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Organizational Models for Managing Parallel Construction Projects in Regional Development

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ABSTRACT

This article addresses the problem of managing parallel construction projects within the context of regional development. The study was conducted as a systematic review of scientific publications and aims to identify organizational mechanisms that ensure the coordinated implementation of a large number of interrelated construction projects. Particular attention is given to the transformation of management challenges when moving from individual projects to construction programs and project portfolios. A comprehensive analysis of contemporary approaches to resource coordination, project management office organization, portfolio management, and digital integration of construction processes was carried out. The findings indicate that as the number of simultaneously implemented projects increases, the primary management challenge gradually shifts from the level of individual projects to the level of inter-project coordination. It is demonstrated that neither complete project autonomy nor rigid centralized control can fully address the complexities of a multi-project environment. Based on the analysis, the author developed the Hybrid Multi-Site Construction Management Model, which combines centralized construction portfolio coordination, autonomous site-level management, and a unified information environment. The proposed model extends existing perspectives on organizational principles for multi-project construction management and may be applied in the planning and implementation of regional development programs. The article may be of interest to construction company executives, project management professionals, regional development program managers, and researchers in the field of construction management.

Keywords: regional development, construction projects, multi-project management, construction portfolio, project coordination, resource allocation, organizational models.

INTRODUCTION

Regional development is increasingly implemented through the simultaneous construction of multiple facilities with different functions, located across various territories and connected by a common regional transformation strategy (Alghaseb & Alali, 2024). The geographical dispersion of construction sites complicates stakeholder coordination, hinders project monitoring, and intensifies competition among projects for limited resources. The situation becomes even more challenging when several projects rely on shared human, financial, or technical resources. Under such conditions, organizational effectiveness is determined not only by the performance of individual projects but also by the ability to manage the entire portfolio as an integrated system (Ding et al., 2024).

Despite the large body of research on construction management, most studies focus either on individual projects or on digital decision-support tools (Jiang et al., 2024). Organizational models for managing multiple parallel construction projects within regional development programs remain considerably less explored. A particularly noticeable gap exists

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in studies that simultaneously address site-level managerial autonomy, centralized resource allocation, and unified coordination mechanisms. Some researchers emphasize the need for stronger centralized control through project management offices, whereas others highlight the importance of flexibility and the autonomy of project teams (Gómez-Cabrera et al., 2025). The question of how these approaches can be integrated within a single organizational system remains unresolved.

The purpose of this study is to develop and theoretically substantiate an original organizational model for managing parallel construction projects in the context of regional development. To achieve this objective, the following research tasks are addressed:

– to analyze existing organizational approaches to managing multiple construction projects;

– to identify the main coordination mechanisms used in regional construction programs;

– to examine the role of portfolio management, digital integration, and resource allocation in a multi-project environment;

– to identify the factors determining the effectiveness of managing geographically distributed construction sites.

The research hypothesis is that the effectiveness of managing parallel construction projects increases when autonomous site-level management is combined with centralized resource coordination, standardized management procedures, and a unified control system. Insufficient coordination intensifies competition among projects for limited resources and reduces the overall performance of the construction program, whereas coordinated management contributes to the more efficient implementation of regional development projects.

The scientific novelty of the study lies in the systematization of contemporary organizational models for multi-project construction management, the integration of portfolio, digital, and coordination-based approaches within a unified management concept, and the development of an original hybrid model for managing geographically distributed construction sites. Unlike existing studies, which typically focus on individual coordination mechanisms, digitalization tools, or resource management practices, the present research offers a holistic perspective on the interaction between organizational structures, information systems, and inter-project coordination mechanisms in the context of regional development.

MATERIALS AND METHODS

The study is based on methods of theoretical literature analysis, comparative analysis of organizational approaches to construction program management, and conceptual synthesis of findings reported in previous research. Particular attention was given to mechanisms for coordinating parallel construction projects, resource allocation among construction sites, stakeholder interaction, and the use of digital management tools.

The literature search was conducted using the Google Scholar, ScienceDirect, SpringerLink, and MDPI databases. Various combinations of the following keywords were applied: “parallel construction projects,” “construction portfolio management,” “project management office,” “regional development,” “multi-project management,” “construction program management,” “resource allocation,” “construction coordination,” “digital construction management,” “BIM,” “ERP,” “Construction 4.0,” “digital twin,” “Lean Construction,” and “organizational models.” Logical operators AND and OR were used to refine the search results. The review included English-language publications published between 2022 and 2026 that contained empirical evidence, analytical reviews, or conceptual models related to the management of multiple construction projects. Studies focusing exclusively on technical aspects of individual construction operations without addressing organizational management mechanisms were excluded from further analysis.

