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Reducing Deviations in Weekly Scheduling At the Finishing Stage of Multi-Family Buildings by Implementing a Model Guide for Digital Agreement Management

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Abstract **-** The article addresses the problem of deviations in the weekly schedule during the finishing stage of multifamily projects. The lack of effective methodologies to manage agreements between stakeholders generates delays, cost overruns and coordination problems. A model guide for the digital management of agreements was developed and implemented, using the ClickUp tool to record, assign and track commitments in real time. After its application, an increase in compliance with planned activities (77.27%), a reduction in rescheduling (18.18%) and an increase in the productivity of key stakeholders was observed. The results demonstrate that the digitization and structuring of agreements significantly improves efficiency and coordination in the critical stages of the project.

Keywords**:** Digital management, agreements, weekly scheduling, multifamily construction, coordination

1. Introduction

The construction industry faces significant challenges due to the lack of effective methodologies for monitoring agreements among stakeholders, which results in coordination problems, delays, and cost overruns in building projects [1]. The implementation of systems that strengthen resource management is crucial, as meeting agreements contributes to the optimization of costs, quality, and execution times [2]. Based on this premise, the absence of formal structures for managing agreements is identified as a critical obstacle affecting the efficiency of construction projects.

Recent studies indicate that 71.75% of delays in private projects are linked to non-compliance with commitments made during stakeholder meetings, with communication issues and a lack of oversight being the primary causes of these delays [3]. Active participation and stakeholder engagement, defined as individuals with a direct interest in the project's success [4], are essential to ensure that activities are carried out according to the schedule and objectives set. In this context, Estrada [5] emphasizes that regular meetings allow for the establishment of clear commitments that align stakeholders toward achieving set goals. However, the lack of specific tools to document and adequately monitor these agreements limits the effectiveness of this process. In many projects, monitoring is conducted verbally or through unsystematic records, which impedes clear visualization of progress and accountability, resulting in operational inefficiencies [6].

Based on these findings, various studies have explored solutions to improve compliance with agreements and coordination among stakeholders in construction projects. Ulhaq [7] highlights the importance of continuous stakeholder engagement through training and adaptation, as informed participation optimizes project execution. Similarly, Daoud [8] identifies issues such as changes in project scope, poor communication, and lack of coordination as key causes of cost overruns and delays in construction, negatively impacting workflows during critical project stages. These findings underline the need for effective tools to monitor agreement compliance and reduce schedule deviations.

To improve accuracy in agreement monitoring, Basheer [9] proposes incorporating blockchain as a system to increase transparency and traceability in the material supply chain. By using blockchain, stakeholders can visualize and control the status of resources in real time, promoting greater collaboration and reducing the potential for conflicts. Likewise, Lou and Lu [10] have developed a framework to verify the authenticity and integrity of construction information, facilitating more reliable data management—a crucial factor for ensuring compliance with agreements and reducing risks in the project's final stages.

Another technological proposal applied to agreement control is the integration of Building Information Modeling (BIM) with Lean methodologies and sustainability approaches, which Mellado and Lou [11] suggest as an efficient strategy to

maximize accuracy and efficiency in construction. By implementing BIM, workflows can be managed and visualized in real time, enabling stakeholders to meet their commitments more effectively. Furthermore, Bakhshi [12] proposes combining Design for Manufacture and Assembly (DfMA) with BIM as a framework that allows stakeholders to customize and adapt prefabricated elements to a defined schedule, enhancing participation and minimizing errors. These integrated management technologies have proven to be a promising solution for reducing deviations by enabling constant and detailed monitoring of project progress.

This article proposes a model guide for the digital management of agreements during the finishing stage of multifamily buildings. The implementation of this guide aims to provide a clear framework that facilitates the recording, monitoring, and fulfillment of agreements reached during site meetings, ensuring that all parties involved work in a coordinated and efficient manner. According to Doukari [13], the lack of coordination in renovation projects can be mitigated through digital platforms that centralize information, enabling smooth communication among stakeholders.

