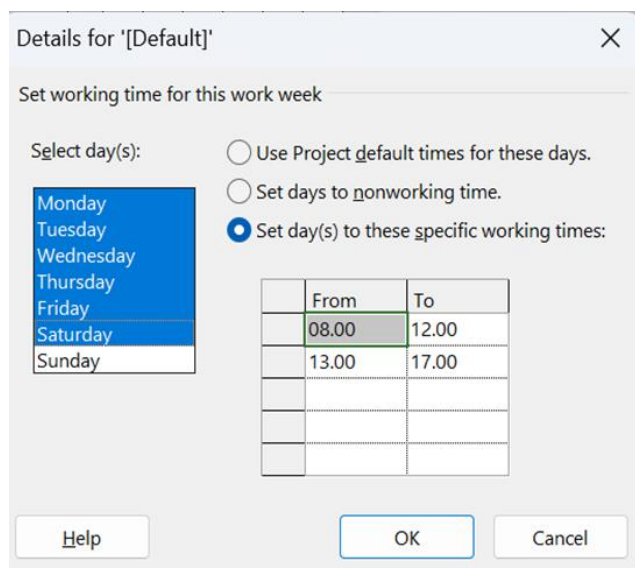


Fig 1.2: Of Operational Hours Settings

Thus, proper calendar management in Microsoft Project becomes a fundamental strategy in creating an efficient and accurate project schedule. This also supports the calculation of cost estimates based on the actual work duration. The construction project for a single-story type 91 house is scheduled to start on Monday, September 2, 2024, and is targeted to be completed on Tuesday, March 25, 2025. Based on the planning results in Microsoft Project, the total duration of the project is 171 working days. This duration has been adjusted according to the previously determined work calendar, which only counts effective working days and excludes holidays and weekends.

The determination of the project duration in this study reflects the actual time required to complete the entire series of activities, from the planning stage, execution, to final completion. By utilizing Microsoft Project, non-working days are automatically eliminated from the calculations, making the resulting time estimates more realistic and accurate for managerial purposes. Each task in this project is arranged sequentially and logically using a task dependency system, utilizing features such as activity relationships like:

- Finish to Start (FS) is commonly used, where a task cannot begin until the previous task is completed, just like foundation work must wait until measurements and land preparation are finished.
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- Additionally, Start to Start (SS) and Finish to Finish (FF) relationships are applied to several parallel activities to improve execution time efficiency, such as roofing work that can run concurrently with ceiling installation.

Additionally, Start to Start (SS) and Finish to Finish (FF) relationships are applied to several parallel activities to improve execution time efficiency, such as roof work that can run concurrently with ceiling installation. This approach allows Microsoft Project to automatically adjust the project schedule in case of duration changes, the addition of new activities, or modifications to working hours. Any changes that occur will directly impact the project's critical path, which is a series of activities that must not be delayed without

affecting the overall schedule.

The use of Microsoft Project allows for the identification of the critical path, which is a series of activities that have no slack (time flexibility) and greatly affect the total duration of the project, namely: Foundation → Columns → Beams → Brick Walls → Roofing → Ceiling Installation → Interior Painting. If any activity on this critical path is delayed, the entire project will be delayed as well. Therefore, activities on the critical path become the main focus in time monitoring. With the help of the Tracking Gantt Chart feature in Microsoft Project, an evaluation of the baseline schedule and actual progress is conducted. Simulation of duration adjustments on non-critical activities can reduce delay estimates by accelerating work through the addition of labor.

Days	Normal Working Hours	Overtime Work Hours
Monday - Thursday	08.00–12.00 13.00–17.00	18.45–20.00 20.30–00.00
Friday	08.00–12.00	-
Saturday	13.00–17.00	-
Sunday	08.00–12.00	-

With this system, project control becomes more structured, helping project managers monitor key activities, avoid task conflicts, and make quick adjustments to the schedule in case of delays or accelerations on the ground. With this system, project control becomes more structured, helping project managers monitor key activities, avoid task conflicts, and make quick adjustments to the schedule in case of delays or accelerations in the field. Analysis of Task Dependencies and Interrelationships in Project Schedules In a construction project, task dependencies are an important element in time planning. Data on this project shows that almost all tasks have predecessors, which means that each job is designed to follow a logical and interdependent work sequence.