At the initial stage, 38 publications addressing construction program management, multi-project coordination, digitalization, and resource allocation were identified. After excluding studies that did not correspond to the research objectives and publications with a narrow technical focus, the final sample consisted of 15 studies. Their analysis made it possible to identify four major groups of factors: organizational coordination, resource management, digital process integration, and strategic construction portfolio management. The findings indicate that the effectiveness of parallel project implementation is primarily determined by the quality of coordination among projects, the ability of the organizational system to ensure coherent resource allocation, and the achievement of common regional development objectives.

Several limitations of the study should also be acknowledged. A substantial proportion of contemporary publications focuses either on specific construction management technologies or on the analysis of individual projects. Studies examining organizational models for managing multiple construction sites as an integrated system remain comparatively limited. Furthermore, many researchers investigate digital tools, planning methods, and resource allocation practices separately. Nevertheless, the selected publications cover the principal directions of development in contemporary organizational management models and provide a sufficient theoretical foundation for the development of the proposed model for managing parallel construction projects in regional development contexts.

RESULTS

A comparison of the reviewed sources indicates that the nature of management tasks changes significantly when multiple construction projects are implemented simultaneously. Within an individual project, managerial attention is typically focused on schedule, cost, and quality performance. This is generally sufficient. However, as the number of projects increases, the situation becomes fundamentally different. Managers must consider not only the status of each project but also the relationships among them. The number of these interdependencies grows rapidly. Shared contractors, overlapping schedules, and the joint use of equipment and specialized personnel gradually create a complex network of interactions that extends beyond the scope of traditional project management approaches (Berge et al., 2025).

An important observation is that organizational complexity does not increase linearly. The volume of construction activities grows progressively, whereas the number of inter-project relationships expands at a much faster rate. This is where problems begin to emerge that are rarely visible at the level of an individual construction site. A delay in material delivery for one project may affect contractor utilization on another. The reallocation of specialists can alter completion schedules across several projects simultaneously. As a result, many deviations that initially appear to be local issues actually reflect the condition of the entire construction program. At this stage, the primary object of management is no longer the individual project but the relationships among projects (Chen et al., 2025).

The analysis of multi-project environments reveals another important characteristic. As the number of projects increases, the origin of major risks begins to shift. At the level of an individual project, risks are typically associated with schedule performance, construction costs, or quality outcomes (Machado et al., 2023). Such risks are well documented in the project management literature. However, when multiple projects are implemented simultaneously, the situation becomes considerably more complex. A significant share of problems emerges not within projects but between them. These issues may result from overlapping resource demands, changing construction priorities, or the need to redistribute managerial attention. Consequently, risk gradually extends beyond the boundaries of individual projects and begins to affect the entire regional development program (Berge et al., 2025).

Resource management provides another illustrative example. Nearly all reviewed studies identify the allocation of limited resources as one of the most challenging aspects of multi-project management (Alghaseb & Alali, 2024). Importantly, this challenge extends far beyond financial resources alone. In practice, shortages more frequently involve skilled personnel, construction equipment, subcontractors, and managerial expertise. When the number of projects is relatively small, such constraints usually remain localized. As the number of projects grows, hidden competition for resources begins to emerge. This competition rarely manifests itself directly. More often, its effects become visible later through schedule delays, changes in work sequencing, or a decline in overall program controllability. Therefore, the effectiveness of a construction program depends not only on the volume of available resources but also on the organization's ability to allocate them efficiently across interconnected projects.

As the number of projects increases, another issue begins to emerge that is often overlooked during the early stages of construction programs. This issue concerns differences in management procedures. When only a few projects are involved, each team may rely on its own approaches to planning, reporting, and performance monitoring without creating significant difficulties. The situation changes when projects become part of a unified program. Even minor differences in reporting formats, decision-approval procedures, or control mechanisms gradually complicate coordination among projects (Keleş et al., 2025). Management teams must spend increasing amounts of time reconciling information received from different projects. Consequently, large-scale construction programs place greater importance on standardized management procedures that allow multiple projects to be treated as components of a single system rather than as a collection of independent initiatives. Table 1 presents the factors most frequently identified as drivers for the implementation of centralized construction project management mechanisms.