The main objective of this article is to provide a model that not only addresses current deficiencies in agreement monitoring but also focuses specifically on ensuring weekly schedule compliance during the finishing stage, where the largest number of subcontractors coincide. This approach seeks to implement information technologies that have proven effective in improving operational efficiency in construction [14]. By adopting this proposal, building projects are expected to significantly reduce schedule deviations, thereby ensuring stakeholder satisfaction and greater traceability of commitments.

2. Methodology

In this paper, a study was conducted on three multi-family construction projects in Metropolitan Lima, managed by medium-sized companies. These projects were selected for their representativeness in terms of complexity and construction characteristics. The choice of these private, multi-family projects was driven by the need to study stakeholder interaction in a context where efficiency and the fulfillment of agreements were crucial.

2.1. Data Collection Instruments

To assess the current state of agreement management and stakeholder involvement, the following data collection instruments were used:

- Meeting minutes: These minutes provided detailed information about the agreements made, the participants, and the progress status at each meeting. This instrument was essential for evaluating how commitments had been managed in previous meetings and identifying patterns of compliance or non-compliance with agreements.
- Interviews with resident engineers: Interviews were conducted with the resident engineers of each project, who provided key information about the project's development, challenges in fulfilling agreements, and their perception of the effectiveness of the tracking tools used.
- Lookahead: This tool allowed the visualization of the record of observations and the status of daily activity compliance in the project. Its use facilitated the identification of issues or delays, although it was not ideal for agile and continuous tracking of tasks and commitments.

2.2. Problem Indicators

To measure the problem addressed in this paper, the following indicators were proposed:

- Indicator of timely completed activities: This indicator measures the percentage of weekly scheduling agreements completed on the scheduled date, focusing on the finishing stage. Equation (1) shows its calculation, where A represents the number of agreements completed within the week's deadline, B is the total number of scheduled agreements, and C is the calculated indicator.
- Indicator of rescheduling in weekly scheduling: This evaluates the stability of the weekly schedule during the finishing stage, considering that rescheduled agreements are those that were not completed by the scheduled date. Equation (2) shows its calculation, where E represents the number of rescheduled agreements, D is the total number of agreements scheduled for the week, and F is the calculated indicator.

– Stakeholder productivity indicator: This measures the number of agreements completed on the agreed date compared to the number of agreements scheduled for each stakeholder involved in the project. A higher index indicates better coordination and compliance with activities. Equation (3) shows its calculation, where G represents the number of agreements completed, H is the total number of agreements scheduled for each stakeholder, and I is the calculated indicator.

$$\frac{A}{B} \times 100 = C \quad (1)$$

$$\frac{E}{D} \times 100 = F \quad (2)$$

$$\frac{G}{H} \times 100 = I \quad (3)$$

A model guide for digital agreement management was developed to enhance agreement tracking and stakeholder involvement in multi-family projects managed by medium-sized companies in Metropolitan Lima. Implemented in a project during its finishing stage, the guide integrates real-time monitoring and feedback, reducing omissions and preventing deviations in the weekly schedule.

3. Tool

ClickUp was chosen as the primary tool for implementing the model guide due to its flexibility, visual tracking capabilities, and adaptability to collaborative projects. ClickUp enabled the customization of workflows, task assignments, and the generation of graphical reports on progress and agreement compliance. Additionally, its intuitive interface and integration options with other applications facilitated its adoption by construction teams. The ability to record agreements, assign responsibilities, and set deadlines made ClickUp a suitable solution to improve transparency and the fulfillment of commitments made during meetings.

Based on this, the guide for digital agreement management was developed and the implementation process of the model guide was structured into three phases.

3.1. Before the meeting

– Designation of the software manager: A ClickUp manager was assigned to handle the software, record agreements, and keep information up to date.
– Meeting scheduling: The manager scheduled the meetings and sent invitations to all stakeholders, including an agenda that covered the review of previous agreements and the discussion of new commitments.
– Preparation of the workspace in ClickUp: Before the meeting, the manager updated the agreement management board with information from previous meetings, the status of agreements, and assigned tasks. General meeting information and participant details were also recorded, as shown in Figures 1a and 1b.

