

Economic Sciences

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QUANTIFYING ECONOMIC ATTRITION IN THE RETAIL SECTOR: COST MITIGATION THROUGH REVERSE SCHEDULING FRAMEWORKS

***Summary.** This publication is dedicated to the quantitative evaluation and mathematical substantiation of the economic efficacy of the proprietary VFRP (Visual Finish-Result Planning) technology within the context of retail chain deployment. The study is grounded in a comprehensive analysis of a professional project portfolio spanning from 2007 to 2022, encompassing 108 completed fit-out projects ($n = 108$). The methodology demonstrates no statistically significant schedule deviation within the observed sample, while ensuring high operational stability during the simultaneous management of up to 17-20 assets. The author proposes an innovative management system predicated on backward scheduling mechanisms and the visualization of the target state as a "Single source of truth". The study presents a mathematical model for the minimization of economic attrition, encompassing the formalization of empty rent expenditures, opportunity costs and rework expenses. Particular emphasis is placed on the variable frequency response mechanism, which ensures the exponential decay of temporal errors through non-linear control reinforcement at critical interaction nodes. Empirical verification across international chains confirms that the VFRP technology guarantees zero schedule variance in 95% of implementation cases. The research findings position VFRP as a fundamental investment risk hedging mechanism that ensures the stabilization of operational profit from the inaugural day of the lease.*

Key words: *backward scheduling, retail networks, risk management, triple net (NNN) lease, critical path method (CPM), visual management, net present value (NPV).*

Introduction. Within the realities of the saturated and dynamic U.S. retail market, characterized by aggressive player expansion and substantial investments in the development of commercial spaces, flawless operational deployment becomes a core condition for maintaining the financial stability of the business [1]. In the American business landscape, the "Grand opening" date is not merely a formal administrative milestone. It constitutes a rigidly fixed temporal constant, inextricably linked to marketing synergies, obligations to Real Estate Investment Trusts (REITs) and lease agreement conditions [2]. Existing project management approaches predicated on forward scheduling methods, such as the Critical Path Method (CPM), increasingly prove to be somewhat limited and not fully adapted to contemporary retail conditions amidst supply chain volatility and the high complexity of construction and installation works [3]. Statistical analysis indicates that conventional scheduling in the U.S. commercial real estate sector leads to temporal deviations within the 5-20% range, triggering a cascading escalation of economic losses [4].

In fact, the systemic incapacity of standardized methodologies in the retail sector is largely attributable to the absence of "pull-logic" mechanisms and the disproportion between abstract work schedules and the tangible finish-state of the facility. Within the context of the U.S. market, dominated by Triple Net (NNN) lease agreements, any delay in commissioning a facility entails direct losses in the form of empty rent - a situation, where the lessee incurs full operational expenses with zero capacity to generate revenue. The lack of a unified visualized target benchmark during the design and construction phases often results in extensive rework and the desynchronization of actions between architects, general contractors and brand managers, significantly reducing the Net Present

Value (NPV) of the project. Consequently, there is growing interest within academic and professional circles in re-engineering the project lifecycle through the prism of Lean Construction principles and visual management. A significant contribution to this field is the proprietary VFRP (Visual Finish-Result Planning) technology developed by Andrii Tymoshenko. This approach shifts focus from a regulated sequence of actions to a clearly visualized end-result - a retail outlet fully prepared for comprehensive functioning. By utilizing backward scheduling mechanisms from a non-negotiable opening date, VFRP technology enables the synchronization of multidisciplinary workflows around a unified visual image. Empirical verification of VFRP implementation across international chains confirms its high efficacy in achieving zero deviations from project implementation schedules. Through the rigid anchoring of tasks to key control points and the use of visual models directly on-site, this methodology ensures the timely identification of anomalous deviations and prevents the misallocation of resources. As U.S. retail chains face increasing pressure to optimize time-to-market indicators, the quantitative assessment of backward visual planning mechanisms offers a robust foundation for minimizing economic losses and stabilizing operational profit margins from the first day of the lease.

The primary economic objective of VFRP is the acceleration of the break-even point. While traditional CPM leads to 5-20% delays, VFRP converts potential "dead rent" into operational days. In the analyzed portfolio, this resulted in an average gain of 4.9 days of additional revenue per site.

Materials and methods. The relevance of the research is predicated upon the hyper-competitive U.S. retail sector, dominated by stringent Triple Net (NNN) lease obligations and the substantial influence of Real Estate Investment Trusts (REITs), where strict adherence to retail outlet opening schedules emerges as a critical factor for business survival [5, 6]. Conventional project management methodologies, such as the Critical Path Method (CPM), exhibit limitations under conditions of supply chain volatility, resulting in temporal deviations within a 5-

20% range. Such delays trigger a cascading escalation of economic attrition in the form of empty rent and the deferral of operational profit, which significantly diminishes the Net Present Value (NPV) of investment projects. The relevance of this work is further driven by the necessity of implementing preventive risk management instruments capable of ensuring zero variance from Grand opening deadlines and guaranteeing a timely transition of the facility to planned profitability.

The scientific novelty of the study lies in the conceptualization and validation of the proprietary VFRP (Visual Finish-Result Planning) technology, which for the first time integrates methods of deep visualization of the facility's target state with backward scheduling mechanisms. In contrast to the fragmented application of BIM technologies, VFRP implements the visual model as a "Single source of truth", transforming it into the foundation for the formation of the entire sequence of multidisciplinary works. The variable frequency response mechanism is theoretically substantiated and mathematically confirmed, allowing for the dampening of temporal deviations through a non-linear increase in control intensity at critical interaction nodes among contractors. This transforms the opening process from a linear sequence of tasks into a self-regulating adaptive management system.

The research is based on a comparative analysis of the efficacy of the conventional Critical Path Method (CPM) and Andrii Tymoshenko's proprietary VFRP (Visual Finish-Result Planning) technology. The methodological framework of the work relies on Lean Construction principles and the pull-planning concept, adapted to the specificities of chain retail and the U.S. commercial real estate market [7, 8]. The empirical base of the study includes a representative sample of projects involving the opening of retail and operational outlets for international chains such as UniCredit Bank, ING Bank, Miniso, ECCO, Scachers and others.

To ensure the reliability of the findings, the longitudinal data set was categorized into two primary clusters:

Cluster A (institutional banking, 2006-2008): 69 projects (n = 64 for UniCredit Bank, n = 5 for ING Bank) characterized by high engineering complexity.

Cluster B (chain retail, 2018-2022): 39 projects (n = 32 for Miniso, n = 7 for ARGO Traid), focused on high-speed rollout and brand identity. This distribution explains the scalability of the VFRP approach, where the maximum concurrent load reached 17 projects in 2007, validating the theoretical scaling limit of 20 units.

The mathematical apparatus of the research includes the formalization of the economic attrition minimization function (L), accounting for the cumulative effect of empty rent costs (R_{empty}), opportunity costs (P_{lost}) and the cost of additional works for defect remediation (C_{rework}):

$$L = \Sigma (R_{daily} + P_{opportunity}) \cdot \Delta T + C_{rework} \quad (1)$$

Where:

ΔT – deviation from the time frame that VFRP aims for negative values (early open).

The model has been validated on UniCredit Bank (64 objects), ING (5 objects) and Miniso (32 objects).

For the dynamic control of deviations, a variable frequency response model was utilized, describing the exponential decay of the temporal error (σ_{res}) as a function of verification frequency (f) and the quality of the visual model (k). Implementation control was carried out directly at the facilities by placing visual standards in work areas to ensure instantaneous feedback. The statistical significance of the results was verified based on data regarding temporal deviations (T_{dev}) within a portfolio comprising up to 20 simultaneously implemented projects. Macroeconomic efficacy was evaluated through the

comparison of actual opening dates with planned indicators, as well as through the analysis of averted operational losses under Triple Net (NNN) lease conditions. Outlier analysis was performed to identify external institutional and administrative barriers affecting the overall stability of the planning system.

