**DOI: 10.32347/2412-9933.2025.62.24-31**
UDC 005.8:005.94

**Murovansky Gleb**
Postgraduate Student of the Department of Project Management,
*https://orcid.org/0009-0003-4610-9087*
*Kyiv National University of Civil Engineering and Architecture, Kyiv*
**Bushuyeva Nataliia**
DSc (Eng.), Professor of the Department of Project Management,
*https://orcid.org/0000-0002-4969-7879*
*Kyiv National University of Construction and Architecture, Kyiv*

# PROACTIVE MANAGEMENT OF SMART DEVELOPMENT PROJECTS IN A TURBULENT ENVIRONMENT

***Abstract.*** *The current turbulent economic environment in Ukraine, characterized by high inflation (15–20%), exchange rate volatility, and unstable energy supply (power outages with a 0.7 probability), poses significant challenges to development companies, leading to increased project costs (10–15% in 2024) and decreased demand. Traditional reactive strategies are insufficient to address these issues. This paper argues for the necessity of a proactive strategic management approach in SMART development projects, integrating digital transformation (BIM, AI, IoT), a focus on sustainability and energy efficiency, and adaptation to changing market demands for affordable and environmentally friendly housing. By analysing global trends and specific conditions in Ukraine, particularly in the context of post-conflict reconstruction (e.g., Bucha), the study highlights the limitations of current reactive practices and the potential of proactive management to enhance competitiveness and adaptability. The research aims to develop innovative mechanisms for development companies' programs through the implementation of proactive strategic management. It explores methods such as AI-driven scenario planning, TRIZ with AI automation, Agile management with AI optimisation, the Critical Chain Method with IoT and AI, and BIM management with AI analytics. Furthermore, the paper examines the synergy created by innovations in "smart city" development projects, using examples from Kyiv (e.g., Faina Town), and proposes a conceptual model for proactive risk and opportunity management in such projects within a BANI (Brittle, Anxious, Nonlinear, Incomprehensible) environment. The model's effectiveness is demonstrated through a mathematical representation and its applicability to the unique challenges of the Ukrainian context, including resource constraints and social focus.*

***Keywords: proactive management; development projects; turbulence environment; SMART city***

## Introduction

A high level of uncertainty characterises the current economic environment in Ukraine: inflation is forecast at 15–20% in 2025 (according to the NBU), exchange rate fluctuations complicate cost planning, and unstable energy supply (power outages with a probability of 0.7) affects construction processes. For development companies, this creates additional risks, such as an increase in project costs (by 10–15% in 2024, according to industry reports) and a decrease in demand due to a decrease in the population's purchasing power. Reactive strategies that dominate the industry do not allow for effective confrontation of these challenges, as they focus on adapting to existing problems, rather than preventing them. A proactive approach, including scenario planning, forecasting market changes and implementing innovations, becomes necessary to ensure the sustainability and competitiveness of companies in such conditions. The global development industry is experiencing an era of digital transformation: according to McKinsey (2024), by 2030, 60% of construction projects will use BIM, AI and IoT technologies to increase efficiency and reduce costs. In Ukraine, this process is lagging: only 10–15% of companies use BIM, and AI is used mainly in large projects (Ukrainian Construction Association report, 2024). At the same time, digital tools allow you to reduce design costs by 15–20%, optimise resource use (up to 25% material savings) and improve construction quality through accurate modelling. Proactive strategic management, which integrates these technologies into development programs, is relevant to overcoming the technological lag and bringing Ukrainian development companies up to global standards. For example, in the reconstruction of Bucha, BIM can speed up planning by 20%, and AI can optimise logistics in conditions of limited resources. Market conditions in Ukraine and the world are

 

changing: demand is shifting towards energy-efficient, affordable housing with an emphasis on environmental friendliness. According to forecasts of the European Commission (2024), by 2030, 70% of new housing in the EU will meet the "net-zero" standards. In Ukraine, striving for integration into the European economic space, development companies are forced to adapt to these requirements, especially within the framework of recovery programs financed by international donors (e.g. UNDP, World Bank). Traditional approaches that ignore these trends lead to a loss of market positions: In 2024, 30% of projects in the Kyiv region did not find buyers due to non-compliance with modern standards. Proactive management, which involves predicting such changes and implementing innovative solutions (e.g. "green" technologies), is relevant to ensure market attractiveness and the sustainability of projects. The development industry in Ukraine has a direct impact on socioeconomic development: According to the State Statistics Service (2023), it provides 7% of GDP and 12% of jobs in the construction sector. In the post-conflict period, its role increases, as the restoration of housing and infrastructure (for example, in Bucha) is a prerequisite for the return of the population and the revival of the economy. However, without innovative mechanisms, companies face inefficiency: In 2024, the average project implementation period increased by 18% due to the lack of a strategic approach. Proactive management, which includes digital tools and forecasting of social needs (for example, affordable housing for displaced persons), allows you to accelerate these processes and increase the social value of projects, which meet national priorities and the goals of international partners, such as UNDP.