3.2. During the meeting

– Recording agreements and assigning tasks: The software was used to document agreements reached, assign tasks, and set specific deadlines, as illustrated in Figure 2a. This detailed record facilitated transparency in task distribution and ensured a visual tracking of progress.
– Review of previous agreements: Agreements established in previous meetings were reviewed, assessing their status (completed, in progress, or not started) and discussing possible solutions for delays or encountered challenges.

3.3. After the meeting

– Continuous monitoring of agreements: The ClickUp manager updated the status of agreements daily and generated progress reports shared with stakeholders, as shown in Figure 2b. These reports allowed stakeholders to monitor deadline compliance and make necessary adjustments in real time.

– Compliance analysis and feedback: A preliminary analysis of agreement compliance was conducted at the end of each meeting cycle, identifying achievements and areas for improvement. This feedback was crucial for refining the process and optimizing management in future meetings.

This comprehensive methodology ensured a structured and collaborative management of agreements, promoting effective communication and commitment compliance in multifamily construction projects.

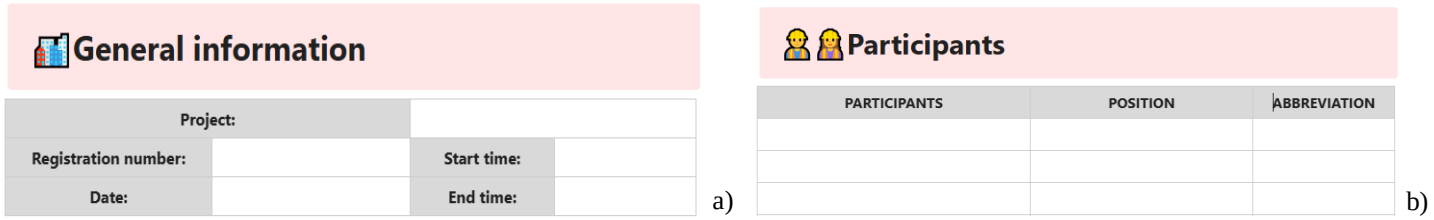

Fig. 1: (a) General information record; (b) participant record.

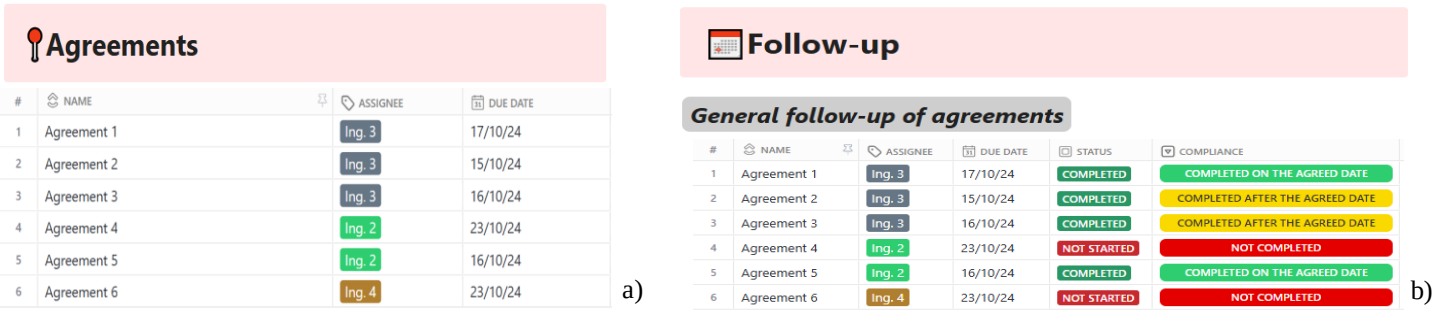

Fig. 2: (a) Agreement record; (b) agreement tracking.

4. Implementation

The model guide was implemented in the Altuars Project, selected due to its status as a multifamily building in the finishing stage and the complexity of coordination among various stakeholders. The implementation aimed to validate the guide's effectiveness in optimizing commitment management, promoting transparency in agreement tracking, and ensuring compliance with established deadlines. This intervention specifically targeted reducing deviations in weekly scheduling during the finishing phase, thereby contributing to improvements in the planning and execution of key activities.