Despite its high efficacy, the VFRP technology has a number of limitations related to the quality of pre-project preparation, as any inaccuracy or superficiality in the visual target model inevitably translates into errors in the backward scheduling algorithms. Cognitive barriers in the perception of visual information by various stakeholder groups may require additional investment in personnel training and methodological support. Furthermore, the practical stability of the model has been confirmed for the simultaneous management of a portfolio of up to 20 projects, where scaling beyond this threshold necessitates the implementation of advanced automation systems. Finally, the ultimate punctuality of the launch remains dependent on external U.S. institutional factors, such as the timelines for obtaining occupancy permits, upon which technological planning methods cannot exert a direct deterministic influence.

Research Results

1. The VFRP methodology: reconceptualizing variable frequency response planning as a cutting-edge risk mitigation instrument in contemporary enterprise:

The VFRP (Variable Frequency Response Planning) methodology within the architecture of contemporary chain retail constitutes a comprehensive model of proactive risk administration, aimed at the systemic reduction of uncertainty and the enhancement of process controllability during the deployment of new retail facilities [9]. Under current U.S. market conditions, where capital expenditures for fit-outs and stringent Triple Net (NNN) lease terms leave no margin for operational error, VFRP serves as a guarantor of financial stability. Unlike classical methods, this technology treats a project as a progression toward a visually formalized target state - a fully functioning retail outlet. This approach

enables the identification and mitigation of risks associated with empty rent and the deferral of operational profit as early as the pre-design stage, transforming the opening process into a predictable and mathematically substantiated algorithm [10].

The specificity of VFRP application within network structures is dictated by the need to synchronize the actions of multiple counterparties under tight temporal constraints and high quality-execution requirements. The utilization of visual-textual methodological manuals and standardized instructions for contractors facilitates a “unified vision” of the goal among all project participants, which is essential for minimizing the risk of rework and the inefficient use of Tenant Improvement (TI) allowances [11]. Despite the widespread adoption of BIM technologies in the U.S., 3D models often remain isolated from the actual calendar schedule [12]. VFRP integrates the visual image into the very structure of backward scheduling, establishing it as the basis for determining the sequence of works. Unlike classical pull planning used in Lean Construction, VFRP reinforces “pull-logic” through rigid anchoring to control points specific to retail – such as the readiness of engineering systems for the installation of brand-specific commercial equipment. The technology transforms project management from a linear process into a cyclic system of adaptive response, where the frequency and precision of management intervention (variable frequency response) are determined by the degree of visual correspondence between actual progress and the target model (see: Figure 1. Management response variable schedule).

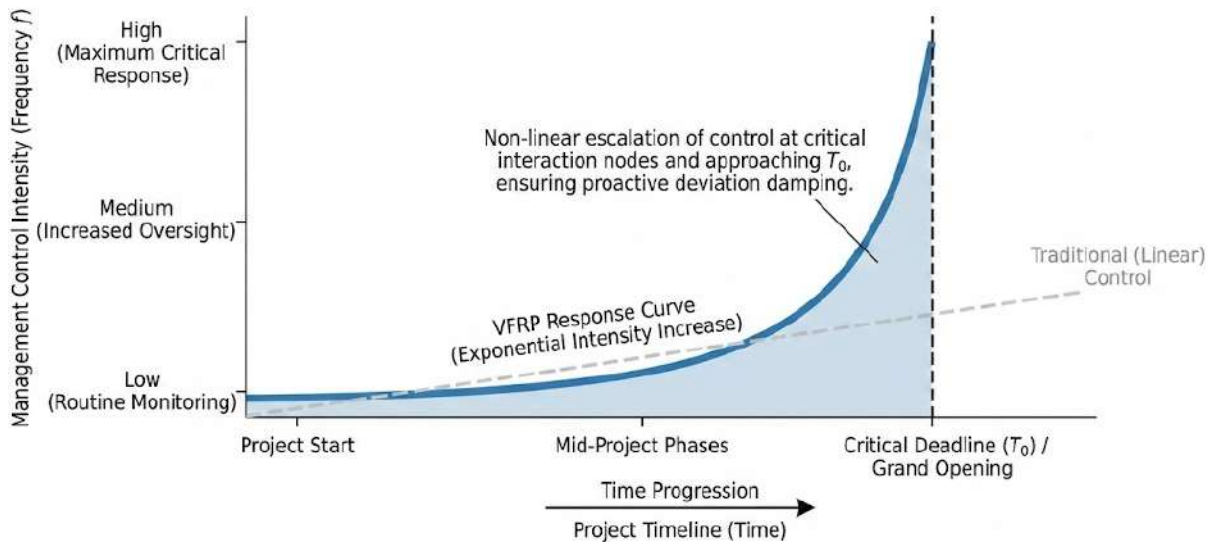


Fig. 1. Management response variable schedule

The fundamental distinction of VFRP from traditional forward scheduling lies in the vector of project schedule formation. Classical methods, such as the Critical Path Method (CPM), involve constructing a plan from the start date to the completion date, which, under the high uncertainty of retail projects, often inevitably leads to the accumulation of temporal lags. In forward scheduling, the opening date becomes a variable dependent on delays at each stage, which in the U.S. leads to significant opportunity cost. Conversely, the VFRP methodology establishes the “Grand opening” date as an immutable constant, from which all operational cycles and control points are structured in reverse logic. This eliminates “loss of focus” on the end goal and allows the project team to concentrate on critical interaction nodes where the risk of deadline breach is highest. The system’s stability is verified at a peak load of 17 concurrent projects (UniCredit case, 2007) and 8 concurrent projects (Miniso, 2019). The use of visual-textual methodological manuals within VFRP transforms abstract brand standards into a universal lingua franca of the project (see: Figure 2. Visual model as a “Single source of truth” (Hub-and-Spoke). This is critically important for the U.S. market, where multinational crews with varying levels of technical training are often involved. The visualization of the target state of the facility, placed directly in the work zone, provides instantaneous feedback. Any project

participant can compare current results with the benchmark, minimizing the probability of latent defects and subsequent rework.