## The purpose of the study

The purpose of the study is to develop innovative mechanisms for a development company's development programs by implementing proactive strategic management to increase its competitiveness and adaptability in uncertain conditions.

## Literature review

Proactively managing smart development projects in turbulent environments is crucial for ensuring project success and sustainability. This involves adapting to rapid changes and uncertainties in market needs, technology, and external conditions. The following sections provide insights into effective strategies and considerations for managing such projects.

Effective management in turbulent environments requires extreme flexibility and responsiveness. Successful product developers, like those at Silicon Graphics and NEC, emphasise a development process that remains fluid and adaptable, allowing for rapid responses to new technical and market information. This approach ensures a better match between system and component technologies and maximises the ability to respond to changes [1; 6].

A proactive strategic orientation, coupled with organic organisational structures, enhances innovativeness and market intelligence, which are critical for new product success in turbulent environments. Innovativeness is particularly crucial in high turbulence, while market intelligence is more important in low turbulence. Environmental turbulence moderates the impact of these factors on product success, highlighting the need for adaptable strategies [3; 7].

Incorporating sustainable development principles into project management is essential for long-term stability and investment attractiveness. Tools like LEED and BREEAM help manage sustainable construction projects under uncertainty by assessing the impact of environmental elements and simulating turbulence scenarios. This approach identifies vulnerable elements and enhances project resilience [2].

Organisational capabilities, such as information technology, innovation, coordination, and emergency management, significantly improve project performance in turbulent environments. Environmental turbulence positively moderates the relationship between coordination capabilities and project performance, emphasising the need for robust capability configurations in digital construction projects [4].

## Improvisational Capabilities and IT Systems

Improvisational capabilities, defined as the ability to spontaneously reconfigure resources, are vital in highly turbulent environments. These capabilities, supported by IT systems like project management and cooperative work systems, enable organisations to address urgent and unpredictable situations effectively. This approach contrasts with traditional dynamic capabilities, which are more suited to moderately turbulent environments [8].

Innovative leadership is crucial in navigating turbulent environments. Leaders must manage digital transformations and foster an organisational culture that supports innovation, collaboration, and emotional intelligence. Developing project management competencies is also critical for maintaining competitiveness and adapting to rapid environmental changes [9; 10].

## Main research

For the successful management of development projects, it is necessary to take into account both theoretical foundations and practical tools that allow you to effectively respond to the challenges of the modern business environment. Let us consider the analysis of trends and features of Ukraine in the management of development projects. The management of development

projects in Ukraine is undergoing significant changes under the influence of both global trends and specific local conditions caused by war, economic instability and socio-political transformations. This analysis highlights the key trends, features and challenges characteristic of Ukraine in 2025, with an emphasis on the development industry, in particular in the context of the restoration of cities such as Bucha (Table 1).

## The successful management of development projects

Let us consider the methods of managing smart development projects and products in the turbulent environment of Ukraine as of 2025. Turbulence, which corresponds to the BANI framework (Brittle, Anxious, Nonlinear, Incomprehensible), requires adaptive, technologically oriented approaches. The methods are based on the integration of artificial intelligence (AI), Building Information Modelling (BIM), Internet of Things (IoT) and proactive strategies, with examples for Kyiv and Bucha.

*Characteristics of the turbulence of the environment.*

Brittle (Fragile) – instability of infrastructure (power outages 0.6–0.7), resources (50% availability in Bucha).

*Table 1 –* ***Analysis of trends and features of Ukraine in the management of development projects***

| No | Trend / Feature | Trend description | Features in Ukraine |
|---|---|---|---|
| 1 | Digitalisation and implementation of new technologies | The use of BIM, AI and IoT is increasing to improve project efficiency. The share of companies with BIM increased from 10% (2022) to 15% (2024), but below the European 50%+. | Implementation is uneven: large companies invest in BIM and AI, while SMEs are limited by finances and personnel. In Bucha, BIM models 50 buildings, but only 20% of contractors have experience. |
| 2 | Focus on sustainability and energy efficiency. | The demand for "green" projects is growing (LEED, BREEAM, UNDP, EBRD requirements). In 2024, 25% of projects in the Kyiv region will be energy efficient. | Emphasis on energy efficiency due to unstable energy supply (outages 0.7). In Bucha, the reconstruction of water treatment facilities reduces costs by 15%. |
| 3 | Changing the structure of demand | The transition from elite housing to affordable and multifunctional. In 2024, 60% of demand will be economy class. | War and migration (6 million displaced persons) have increased the need for mass housing. In Bucha, the priority is modular houses (3–6 months vs 12–18). |
| 4 | The growing role of the state and international partners | The state and donors (UNDP, World Bank) will finance 40% of projects in 2024, introducing requirements for transparency of tenders. | Bureaucracy complicates management (delays of 2–3 months), but ensures stability. In Bucha - $1.5 million from UNDP. |
| 5 | Proactive management as a response to uncertainty | Transition to proactive strategies with scenario planning and forecasting. | Uncertainty (inflation 15–20%, prices +30%) stimulates AI for forecasting and TRIZ for contradictions. In Bucha, AI reduced logistics by 10%. |
| 6 | High level of uncertainty | War caused instability: cement +25% (2024), energy outages (70% of projects), payment delays (20% of budget). | Management needs flexibility: in Bucha, adaptation to 50% of resources with modular structures (savings 15%). |
| 7 | Limited resources and staff | The lack of specialists (30% left) and finances (SME budget $200–300 thousand) make scaling difficult. | In Bucha, 5% of teams have BIM experience, and remote experts or training is needed (50 hours – $5,000). |
| 8 | Dependence on external funding | Donors (UNDP, EU) cover 60% of the costs, requiring transparency and reporting. | In Bucha, projects ($1.5 million) are delayed due to audit (1 month), but are more stable than private investments. |
| 9 | Shortened implementation times | The times are reduced from 12–18 months to 6–9 months due to the urgency of recovery (Minregion, 2024). | In Bucha, AI predicts the times (85% accuracy) and modular structures accelerate by 30%. |
| 10 | The social orientation of projects | Development is moving towards social goals – housing for displaced people, and infrastructure (schools, hospitals). | In Bucha, 70% of projects are for communities, the margin is up to 10%, but the social value is growing. |