Table 1: Most Significant Factors Driving the Implementation of a Centralized Construction Project Management System (Alghaseb & Alali, 2024)

Factor	Average Score
Insufficiency of the Project-Based Approach	8,79
Low Project Performance	8,71
Shortage of Qualified Personnel	8,64
Lack of Standardized Processes	8,50
Insufficient Strategic Management	8,43
Inefficient Resource Allocation	8,29

The data presented in the table reveal an interesting feature. Among the factors that most frequently encourage organizations to establish centralized management mechanisms, issues directly related to construction activities are almost absent. The discussion does not concern construction technologies or the technical characteristics of facilities. The main challenges arise at the coordination level. It is here that difficulties emerge in resource allocation, decision alignment, and maintaining a unified implementation strategy across the program. This pattern suggests that as the number of projects increases, effectiveness becomes less dependent on the performance of individual facilities and more dependent on the quality of interaction among them.

At the same time, the findings do not provide grounds for viewing centralization as a universal solution. A number of studies emphasize the importance of preserving the autonomy of construction site managers when addressing day-to-day operational tasks (Garcés et al., 2025). Site managers understand local construction conditions better than anyone else and are able to respond more quickly to changing circumstances. However, as the number of projects grows, there is an increasing need for mechanisms that allow such decisions to be coordinated at the level of the entire program. Therefore, the central issue is not the choice between centralization and autonomy. Much more important is identifying the point at which local independence ceases to enhance effectiveness and begins to complicate coordination.

Another trend also becomes apparent. Organizational models evolve together with the growing scale of construction activity. Initially, management is concentrated on an individual project. Subsequently, the need arises to coordinate several projects simultaneously. The next stage is associated with managing the entire construction portfolio. Ultimately, a unified coordination environment is formed in which projects are viewed not as independent entities but as components of a broader system (Berge et al., 2025). Within this system, particular importance is attached to the ability to coordinate decisions among projects located in different territories, sharing common resources, and participating in the implementation of a single regional development program.

The analysis of contemporary organizational models demonstrates that the spread of digital technologies in construction is closely associated with the growing complexity of multi-project management. At first glance, it may appear that digitalization is driven primarily by the emergence of new technological solutions. The findings of this study suggest a somewhat different picture. As the number of projects increases, traditional coordination mechanisms come under increasing pressure. The volume of information grows. The number of participants increases. More interdependencies emerge among projects. Under such conditions, organizations find it increasingly difficult to maintain consistency in decision-making solely through conventional management procedures.

This tendency is particularly evident in programs that combine several construction sites. Each decision affects multiple processes simultaneously. Changes in work schedules influence material deliveries. The reallocation of equipment affects contractor workloads. Adjustments to the timeline of one facility may require revisions to plans at other sites. When only a few projects are involved, such issues are usually resolved locally. However, in a multi-project environment, the volume of information begins to grow faster than the management system’s ability to process it. It is at this point that delays, conflicts between organizational units, and inconsistencies in the actions of construction stakeholders begin to emerge (León-Romero et al., 2024).

Against this background, particular importance is attached to models based on the integration of building information modeling and enterprise resource management systems. Their role is not limited to the automation of individual operations. Something else is far more important. These solutions make it possible to integrate data on construction activities, resources, and project schedules within a unified management environment. As a result, decisions can be coordinated across different facilities and program participants without the need for continuous expansion of the management structure. The results of ERP and BIM integration in construction organizations are presented in Table 2.

Table 2: Effects of ERP–BIM Integration on Construction Processes (Junussova et al., 2022)

Performance Indicator	Value (%)	Impact
Reduction of pre-contract work duration	22	Improved project preparation
Reduction of non-value-adding activities	47	Lower organizational waste
Share of lifecycle costs affected by integration	60	Long-term management optimization

The significance of digital systems extends far beyond the automation of individual operations. Their primary role is associated with organizing interaction among projects. The greater the number of projects being implemented simultaneously, the more difficult it becomes to maintain consistency in decisions made at different levels of management. Under such conditions, the speed of information exchange becomes no less important than resource availability or the production capabilities of contractors. In essence, integrated digital systems become part of the coordination mechanism of a construction program. They enable organizations to identify emerging conflicts more quickly, compare data from different projects, and maintain a unified view of the status of the entire program (Junussova et al., 2022).