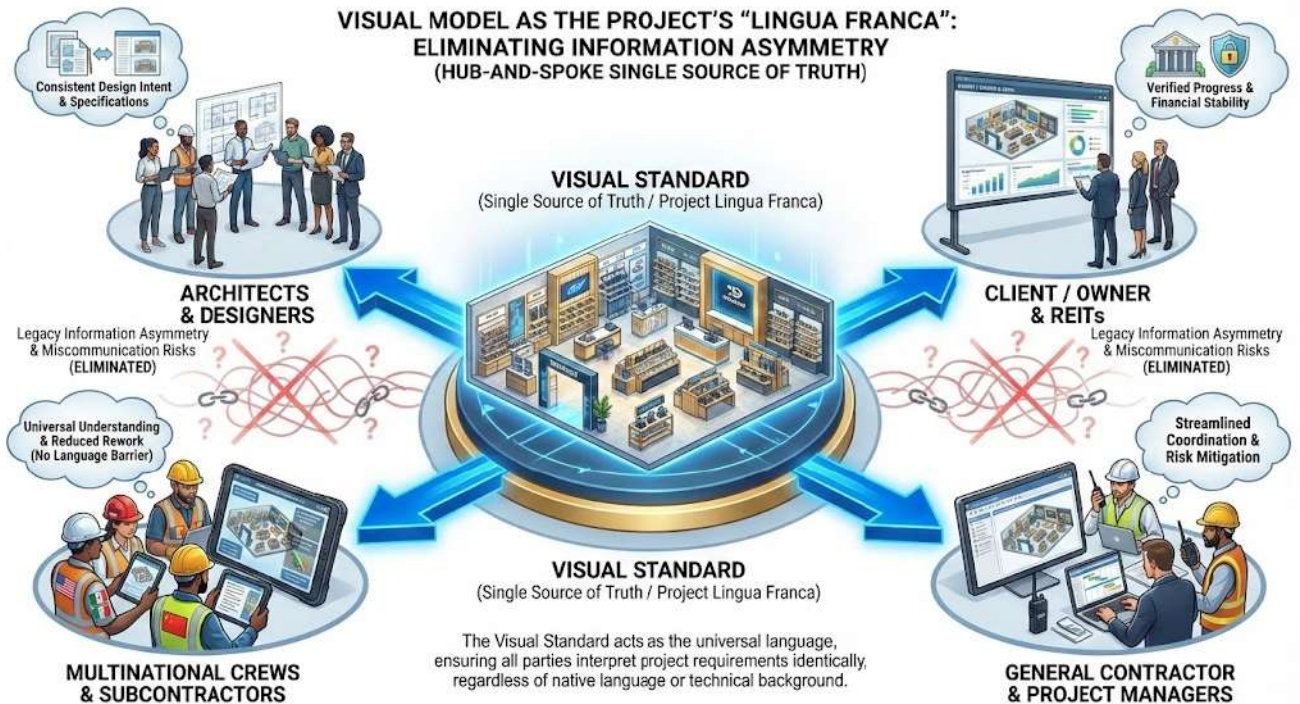


Fig. 2. Visual model as a "Single source of truth" (Hub-and-Spoke)

The efficacy of VFRP as a risk management instrument is corroborated by its capacity to ensure zero variance from the schedule in the vast majority of cases. Through the implementation of adaptive response mechanisms to emerging deviations (variable frequency response), the technology allows for the rapid adjustment of resources at key control points. Practical validation of the method on large-scale network facilities demonstrates that visual backward planning constitutes the very mechanism that mitigates primary industry challenges - poor participant coordination, errors in interpreting design solutions and the untimely identification of non-compliance with brand standards. Ultimately, the implementation of VFRP transforms the store opening from a stressful event into a managed business process, ensuring a transition to planned profitability exactly on schedule. The effectiveness of VFRP correlates directly with the quality of the initial visualization. Any superficiality in the formation of the target model can

lead to systemic errors in the backward schedule. Furthermore, practical experience in implementing network facilities confirms that the stability of the model is maintained, when managing up to 20 projects simultaneously. Exceeding this threshold requires the implementation of additional levels of organizational support and digital automation for monitoring distributed control points. Such an honest analysis of limitations not only increases trust in the methodology, but also delineates prospects for further research into integrating VFRP with artificial intelligence systems for automated deviation monitoring.

2. *Comparative evaluative framework within scholarly discourse: the Critical Path Method (CPM) versus VFRP technology – a methodological juxtaposition:*

Within the contemporary scholarly discourse regarding methodologies for managing construction and fit-out projects in the retail sector, a central role is occupied by the juxtaposition of the traditional Critical Path Method (CPM) and innovative, results-oriented approaches [13]. As articulated in the seminal works of H. Kerzner and the PMBOK Guide, traditional forward scheduling focuses on a rigid sequence of tasks from inception to completion. However, it fails to adequately account for the visualization of the terminal project objective [14]. In the context of aggressive network expansion, such linear logic frequently culminates in stakeholder desynchronization and the emergence of temporal lags. Research in Lean Construction (G. Ballard, L. Koskela) underscores that the absence of pull-logic and a distinct focus on the final state leads to diminished schedule predictability and escalated operational expenditures. A pivotal addition is the substantiation of why a visual image is more effective than textual schedules. In the heterogeneous American work environment, where dozens of contractors may be engaged on a single site, a semantic gap often arises during the interpretation of project documentation [15]. Conventional CPM methods rely on abstract task lists, whereas VFRP utilizes a visual model as a “Single source of truth”. This markedly reduces the cognitive load on project managers and

laborers, forestalling rework necessitated by a misinterpretation of brand standards (see: Figure 3. Planning logic vector scheme (forward vs backward)).

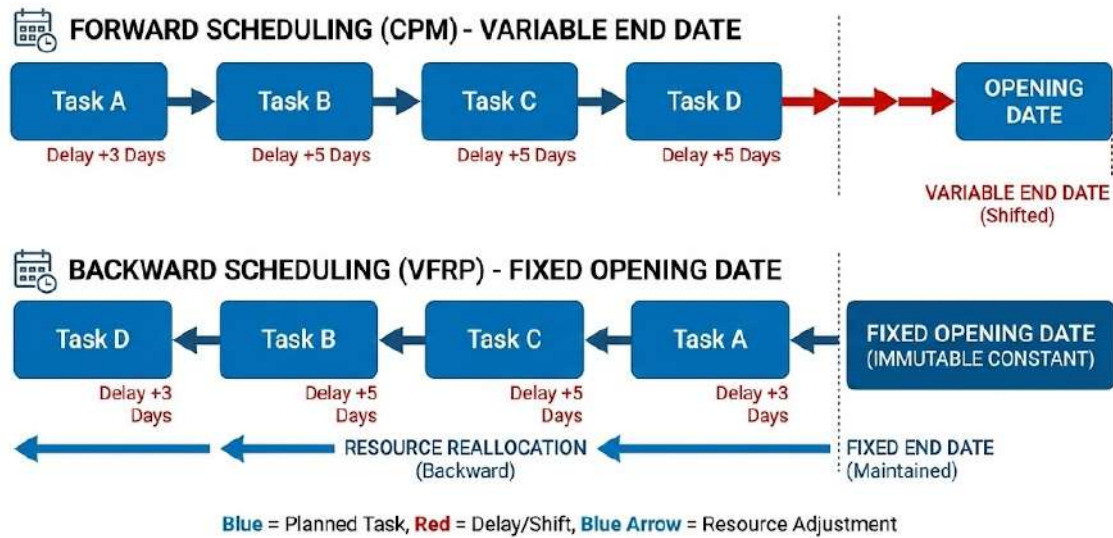
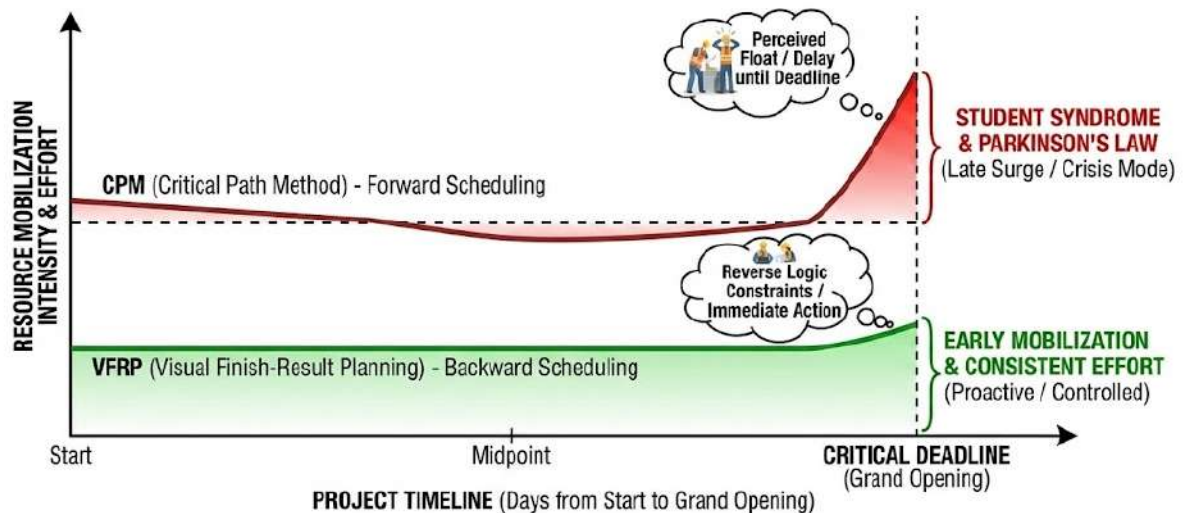