As part of the implementation, general meeting information (Figure 3a), participant details (Figure 3b), and the agreements reached (Figure 4) were recorded.

Fig. 3: (a) General information of the implementation; (b) participants of the implementation.

Agreements

#	NAME	ASSIGNEE	DUE DATE
1	Installed 2nd Floor laundry doors	M y M SAC	21/10/24
2	Provide the date of the bathroom furniture	M y M SAC	21/10/24
3	Arrival of kitchen base units on the 7th and 8th floors	MDA	21/10/24
4	Arrival of wallpaper	Arquitecta	21/10/24
5	Entry of new staff for talks	FIVAN	21/10/24
6	Arrival of 9th floor bathroom granite panels	C Y S	22/10/24
7	Entry of 4 new people for 2nd coat of paint	Chachi SAC	23/10/24
8	Arrival of granite countertops for the 10th floor bathroom	C Y S	28/10/24
9	Installed floor paper 3 and 4	FIVAN	26/10/24
10	Plan for roof veneer	Arquitecta	26/10/24
11	Veneer delivery up to the 12th floor	SYPSO SAC	26/10/24
12	First-hand preview (12th and 13th floor)	Chachi SAC	26/10/24
13	Fine filler progress (15th floor)	Chachi SAC	26/10/24
14	Arrival of kitchen boards from the 7th and 8th floor	C Y S	25/10/24
15	Thick filler progress (16th floor)	Chachi SAC	26/10/24
16	Arrival of tall kitchen furniture from the 7th and 8th floors	MDA	23/10/24
17	Arrival of kitchen boards from the 6th floor	C Y S	23/10/24
18	Paper installers entry	FIVAN	23/10/24
19	Kitchen trap arrival	Alex Cone	23/10/24
20	Plan for cladding balconies	Arquitecta	23/10/24
21	Bring closet material from Floor 5 and 6	M y M SAC	24/10/24
22	Arrival of bathroom furniture from the 2nd to the 5th floor	M y M SAC	25/10/24

Fig. 4: Agreements of the implementation.

5. Results

The following results were obtained after implementing the model guide for the digital management of agreements in the finishing stage of a multifamily project. Figure 5 presents the tracking and fulfilment of the agreements established during site meetings, reflecting the guide's impact on participant organization and accountability. Meanwhile, Figures 6a and 6b display the values achieved for each of the defined performance indicators: activities completed on time, rescheduling in weekly planning, and stakeholder productivity.

Table 1 shows that the percentage of activities completed on time reached a value of 77.27%. This indicator demonstrates the guide's capacity to promote compliance with the agreements scheduled in each meeting, ensuring that activities are carried out within the stipulated time.

Regarding the indicator of rescheduling in weekly planning, a value of 18.18% was recorded. This reduction in rescheduling implies greater stability in weekly planning, achieving continuous workflow without significant interruptions.

Finally, the stakeholder productivity indicator yielded varying results. The Architect achieved a compliance rate of 33.33%, while subcontractors such as M Y M SAC, MDA, Chachi SAC, and SYPSO SAC achieved a 100% compliance level, evidencing high levels of commitment and agreement fulfilment. Other participants, such as FIVAN and C Y S, achieved 66.67% and 75%, respectively, highlighting variability in compliance levels and the guide's effectiveness in facilitating coordination among diverse stakeholders.