A similar logic can be observed in other contemporary approaches to construction management. Lean Construction places primary emphasis on the alignment of stakeholder actions and the continuity of work processes (Jajac, 2025). The concept of digital twins is focused on the continuous updating of information regarding project implementation and the current condition of facilities. Approaches commonly grouped under the concept of Construction 4.0 seek to connect data that previously existed in isolation and were used independently by different organizational units (Qadir et al., 2026). Despite differences in tools and technologies, all of these models essentially address the same challenge. They reduce the number of disconnects between projects, departments, and construction stakeholders.

Interestingly, a comparison of the reviewed sources suggests that digitalization appears not as the cause of organizational change but rather as its consequence. As long as an organization manages a relatively small number of projects, existing coordination mechanisms are generally sufficient. The situation changes as the construction program expands. The number of interdependencies increases. The burden on the management system grows. A need emerges for continuous data exchange among projects and for a unified information environment. Therefore, the spread of digital technologies in construction largely reflects an attempt to adapt organizational structures to the increasing scale and complexity of multi-project management.

DISCUSSION

The conventional view of construction management development typically associates improvements in performance with the refinement of methods used to manage individual projects. This perspective remains influential today. However, the findings of the present study point to a different challenge. Within regional development programs, the main constraints increasingly emerge not within individual construction projects but between them. The greater the number of projects implemented simultaneously, the stronger the dependence of each project on decisions made at other construction sites.

For this reason, the evolution of organizational models cannot be explained simply by the growing complexity of project management practices. The object of management itself is

changing. Whereas managerial attention was previously concentrated on the construction site, project schedule, and resources of a specific project, increasing importance is now attached to inter-project relationships, coordination mechanisms, and decision alignment at the program level. From this perspective, program management, project management offices, and portfolio structures can be viewed as different approaches to solving the same problem. Their common objective is to preserve the controllability of the system under conditions characterized by a growing number of interdependent projects.

In the academic literature, effectiveness is often associated with stronger control over individual projects. However, strong performance at the project level does not automatically guarantee the successful implementation of the overall program. Moreover, efforts to optimize the performance of a single project may create additional difficulties at the construction portfolio level. Projects begin to compete for specialists, equipment, and financial resources. Priorities shift. As a result, the local efficiency of individual projects does not always align with the objectives of a regional development program, which requires coordinated action across all stakeholders and construction sites.

Project management offices are frequently regarded as instruments for process standardization and project performance control (Antoniou & Tsavlidou, 2025). Such an interpretation reflects only part of their actual function. In the context of multiple simultaneous construction projects, the role of the project management office extends far beyond the preparation of procedures and reports. Its primary function is coordination. It is within this structure that decisions are aligned among projects that share resources, are implemented across different territories, and often face competing priorities. Without such a coordinating mechanism, even well-organized projects tend to operate in isolation, gradually reducing the controllability of the entire program.

A similar situation can be observed in portfolio management. Its role is not limited to the creation of another managerial level. Likewise, an additional administrative layer does not automatically solve coordination problems and, in some cases, may even complicate them. The principal advantage lies elsewhere. The portfolio approach makes it possible to view projects as interconnected components of a broader system. Within this system, resource reallocation, changes in work sequencing, and adjustments to priorities are no longer perceived as exceptional measures. They become a routine part of management practice. Attention shifts from the performance of individual projects to the stability of the entire regional development program. It is this ability to maintain the coherence of the construction portfolio that largely determines the effectiveness of large-scale territorial development initiatives (Cleary & Lamanna, 2022).

One of the central issues in the management of regional construction programs remains the distribution of authority between construction sites and the coordinating center. Two opposing positions typically dominate the discussion. The first advocates stronger centralized control. The second is based on maximizing the autonomy of project teams. The findings of this study indicate that each of these approaches has its own limitations. Consequently, the issue is considerably more complex than a simple choice between centralization and decentralization.

A high degree of autonomy at the construction-site level enhances managerial responsiveness. Site managers operate within the production process and encounter emerging changes on a daily basis. It is at this level that the most complete information is available regarding project progress, contractor performance, and current constraints. Under such conditions, many decisions can indeed be made more quickly. However, as the number of projects increases, additional processes begin to emerge. Competition for skilled personnel intensifies. The allocation of equipment becomes more complex. Differences in priorities arise

among projects. Gradually, the risk increases that decisions justified from the perspective of an individual project will conflict with the interests of the construction program as a whole.