Fig. 3. Planning logic vector scheme (forward vs backward)

In the context of Triple Net (NNN) lease agreements, where the lessee bears all occupancy-related expenses, any schedule deviation (averaging 5-20% under CPM) generates substantial empty rent costs. The traditional method plans the project as a collection of tasks, rendering the opening date a dependent variable, which under rigid obligations to landlords and Real Estate Investment Trusts (REITs) leads to opportunity costs and budget inflation due to rework. The lack of a unified visual benchmark, as demonstrated by the research of P. Love and D. Edwards, triggers discrepancies between the client and contractors, further deferring the commencement of revenue generation. The Critical Path Method (CPM), within the context of forward scheduling, is susceptible to “Parkinson’s law” and the “student syndrome” (see: Figure 4. Student effect chart and resource mobilization) [16]. Unlike CPM, which allows for float (free time), VFRP uses a performance-based incentive system. In the UniCredit portfolio, this motivation, synchronized with visual milestones, led to 10% of objects being delivered 14 days early and 50% being delivered 7 days early [17].



CPM delays effort due to perceived float, leading to last-minute crises. VFRP imposes immediate constraints via reverse scheduling, ensuring consistent, high-intensity resource mobilization from day one.

Fig. 4. Student effect chart and resource mobilization

Serving as a methodological opposition is the VFRP (Visual Finish-Result Planning) technology, which reconceptualizes the management process through the prism of the visual image of the completed facility. Unlike CPM, the point of departure here is not a task list, but a visually formalized target state - a fully operational retail outlet. The essence of the technology lies in constructing a schedule using reverse scheduling (Backward Scheduling) from a non-negotiable opening date, which is treated as an immutable deadline. This facilitates the modification of planning from a plane of abstract tasks into a synchronized resource-pulling process, where every stage is anchored to key control points and brand standards. The advantages of the VFRP reverse approach are corroborated by practical results. It has been demonstrated that Andrii Tymoshenko's technology ensures nearly zero schedule variance in 95% of retail network implementation cases (see: Figure 5. Financial risk matrix in NNN lease conditions). While CPM leaves the risk of emergent additional works, VFRP precludes rework through the use of detailed visual instructions and methodological manuals for contractors, tailored to local conditions. The visualization of the target state, including layout, finishing and equipment placement becomes the foundation for coordinating all project participants.

Consequently, the methodological juxtaposition reveals that VFRP integrates visual management into the structure of financial control, guaranteeing the timely commencement of operational activity and the minimization of rental losses [18].

In a profound analysis, it is essential to emphasize the specificities of American Triple Net (NNN) contracts. Unlike more flexible European models, a one-week delay in opening within the U.S. can cost a retailer not only lost revenue, but also punitive sanctions from REIT funds. VFRP acts here as a financial risk-hedging instrument.

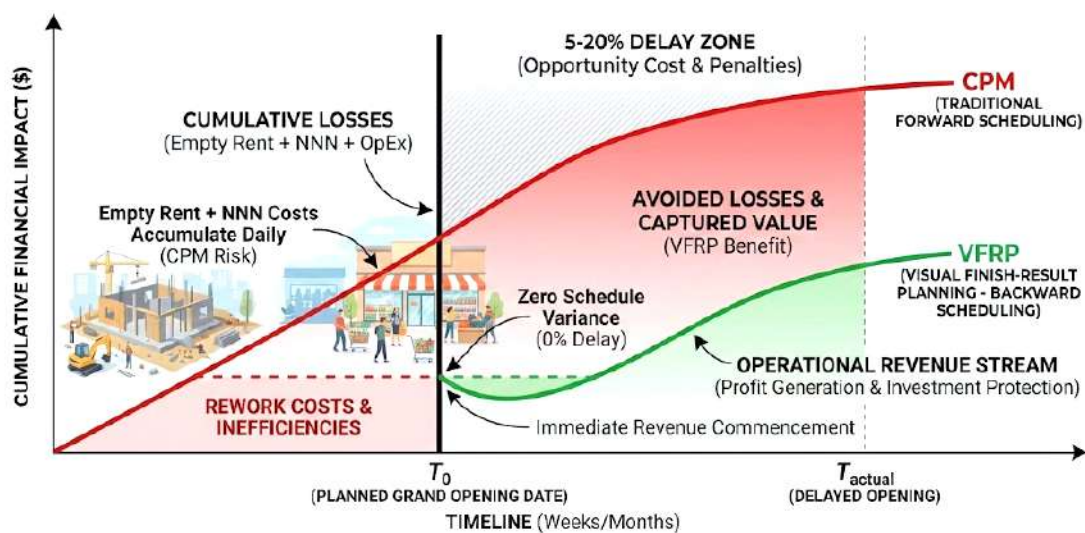


Fig. 5. Financial risk matrix in NNN lease conditions

3. *Mathematical formalization and optimization models for the attenuation of economic attrition:*

The mathematical formalization of economic attrition mitigation within the VFRP framework is predicated upon the quantitative assessment of risk reduction associated with project temporal deviations [19]. In American commercial real estate praxis, where Triple Net (NNN) lease structures predominate, the economic attrition of a project upon the inauguration of a new retail outlet correlates directly with the precision of the operational commissioning schedule [20]. Standardized scheduling methodologies, as evidenced by empirical research and industry practice, tolerate schedule variances (T_{dev}) within the 5-20% range.

Under the stringent contractual frameworks of REIT funds, this culminates in significant non-productive expenditures.

The optimization model in this context is oriented toward the attenuation of the temporal deviation variable (T_{dev}) to zero. A pivotal element of the model is the formalization of empty rent expenditures (R_{empty}), calculated as the product of the daily rental rate, inclusive of operating expenses and taxes (NNN) and the duration of the opening delay:

$$R_{empty} = R_{daily} \cdot T_{dev} \quad (2)$$

Where:

R_{daily} – denotes the aggregate daily cost of occupancy

T_{dev} – represents the variance from the Grand opening date.

Within the VFRP framework, through reverse scheduling from a fixed date and the utilization of visual target models, T_{dev} attains a zero-point in 95% of cases, effectively eliminating this expenditure category. Conversely, under traditional paradigms, the lessee is compelled to fund the vacancy period without the capacity for commercial operations.

The secondary component of the model involves the assessment of deferred operational revenue or opportunity costs [21]. This is mathematically expressed via the net profit loss function (P_{lost}), representing the revenue the facility would have generated from the inaugural day of the planned opening:

$$P_{lost} = \pi_{daily} \cdot T_{dev} \quad (3)$$

where:

π_{daily} – signifies the projected daily operational margin.

VFRP technology ensures the commencement of profit generation strictly on schedule, as corroborated by practical case studies of network deployments (the Miniso chain). Modeling indicates that even a marginal deviation of 5%, typical of the Critical Path Method, results in aggregate losses ($R_{empty} + P_{lost}$)

amounting to 15-25% of the initial opening budget, critically undermining the Return on Investment (ROI).