General follow-up of agreements

#	NAME	ASSIGNEE	DUE DATE	STATUS	COMPLIANCE
1	Installed 2nd Floor laundry doors	M y M SAC	21/10/24	COMPLETED	COMPLETED ON THE AGREED DATE
2	Provide the date of the bathroom furniture	M y M SAC	21/10/24	COMPLETED	COMPLETED ON THE AGREED DATE
3	Arrival of kitchen base units on the 7th and 8th floors	MDA	21/10/24	COMPLETED	COMPLETED ON THE AGREED DATE
4	Arrival of wallpaper	Arquitecta	21/10/24	COMPLETED	COMPLETED AFTER THE AGREED DATE
5	Entry of new staff for talks	FIVAN	21/10/24	COMPLETED	COMPLETED ON THE AGREED DATE
6	Arrival of 9th floor bathroom granite panels	C Y S	22/10/24	COMPLETED	COMPLETED ON THE AGREED DATE
7	Entry of 4 new people for 2nd coat of paint	Chachi SAC	23/10/24	COMPLETED	COMPLETED ON THE AGREED DATE
8	Arrival of granite countertops for the 10th floor bathroom	C Y S	28/10/24	COMPLETED	COMPLETED ON THE AGREED DATE
9	Installed floor paper 3 and 4	FIVAN	26/10/24	COMPLETED	COMPLETED AFTER THE AGREED DATE
10	Plan for roof veneer	Arquitecta	26/10/24	NOT STARTED	NOT COMPLETED
11	Veneer delivery up to the 12th floor	SYPSO SAC	26/10/24	COMPLETED	COMPLETED ON THE AGREED DATE
12	First-hand preview (12th and 13th floor)	Chachi SAC	26/10/24	COMPLETED	COMPLETED ON THE AGREED DATE
13	Fine filler progress (15th floor)	Chachi SAC	26/10/24	COMPLETED	COMPLETED ON THE AGREED DATE
14	Arrival of kitchen boards from the 7th and 8th floor	C Y S	25/10/24	COMPLETED	COMPLETED ON THE AGREED DATE
15	Thick filler progress (16th floor)	Chachi SAC	26/10/24	COMPLETED	COMPLETED ON THE AGREED DATE
16	Arrival of tall kitchen furniture from the 7th and 8th floors	MDA	23/10/24	COMPLETED	COMPLETED ON THE AGREED DATE
17	Arrival of kitchen boards from the 6th floor	C Y S	23/10/24	COMPLETED	COMPLETED AFTER THE AGREED DATE
18	Paper installers entry	FIVAN	23/10/24	COMPLETED	COMPLETED ON THE AGREED DATE
19	Kitchen trap arrival	Alex Cone	23/10/24	COMPLETED	COMPLETED AFTER THE AGREED DATE
20	Plan for cladding balconies	Arquitecta	23/10/24	COMPLETED	COMPLETED ON THE AGREED DATE
21	Bring closet material from Floor 5 and 6	M y M SAC	24/10/24	COMPLETED	COMPLETED ON THE AGREED DATE
22	Arrival of bathroom furniture from the 2nd to the 5th floor	M y M SAC	25/10/24	COMPLETED	COMPLETED ON THE AGREED DATE

Fig. 5: Monitoring of the implementation.