The opposing model raises no fewer questions. Centralized management provides greater control over resources and helps maintain a unified system of priorities. This is particularly important in large regional development programs where multiple projects rely on shared financial, human, and technical resources. At the same time, increased control also has a downside. Managerial decisions become more distant from the construction site. The number of approval procedures increases. The system becomes less flexible. In some cases, site managers are forced to respond not to actual conditions on the construction site but to the requirements of centralized procedures. Consequently, excessive centralization may create problems that are no less significant than those associated with excessive autonomy.

The opposition between centralization and decentralization appears largely artificial. The findings of this study suggest that the stability of a construction program is determined not by the degree of authority concentrated at a particular management level. Much more important is understanding which decisions should be made at the construction-site level and which require coordination across the entire program. Operational management cannot be effectively conducted from a single centralized center. Information regarding project progress, contractor activities, and emerging constraints will always remain closer to the construction site. At the same time, resource allocation, quality control, and the determination of overall priorities cannot be considered separately for each project. These functions require coordination at the level of the entire construction portfolio. Attempts to concentrate both groups of functions within a single management center inevitably create an imbalance. The system either loses flexibility or encounters difficulties in maintaining consistency among projects.

The practices of organizations simultaneously implementing multiple construction projects across different regions clearly illustrate this pattern. Each project retains its own manager and project team. This makes it possible to respond rapidly to changing construction conditions and to make decisions without lengthy approval procedures. At the same time, issues related to resource allocation, quality control, and priority management remain under centralized coordination. Such a distribution of functions helps avoid extreme approaches. Construction sites do not become completely autonomous entities. At the same time, they do not lose their ability to adapt quickly to local conditions.

The characteristics of the construction projects themselves are also important. The degree of centralization cannot remain identical across all projects. Residential construction is typically characterized by a high level of process repetition and therefore allows for the use of standardized management mechanisms. Infrastructure projects, by contrast, require more complex resource coordination and involve a larger number of stakeholders. Social infrastructure projects demand increased attention to regulatory compliance, quality assurance, and stakeholder engagement. For this reason, the distribution of managerial authority should take into account both the scale of the program and the specific characteristics of the projects being implemented. Figure 1 presents the author's model for managing parallel construction projects in regional development, based on the separation of strategic and operational functions between management levels and their integration within a unified coordination system.