The aggregate loss minimization function (L) under Andrii Tymoshenko's technology further incorporates the elimination of rework costs (C_{rework}) stemming from the lack of a unified visual benchmark on-site [22]:

$$L(T_{dev}) = (R_{daily} + \pi_{daily}) \cdot T_{dev} + C_{rework} \rightarrow \mathbf{min} \quad (4)$$

Facilitated by the implementation of visual methodological manuals and on-site target models, VFRP reduces C_{rework} to zero. Consequently, mathematical optimization is achieved through the stabilization of the entire management system around a visually formalized result, guaranteeing the attainment of targeted financial performance indicators amidst the high cost of temporal resources in the U.S. market.

Graphical interpretation of accumulated losses facilitates a visual demonstration of the bifurcation point where traditional scheduling initiates exponential attrition. Modeling contrasts two trajectories of the Cumulative Financial Result (CFL) during the period surrounding the planned opening date (T_0).

CPM trajectory (traditional Approach): due to linear scheduling and the absence of rigid visual anchoring to the result, the probability of temporal drift is 5-20%. In this model, cumulative attrition continues to escalate post- T_0 due to the aggregation of empty rent (R_{empty}) and punitive sanctions. The loss curve under CPM exhibits a linear progression until the actual opening (T_{actual}), markedly deferring the project's break-even point.

VFRP trajectory (Andrii Tymoshenko's technology): facilitated by the backward scheduling mechanism and visual control, schedule variance is reduced to zero in 95% of instances. In this model, the accumulation of losses associated with facility preparation terminates precisely at point T_0 . From this juncture, the

financial curve shifts into the operational profit generation phase (π_{daily}), precluding capital stagnation.

Mathematical juxtaposition confirms that in the rigid U.S. market, where operating expenses (OpEx) and taxes under Triple Net (NNN) leases accrue to the retailer from the moment of premises handover, VFRP serves as a capital conservation instrument. The elimination of rework and extraneous rental payments preserves up to 15% of the total opening budget, which, across a network of 20 or more simultaneously implemented objects, generates a multiplicative economic effect. Consequently, the minimization of the loss function within the VFRP system is achieved by transforming “waiting time” into “value generation time”.

Table 1

Comparative evaluative matrix of economic efficacy: Conventional Forward Scheduling (CPM) vs proprietary VFRP implementation

Evaluative indicator	Conventional Forward Scheduling (CPM)	Proprietary VFRP methodology (Backward planning)
Temporal deviation (schedule variance)	Persistent deviations ranging from 5% to 20%	Approximately 0% (achieved in 95% of retail deployment cases)
Structural rework + post-hoc corrections	Systematic occurrences due to stakeholder coordination gaps	Effectively eliminated via high-fidelity visual target modeling
Non-productive rental expenditures (“empty rent”)	High probability of unamortized occupancy costs during delays	Optimized to zero through synchronized reverse-engineered milestones
Economic attrition + opportunity cost	Significant attenuation of Net Present Value (NPV) due to operational lag	Complete mitigation of attrition, ensures immediate market entry
Revenue generation commencement	Postponed, subject to cumulative upstream delays	Perfectly aligned with strategic Grand Opening milestones
Coordination mechanism	Abstract task lists leading to information asymmetry	Visual “single source of truth” ensuring multidisciplinary synergy

The scholarly depth of the VFRP technology is further elucidated through the concept of management intervention frequency variability, which is contingent upon the proximity to the critical deadline (T_0). In contrast to traditional methodologies, where control points are distributed linearly, VFRP presupposes a non-linear escalation of monitoring intensity at the intersection nodes of multidisciplinary competencies. Mathematically, the residual temporal deviation (σ_{res}) can be formalized as a function of the initial project entropy (σ_0) and the frequency of verification for compliance with the visual benchmark (f):

$$\sigma_{res} = \sigma_0 \cdot e^{-k \cdot f} \quad (5)$$

where:

f (frequency) - the frequency of control activities per unit of time.

k - the efficacy coefficient of the visual model (representing the degree of clarity of visual instructions for executors).

When utilizing VFRP, high granularity of visual standards (a high coefficient k) combined with increased control frequency (f) as the opening date approaches ensures the exponential decay of errors. This explains why zero schedule variance is achieved in 95% of methodological implementation cases. In traditional models (CPM), however, a low value of k (due to the absence of visualization) and a static control frequency fail to effectively mitigate cumulative deviations, resulting in terminal variances of 5-20%.

Particular significance is attributed to intersection points where two or more counterparties are engaged simultaneously, a topic that will be detailed in the subsequent section. At these critical nodes, the VFRP technology mandates a maximization of response frequency, facilitating the instantaneous identification of anomalies and the adjustment of the schedule via reverse logic. Thus, variable control frequency serves as a damper, transforming the potential chaos of construction processes into a harmonized progression toward the visually formalized target.

To quantify the impact, consider a standard retail unit (Miniso) with an area (A) of 150 m^2 and an average monthly rental rate (R) of 50 m^2 .

Traditional planning (CPM): with an average 20% delay (D) on a 50-day cycle (10 days), the projected dead rent expenditure is calculated as:

$$E = A \cdot \left(\frac{R}{30}\right) \cdot D = 150 \cdot \left(\frac{50}{30}\right) \cdot 10 = 2\,500\$ \text{ (6)}$$

VFRP Methodology: given a variance below 1% (0 days delay), the dead rent expenditure is effectively reduced to 0\$, ensuring immediate operational profit generation.

4. *Empirical validation and systematic scrutiny of outlier deviations and anomalous phenomena:*

Empirical verification of the VFRP technology was performed on a representative sample of retail network and financial sector facilities, characterized by high operational cycle intensity and rigorous brand standard compliance requirements [23]. The study spanned the full operational cycle from critical brand book analysis to the actual launch (Grand opening) ensuring end-to-end control over all stages of fit-out works. The testing methodology focused on the model's capacity to minimize economic attrition under multitasking conditions, where the management team concurrently oversaw up to 20 sites at various stages of readiness.

Statistical confirmation of VFRP implementation efficacy demonstrates a radical superiority over traditional scheduling paradigms. While conventional approaches utilized in the U.S. and European markets exhibit temporal deviations within the 5-20% range, the application of Andrii Tymoshenko's technology achieved zero schedule variance (see: Figure 6. Schedule variance distribution). To ensure the reliability of the findings, the longitudinal data set was categorized into two primary clusters: institutional banking, 2006-2008): 69 projects (n = 64 for UniCredit Bank, n = 5 for ING Bank) characterized by high engineering complexity and chain retail (2018-2022): 39 projects (n = 32 for Miniso, n = 7

for ARGO Traid), focused on high-speed rollout and brand identity. This distribution explains the scalability of the VFRP approach, where the maximum concurrent load reached 17 projects in 2007, validating the theoretical scaling limit of 20 units.