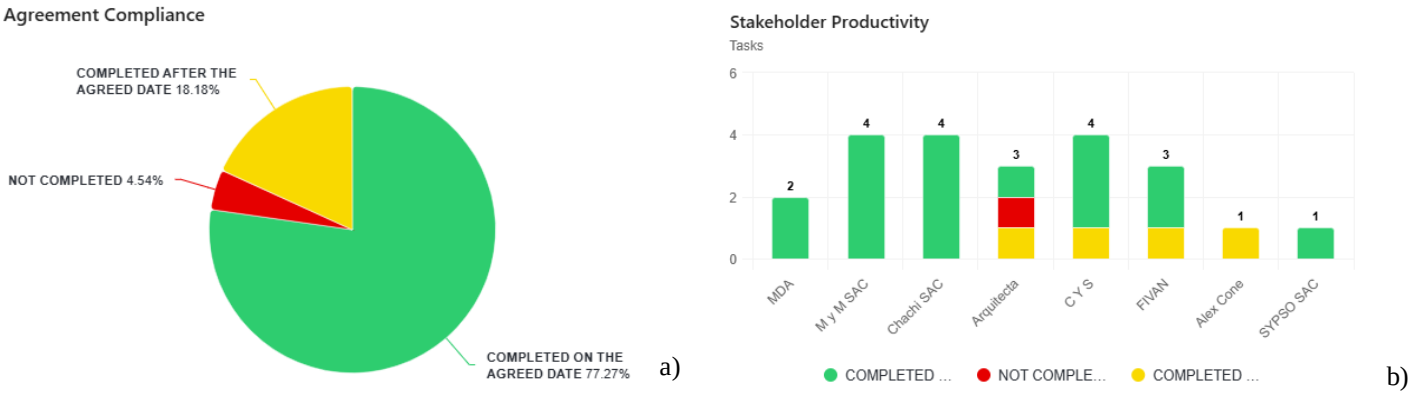

Fig. 6: (a) Results of agreement compliance; (b) results of stakeholder productivity.

Table 1: Summary of indicators.

Indicator	Percentage
Activities completed on time	77.27%
Rescheduling in weekly schedule	18.18%
Stakeholders' productivity	Architect: 33.33% M Y M SAC: 100% MDA: 100% FIVAN: 66.67% Chachi SAC: 100% C Y S: 75% SYPSO SAC: 100% Alex Cone: 0%

6. Results analysis

The implementation of the model guide for the digital management of agreements during the finishing stage demonstrated significant improvements in performance indicators compared to previous values (Table 2). Since this phase is particularly complex due to the simultaneous participation of multiple subcontractors, the guide allowed for more effective coordination, minimizing deviations in the weekly schedule.

The indicator for activities completed on time increased from 68.29% to 77.27%, reflecting the guide's success in facilitating the fulfillment of agreements despite the challenges of this stage. However, supply delays, such as the late arrival of wallpaper, impacted the schedule, highlighting the need to anticipate and mitigate logistical issues that affect deadline compliance.

The percentage of rescheduled tasks also decreased from 31.71% to 18.18%, indicating greater stability in weekly planning. This improvement was achieved through a structured framework for managing and monitoring commitments, allowing early resolution of issues before they disrupted the schedule. The reduction in rescheduling is particularly beneficial in the finishing stage, where activities must follow a precise sequence to avoid cumulative delays.

Regarding stakeholder productivity, notable variations were observed. Subcontractors such as M Y M SAC, MDA, Chachi SAC, and SYPSO SAC achieved 100% compliance, while the architect, responsible for coordinating and supervising subcontractors, had a low compliance rate of 33.33%, which may have limited the guide's effectiveness. Similarly, FIVAN recorded a 66.67% compliance rate, showing room for improvement in aligning its activities with the overall schedule. These results underscore the need to strengthen communication and support for these key roles to optimize decision-making and minimize deviations during the project's final stage.

Table 2: Results summary.

Implementation results		
Indicator	Before implementation	After implementation
Activities completed on time	68.29%	77.27%
Rescheduling in weekly schedule	31.71%	18.18%
Stakeholders' productivity	-	Architect: 33.33% M Y M SAC: 100% MDA: 100% FIVAN: 66.67% Chachi SAC: 100% C Y S: 75% SYPSO SAC: 100% Alex Cone: 0%

7. Conclusion

This paper demonstrates the effectiveness of a model guide for digital agreement management in reducing deviations during the finishing stage of multi-family building projects. By utilizing digital tools, the guide enhances coordination and compliance, addressing challenges arising from simultaneous activities managed by multiple subcontractors.

Results show improved project performance, with planned activity compliance rising from 68.29% to 77.27%, and rescheduling rates decreasing from 31.71% to 18.18%. These outcomes highlight the importance of structured agreement management in maintaining workflow stability, particularly in phases requiring precise coordination.

The digital platform enables centralized information management, real-time tracking, and transparent accountability, minimizing delays and rescheduling. This fosters a collaborative culture among stakeholders, ensuring commitments are met.

Additionally, variability in stakeholder performance suggests the need for tailored strategies like training and role reinforcement. Addressing these gaps will further improve the guide's impact and stakeholder contribution.

In conclusion, this study confirms that digitalizing agreement management is a practical solution for improving efficiency and reducing risks in construction projects. The proposed guide sets the foundation for better planning, coordination, and sustainability, supporting the industry's growing demands for quality and performance.

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