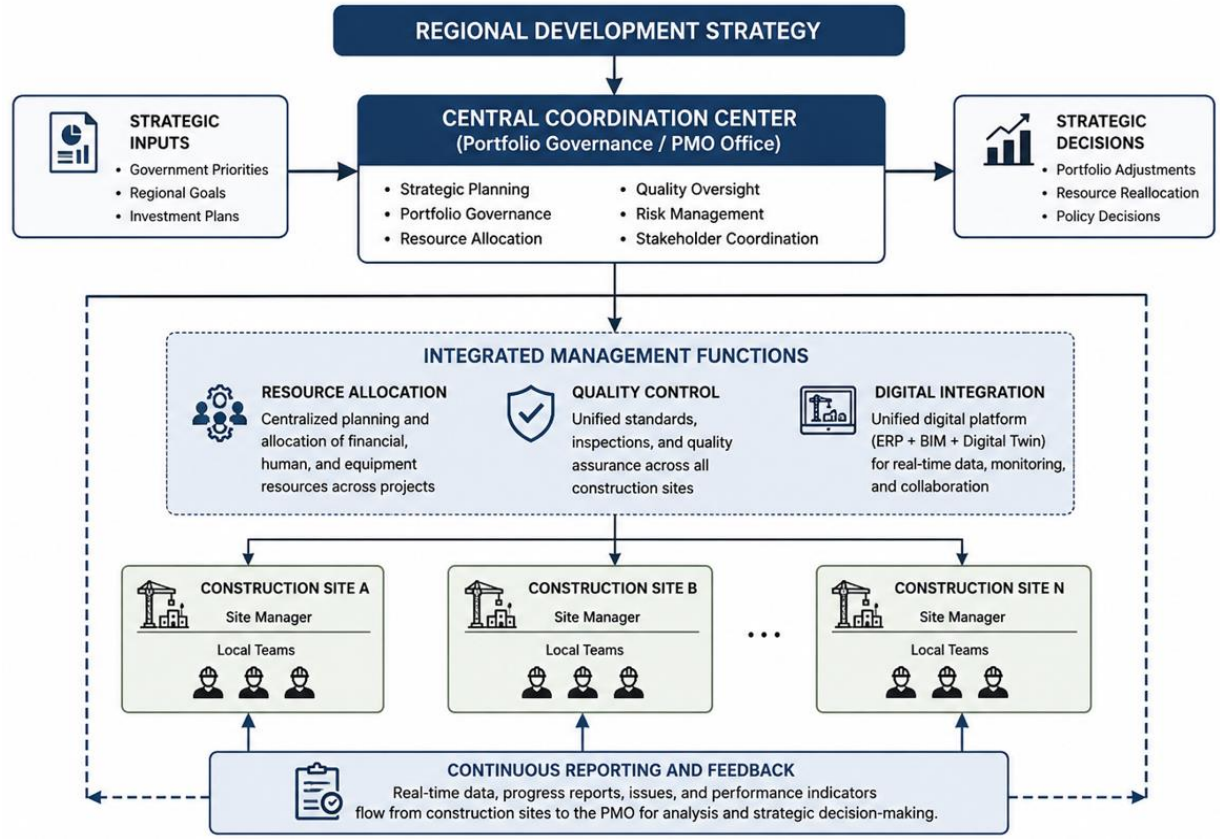


Figure 1: Hybrid Multi-Site Construction Management Model for Regional Development Projects (Author's Development)

Most existing organizational models seek to strengthen one side of the management process. In some cases, the primary emphasis is placed on centralized control. In others, priority is given to the autonomy of individual projects. The findings of this study indicate that both strategies encounter the same challenge. As more projects become incorporated into a regional development program, it becomes increasingly difficult to ensure both coordination among projects and sufficient managerial flexibility at individual construction sites.

The proposed model is based on a different understanding of this issue. Construction program management is viewed as a system of interconnected levels, each responsible for its own set of functions. Decisions related to resource allocation, project quality, and overall development priorities require consideration at the program level. At the same time, a substantial portion of operational information originates directly at the construction site and quickly loses relevance when it passes through multiple layers of approval. For this reason, operational management should remain as close as possible to the location where construction activities are performed.

A unified information environment becomes particularly important in this context. In traditional organizational structures, information concerning construction progress, resource utilization, and emerging constraints is often dispersed across different departments and projects. This complicates coordination and increases decision-making time. By integrating information flows within a common digital environment, it becomes possible to view the construction program as a single system rather than as a collection of independent projects.

The organization of continuous feedback is equally important. Management decisions cannot rely solely on the top-down flow of information. Conditions at construction sites change much more rapidly than formal management procedures. Consequently, the stability of the

program depends on the ability of the system to continuously incorporate information received from project sites and to adapt strategic decisions promptly to emerging changes.

In this regard, the sustainability of a multi-project construction program is determined neither by the degree of centralization nor by the extent of autonomy granted to individual projects. Far more important is the ability to combine both principles within a unified organizational structure. Coordination among projects is necessary to achieve the overall objectives of the program. Managerial flexibility remains an essential condition for the effective operation of each construction site. The organizational model for managing parallel construction projects developed in this study is based precisely on the integration of these principles.

CONCLUSION

The challenges of regional construction increasingly emerge not within individual projects but at the level of their interaction. It is at this level that the principal constraints associated with resource allocation, decision coordination, and maintaining the stability of construction programs arise. Under such conditions, effectiveness is determined not so much by the quality of management within a single project as by the ability to coordinate a large number of interconnected projects within a unified system.

Another important conclusion concerns the limitations of existing organizational models. Strengthening centralized control improves consistency among projects but simultaneously reduces managerial flexibility. Complete autonomy of construction sites produces the opposite effect. It accelerates local decision-making but complicates coordination at the program level. For this reason, the most sustainable organizational solutions emerge at the intersection of these two approaches rather than within either extreme.

The proposed model conceptualizes a construction program as a set of interconnected projects united by shared resources, strategic objectives, and coordination mechanisms. Its key feature is the separation of strategic and operational functions between management levels while maintaining continuous information exchange among them.

The research hypothesis was confirmed. The effectiveness of managing parallel construction projects increases when site-level autonomy is combined with centralized construction portfolio coordination, unified management principles, and an integrated information environment.

Future research should focus on the practical validation of the proposed model in programs of different scales, as well as on examining the specific characteristics of managing residential, infrastructure, and social construction projects within multi-project environments. Particular attention should also be given to investigating the influence of digital tools on the quality of inter-project coordination and the speed of managerial decision-making.

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