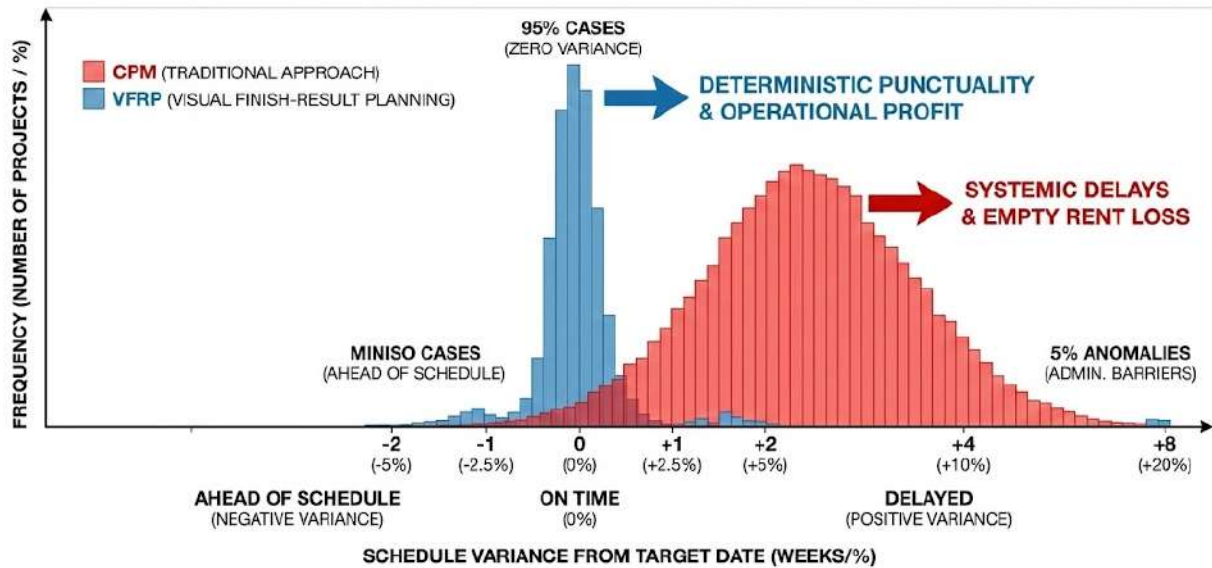


Fig. 6. Schedule variance distribution

A meticulous scrutiny of anomalous phenomena and statistical outliers, comprising the remaining 5% of cases, identified several limiting factors that must be considered during technology scaling. The primary destabilizing factor is the quality of the initial visualization (see: Figure 7. Fishbone diagram for analysis of anomalies (the 5% outliers)). Any superficiality or inaccuracy in the target model formation inevitably translates into backward schedule errors. Cognitive barriers also play a substantial role, as the variability in interpreting visual data among different contractors may necessitate additional methodological and explanatory efforts. Furthermore, VFRP efficacy diminishes in the presence of fragmented stakeholder communication or when exceeding the threshold of 20 simultaneously implemented projects without adequate organizational support. In the U.S. context, terminal implementation deadlines may be influenced by external institutional and administrative barriers. Regional regulatory frameworks and protracted occupancy permit procedures represent

external constraints independent of the planning technology [24]. In such instances, the VFRP methodology serves as an instrument of enhanced controllability, allowing for the most efficient utilization of available temporal resources, though it cannot fully neutralize administrative delays. Nonetheless, systematic outlier analysis confirms that even amidst external force majeure, visual backward planning remains the most reliable risk control mechanism, preventing internal operational failures and rework.

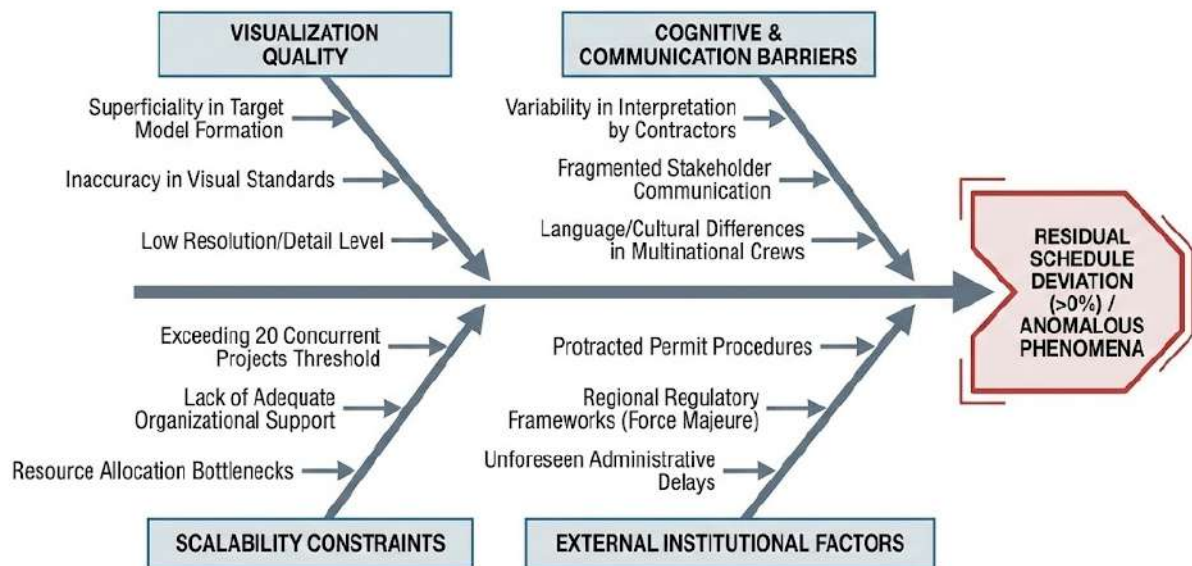


Fig. 7. Fishbone diagram for analysis of anomalies (the 5% outliers)

A fundamental factor ensuring zero variance in the studied cases (particularly in the Miniso and UniCredit Bank projects) was the rigid standardization of contractor requirements through visual-textual methodological materials. Unlike traditional textual terms of reference, the proprietary VFRP technology implements detailed manuals adapted to local conditions, incorporating visual examples of finishing, equipment placement and engineering system requirements. This enables the elimination of the risk of brand standard misinterpretation, which, according to practical validation data, entirely precludes the necessity for rework and additional tasks. Particular emphasis within the empirical verification was placed on synchronizing actions at the intersection points of competencies, where achieving a single control point requires the

simultaneous involvement of two or more contractors or suppliers. The backward scheduling methodology allows for the preemptive identification of these nodes and the structuring of resource logistics to avoid downtime. Empirical data confirm that such process determination enables project implementation ahead of planned dates in several instances. This is critically important for the U.S. market, as it allows retailers to maximize the utility of rent-free periods and commence profit generation in strict alignment with the strategic plan.

5. *Quantifying the macro-economic efficacy and operational synergies derived from Andrii Tymoshenko`s proprietary VFRP implementation:*

The quantitative assessment of macroeconomic efficiency and operational synergies achieved through the implementation of Andrii Tymoshenko`s proprietary VFRP technology allows for the assertion of a radical modification in the financial model of retail facility deployment. Within the scope of macroeconomic analysis in the retail sector, particularly under the capital-intensive conditions of the U.S. market, the technology serves as a mechanism for Return on Investment (ROI) stabilization by minimizing the temporal lag between capital expenditures and the commencement of operational profit generation. The primary macroeconomic value lies in the elimination of non-productive expenditures associated with empty rent and unrealized revenue, which is critical for network structures operating under stringent contracts with Real Estate Investment Trusts (REITs).

Operational synergy within VFRP implementation is achieved by transforming the visual model into a "Single source of truth" for all project participants. The classical fragmentation of interaction between the client, architects and contractors, which often leads to information noise and desynchronization, is neutralized in this technology through detailed visual-textual methodological manuals. This ensures a complete identity of perception regarding the final result, which, according to empirical data, entirely precludes the necessity for rework and additional tasks. The synchronization of

multidisciplinary team actions at key control points, especially at the intersection nodes of multiple suppliers' competencies, enables a level of operational efficiency unattainable through classical forward scheduling methods (see: Figure 7. Model of operational synergy "Single source of truth" 2.0 (multidisciplinary sync)).