Item Pekerjaan	Waktu (hari)	Predecessors		
		No. Pekerjaan	Type	Rentang Waktu
Pekerjaan Persiapan				
a Pembersihan Lahan	4			
b Pengukuran dan Pembuatan Bouwplank	5	1a	FS	0
c Mobilisasi Alat Kerja	2	1b	SS	0
d Demobilisasi Alat Kerja	2	10b.2	FS	0
Pekerjaan Tanah				
a Galian Tanah (Pondasi)	4	1b	FS	0
b Urugan Tanah (Sisi-Sisi Pondasi)	4	3a.3	FS	1
Pekerjaan Struktur				
a Pekerjaan Pondasi & Sloof				
a.1 Pemasangan Bekisting (Batako)	7	2a	FS	0
a.2 Pemasangan Besi	4	3a.1	FS	0
a.3 Pengecoran (Manual)	2	3a.2	FS	0
b Pekerjaan Kolom				
b.1 Pemasangan Bekisting (Triplek)	7	3b.2	FS	0
b.2 Pemasangan Besi	4	3a.3	FS	0
b.3 Pengecoran (Manual)	2	3b.1	FS	0
c Pekerjaan Balok				
c.1 Pemasangan Bekisting (Triplek)	7	3b.3	FS	0
c.2 Pemasangan Besi	4	3c.1	FS	0
c.3 Pengecoran (Manual)	2	3c.2	FS	0
d Pekerjaan Plat Lantai dasar				
d.1 Perataan Tanah area Lantai	4	8b.2	FS	0
d.2 Urugan Pasir (Dibawah Cor Lantai)	4	3d.1	FS	0
d.3 Pemasangan Besi	4	3d.2	FS	0
d.4 Pengecoran (Manual)	2	3d.3	FS	0
Pekerjaan Atap				
a Rangka Atap	10	3c.3	FS	3
		3d.4	FS	0
b Pemasangan seng	8	5b	FS	-1
		4a	FS	0

Fig 1.3: Item Pekerjaan dan Prodesesor

In Microsoft Project, there are several types of task dependencies. Based on the image and description provided, this project implements the following types of dependencies: FS (Finish to Start), SS (Start to Start), FF (Finish to Finish),

SF (Start to Finish). The use of FS and SS relationships indicates that project scheduling is designed not only linearly but also dynamically and efficiently, taking into account the need for time acceleration (fast-tracking) and resource efficiency. The use of Auto Schedule and Critical Path tracking in Microsoft Project provides significant advantages in project time management. With an automated, visual, and responsive system to changes, project managers can anticipate delays, set work priorities, and keep the project on schedule as planned.

This is very important for construction projects such as residential building, which usually have tight deadlines, limited resources, and high inter-departmental work dependencies. A schedule developed with a bottom-up approach in residential project planning provides a strong foundation for project oversight, time control, and budgeting. This approach allows direct involvement from all parties involved at every stage of the project, making time and budget estimates more realistic and aligned with field conditions. Thus, the use of this approach can improve accuracy in planning and minimize the risk of delays and cost overruns, allowing the project to run more efficiently and in accordance with the established objectives.

From the table above, it shows the workers' overtime hours for 9 days from February 10-20. With The workdays from Monday to Thursday are arranged with four work time slots, namely from 08:00–12:00, 13:00–17:00, and from 18:45–20:00, 20:30–00:00. This indicates that the project is designed to operate with high intensity and includes nighttime hours, which are usually used to meet tight deadlines. On the other hand, the workweek from Monday to Saturday has more conventional working hours, namely from 08:00–12:00 and 13:00–17:00, without any overtime. This pattern reflects a standard 8-hour workday approach and demonstrates stability and efficiency more suitable for long-term projects.

The difference in this arrangement indicates flexibility in project planning, where working hours are adjusted to the specific operational needs. Both work schedules can be applied strategically depending on the urgency and complexity of the managed project. In this type 91 house construction project, cost and time evaluations are conducted periodically using Microsoft Project. All project costs are calculated based on the initial estimates made at the beginning of the planning phase, which include material costs, labor, and other operational expenses. Any deviations from the predetermined budget are recorded and analyzed to determine the causes and possible solutions.

In addition, time control is carried out by monitoring each activity through the Cost Performance Index (CPI) and Schedule Performance Index (SPI) features. CPI provides information on whether the project is within the established budget, while SPI helps in measuring whether the project is following the planned schedule. By using these two indicators, project managers can make more accurate decisions to address any issues or delays that may arise during the project's execution. In the management of the type 91 house construction project, the use of Microsoft Project has proven to be very effective in improving efficiency in planning, time control, and budget management. With the baseline tracking feature, project managers can easily monitor deviations from the agreed-upon schedule and budget. If there are delays or cost overruns, adjustments can be made quickly to ensure the project stays within the

established time and budget constraints.

5. Conclusion

Based on the research and analysis that have been conducted, it can be concluded that the use of Microsoft Project in the construction project of a single-story type 91 house in Samarinda can enhance the effectiveness of time management and project control. With its various features, Microsoft Project enables precise planning, optimal resource management, and structured project monitoring. The bottom-up planning method and the use of tools such as critical path, SPI, and CPI make project management more flexible to changes occurring in the field. This research provides practical benefits for the management of small to medium-scale construction projects, especially in developing areas that still use little digital technology in project planning and supervision.

6. Thank-You Note

The author would like to express sincere gratitude to previous researchers for their contributions in developing project time planning and control methods, particularly those utilizing Microsoft Project software and approaches such as the Critical Path Method (CPM). Thanks to their findings, both I and other readers have gained a deeper understanding of the importance of time management in construction projects.

The knowledge derived from earlier studies serves as a strong foundation for this article, which aims to analyze time control efficiency in the construction of a one-story type 91 house. It is hoped that this research will offer further insights into the practical application of systematic and effective project time management, and assist construction practitioners in planning realistic work durations that are adaptive to real site conditions.

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