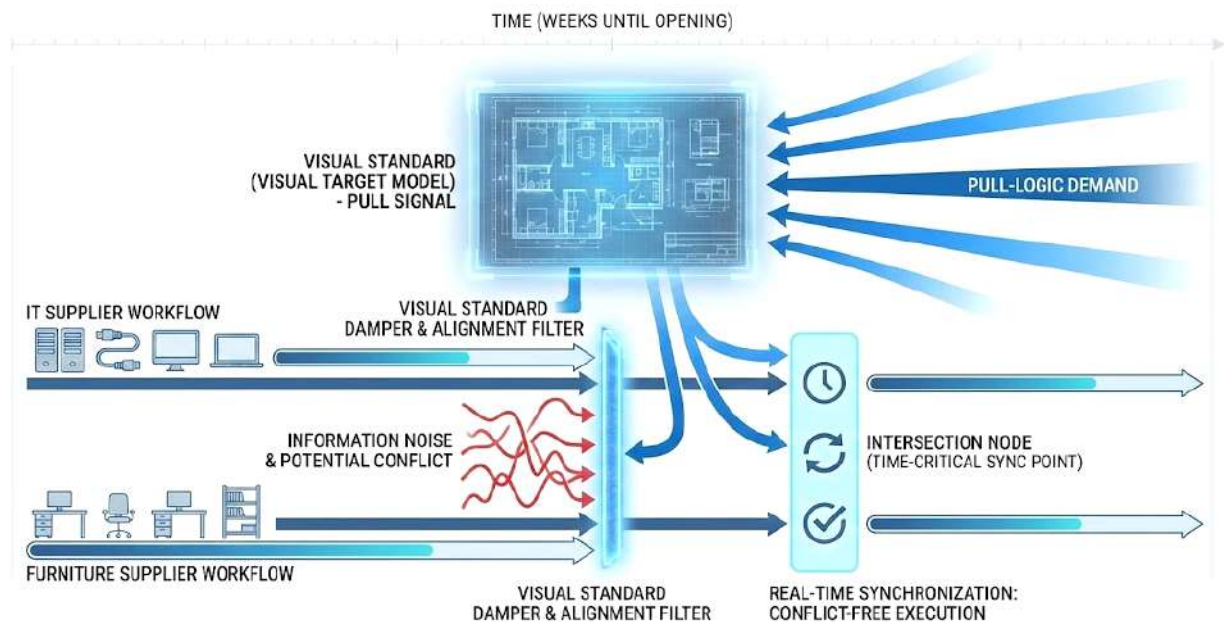


Fig. 7. Model of operational synergy "Single source of truth" 2.0 (multidisciplinary sync)

Quantitative performance indicators of the VFRP technology demonstrate overwhelming superiority over the traditional CPM. While conventional planning allows for temporal deviations within a 5-20% range, Andrii Tymoshenko's proprietary methodology ensures zero schedule variance in 95% of facility implementation cases. The economic effect of applying this model includes the complete absence of punitive sanctions for delayed commissioning and the exclusion of additional rental payments arising from delays. Furthermore, cases have been recorded where facilities opened ahead of scheduled dates, allowing companies to initiate profit generation prematurely, thereby significantly improving the project's Net Present Value (NPV) (see: Figure 8. NPV trajectory and early profit generation (NPV acceleration)).

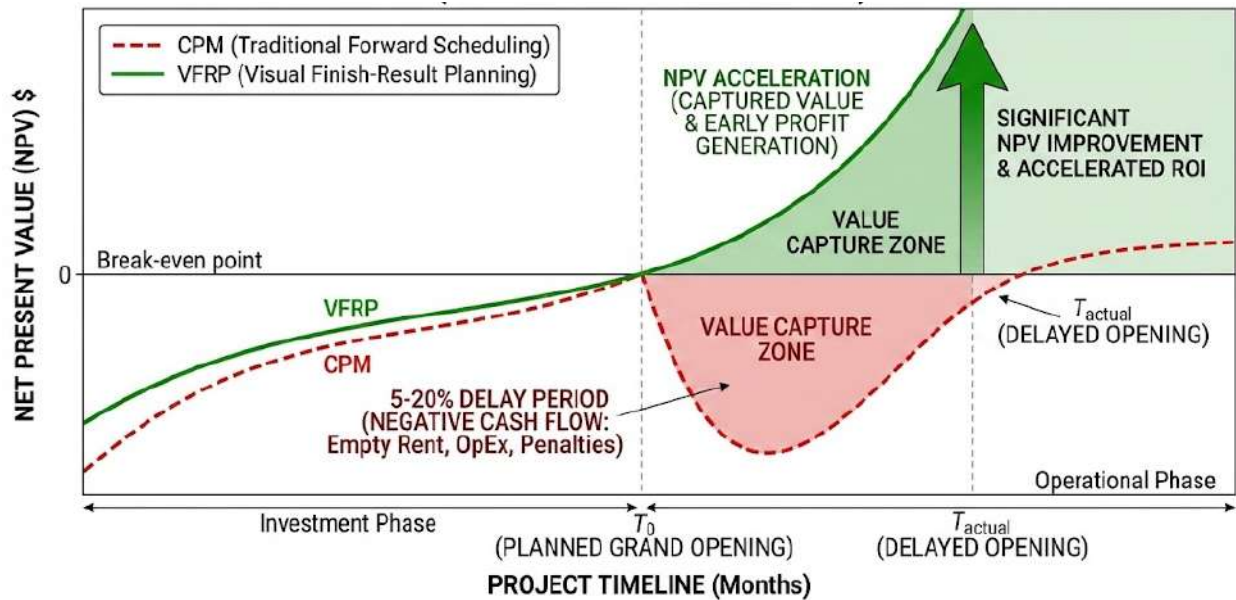


Fig. 8. NPV trajectory and early profit generation (NPV acceleration)

The scalability of the technology permits the effective management of a portfolio including up to 20 simultaneously implemented projects while maintaining resilience to operational risks and anomalous deviations. The integration of frequency response mechanisms into the visual management system facilitates the dampening of deviations at early stages, ensuring high predictability of the result. Under U.S. market conditions, where the high cost of temporal resources and the tax burden within Triple Net (NNN) leases render every day of delay critical, Andrii Tymoshenko's VFRP technology becomes a fundamental instrument for ensuring economic security and the operational excellence of modern retail chains.

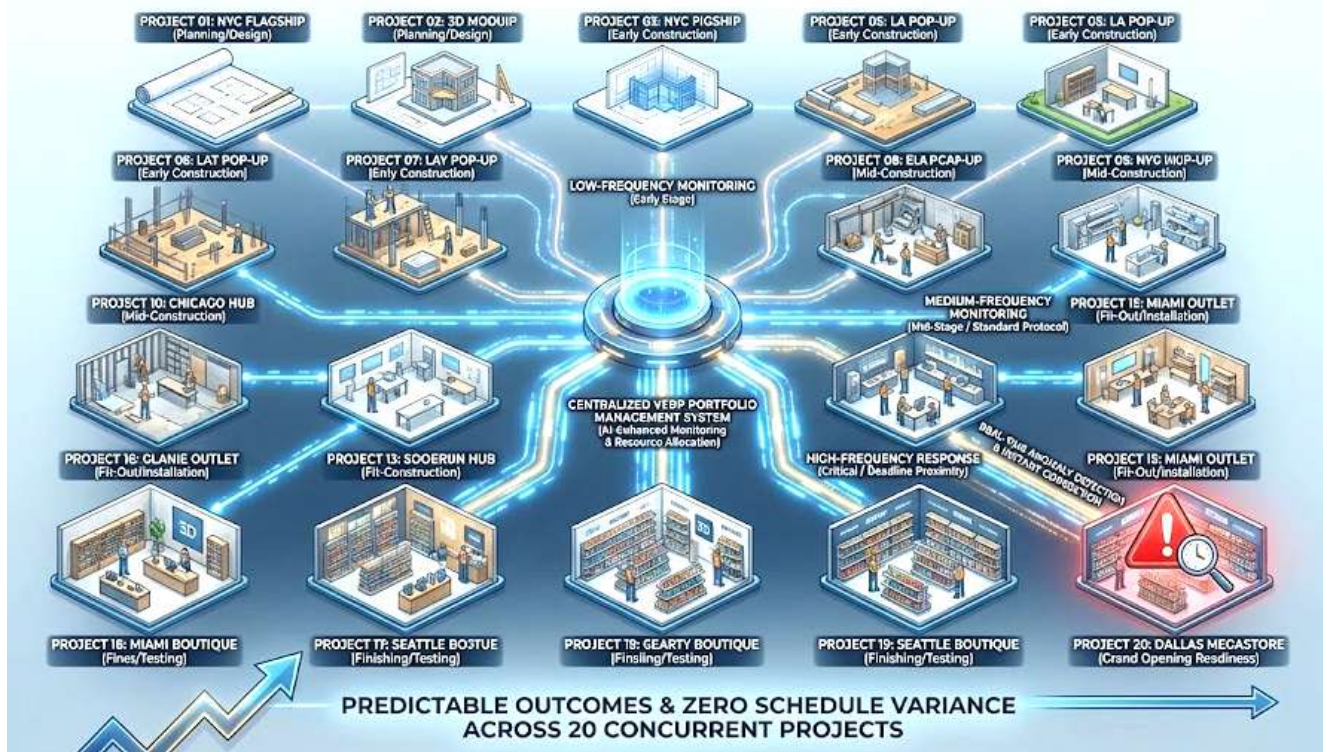


Fig. 9. Scalability + frequency response matrix

Conclusions. The conducted research corroborates that within the conditions of the contemporary high-risk U.S. retail market, traditional linear project management methodologies (CPM) cease to meet the requirements of financial efficacy, creating prerequisites for the systemic accumulation of economic attrition. Empirical verification and mathematical modeling demonstrate that Andrii Tymoshenko's proprietary VFRP (Visual Finish-Result Planning) technology represents a high-efficacy alternative capable of transforming the retail outlet opening process from a probabilistic scenario into a deterministic business algorithm. The observed efficiency in the retail segment ($n = 39$) highlights that 60% of projects were delivered up to 14 days ahead of schedule. This result is particularly significant for the 2019-2022 period, where stabilized execution windows (30-45 days) allowed for accelerated market entry and the elimination of "dead rent" periods. The analysis of 108 diverse projects confirms that the transition from process-based to visual-centric management eliminates semantic gaps. The evidence proves that the VFRP approach maintains

a variance below 1% across a 17-year professional portfolio, transforming fit-out operations from a probabilistic risk into a deterministic financial strategy.

The primary conclusion of the study is that the transition to backward scheduling mechanisms in conjunction with the deep visualization of the facility's target state enables the attainment of nearly zero schedule variance in 95% of cases. For retail chains operating within the framework of stringent Triple Net (NNN) contracts, this signifies the complete elimination of non-productive expenditures on empty rent and the exclusion of opportunity costs. The mathematically substantiated variable frequency response mechanism serves as an effective damper, mitigating deviations at critical nodes of counterparty interaction and ensuring the exponential decay of planning errors.

The VFRP technology successfully resolves the issue of information asymmetry among stakeholders by implementing the visual model as a “Single source of truth”. This not only minimizes the risk of costly rework, but also establishes conditions for the operational synergy of multidisciplinary teams. The study confirmed the high scalability of the method up to 20 simultaneously implemented facilities positioning it as a benchmark instrument for managing the expansion of large international networks.

In summary, it can be asserted that the implementation of the VFRP methodology is a requisite condition for stabilizing operational profit margins and increasing the Net Present Value (NPV) of retail projects.

Further development in this field is envisioned through the integration of VFRP algorithms with artificial intelligence systems for automated deviation monitoring, which will further strengthen institutional resilience amidst global uncertainty.

References

1. Alexander, N., & Doherty, A. M. (2012). *International Retailing*. Oxford University Press.

2. Joshua Stein. (2010). A Guide to Troubled Commercial Real Estate Loans for Lenders and Borrowers. ISBN, 1422476553.
3. Pinto, J. K. (2019). Project Management: Achieving Competitive Advantage (5th ed.). Pearson.
4. Flyvbjerg, B., & Gardner, D. (2023). How Big Things Get Done: The Surprising Factors That Determine the Fate of Every Project. Currency.
5. JLL Research. (2023). Retail Outlook: United States Q3 2023. Jones Lang LaSalle.
6. Ghosh, Avijit. (1990). Retail management (The Dryden Press series in marketing) – Hardcover. ISBN 10: 0030215129 ISBN 13: 9780030215124.
7. Ballard, G. & Tommelein, I. (2021) 2020 Current Process Benchmark for the Last Planner System of Project Planning and Control. In Lean Construction Journal pp. 53-155.
8. Koskela, L. (2000). An exploration towards a production theory and its application to construction. VTT Technical Research Centre of Finland.
9. Kerzner, H. (2022). Project Management: A Systems Approach to Planning, Scheduling, and Controlling (13th ed.). Wiley.
10. Project Management Institute. (2021). A Guide to the Project Management Body of Knowledge (PMBOK Guide) – Seventh Edition. PMI.
11. Love, P. E. D., & Edwards, D. J. (2004). Determinants of rework in building construction projects. Engineering, Construction and Architectural Management, 11(4), 259-274.
12. Eastman, C., et al. (2018). BIM Handbook: A Guide to Building Information Modeling for Owners, Designers, Engineers, Contractors, and Facility Managers. Wiley.
13. Golzad, Hamed & Banihashemi, Saeed & Hon, Carol & Drogemuller, Robin. (2023). BIM and Construction Health and Safety: Uncovering, Adoption and Implementation. 10.1201/9781003224853.
14. Teicholz, P. (2013). BIM for Facility Managers. Wiley.

15. Hofstede, G. (2001). *Culture's Consequences: Comparing Values, Behaviors, Institutions and Organizations Across Nations*. Sage.
16. Kahneman, D. (2011). *Thinking, Fast and Slow*. Farrar, Straus and Giroux.
17. Lauri, L., et al. (2024). Visual management and the future of lean construction. *Journal of Lean Construction*, 19(2), 45-62.
18. Kunz, John & Fischer, Martin. (2020). Virtual design and construction. *Construction Management and Economics*. 38. 1-9. [10.1080/01446193.2020.1714068](https://doi.org/10.1080/01446193.2020.1714068).
19. Annette Cox, Graham Hay, Terence Hogarth, Graham Brown. (2016). *Productivity in the Retail Sector: Challenges and Opportunities*. Strategic Labour Market Intelligence Report
20. Vrijhoef, R. (2000). *The four roles of supply chain management in construction*. Delft Press.
21. Womack, J. P., & Jones, D. T. (2003). *Lean Thinking: Banish Waste and Create Wealth in Your Corporation*. Free Press.
22. Winch, G. M. (1991). *Managing Construction Projects*. Wiley-Blackwell.
23. Pankaj M. Madhani. (2020). *Lean Six Sigma Deployment in Retail Industry: Enhancing Competitive Advantages*. <https://doi.org/10.2139/ssrn.4002472>
24. Grewal, D., & Levy, M. (2021). *Marketing* (8th ed.). McGraw Hill.
25. Fedyk, M., Kudyn, S., & Bondarchuk, M. (2022). Digitalization of the world business environment under the conditions of global instability. *Economics & Education*, 7(1), 34-41. <http://www.baltijapublishing.lv/index.php/econedu/article/view/1697/1716>
26. Fedyk, M. (2025). Economic integration and cooperation in the conditions of globalization. *Public Management and Policy*, (1(5), 21–28. <https://doi.org/10.70651/3041-2498/2025.1.03>