Anxious (Anxious) – economic uncertainty (inflation 15–20%), social pressure (6 million displaced persons).

Nonlinear (Nonlinear) sudden changes in demand (60% economy class in Bucha, 50% in Kyiv), prices (+25–30%).

Incomprehensible (Incomprehensible complexity of forecasting due to lack of data and chaos.

*The concept of smart projects and products*

Smart development projects and products are objects (housing, infrastructure, systems) that use AI, BIM and IoT for:

Adaptability – responding to disruptions and changes.

Efficiency – optimising resources and time (15–30%).

Sustainability – energy efficiency (15–20%) and social value.

The key methods, their tools, advantages, limitations and application examples are described below.

*Scenario planning with AI forecasting.*

Development of scenarios (optimistic, baseline, pessimistic) using AI to forecast demand, risks and resources.

Tools – LSTM AI models (time series), big data analysis (500GB in Bucha, 2TB in Kyiv).

Process:

Data collection (demand, prices, resources).

AI forecast (80–85% accuracy).

Scenarios (50% and 75% availability).

Advantages – flexibility in uncertainty, and forecast accuracy (+20% compared to traditional methods).

Limitations – need for data and computing power ($50,000).

In Bucha, AI forecasts demand for 50 houses (85%), and in Kyiv, traffic for 1 million people (80%).

*TRIZ with AI automation*

Using the Theory of Inventive Problem Solving (TRIZ) to resolve contradictions and automated AI for speed.

Tools – TRIZ contradiction matrix, AI (generative models, e.g. GPT).

Process:

Definition of contradiction ("speed vs quality").

AI suggests TRIZ principles (e.g. "flexibility").

Implementation (modular designs).

Advantages – innovation, cost reduction (15%), automation (+50% speed).

Limitations – complexity of AI integration ($20,000), static without adaptation.

For example – in Bucha, TRIZ+AI optimises modular buildings (15% savings), and in Kyiv – building density (+15% green areas).

*Agile management with AI optimisation*

An iterative approach with short cycles, supported by AI for resource and schedule optimisation.

Tools – Scrum (2–6 weeks), AI (genetic algorithms for Ropt, Topt).

Process:

Breakdown into sprints (construction, infrastructure).

AI calculates optimal resources (-10–15%).

Weekly adaptation.

Advantages – speed (20–30%), flexibility in nonlinearity.

Limitations – less effective for large projects, need for team coordination.

For example – in Bucha Agile speeds up 50 buildings by 30%, and in Kyiv – a transport hub by 17%.

*Critical Chain Method (CCPM) with IoT+AI*

Focus on key stages with buffers, supported by IoT for monitoring and AI for adaptation.

Tools – CCPM (20% time buffers), IoT (sensors), AI (Reinforcement Learning).

Process:

Identification of critical stages (foundation, logistics).

IoT captures disruptions (energy, materials).

AI adjusts buffers (85% accuracy).

Advantages – reduced delays (15%), adaptation to fragility.

Limitations – the difficulty of forecasting in chaos, IoT costs ($10,000).

For example – in Bucha CCPM completes a water treatment plant in 9 months, and in Kyiv – a school in 12 months.

*BIM management with AI analytics*

Digital modelling of projects with AI for data analysis and optimisation of solutions.

Tools – BIM (Autodesk Revit), AI (cost, quality analytics).

Process:

Project modelling (90–95% accuracy).

AI analyses cost and quality (-15% errors).

Integration with construction.

Advantages – accuracy (90%+), savings on design (15–20%).

Limitations – lack of personnel (5–20% with experience), license costs ($5,000).

For example in Bucha BIM models 50 houses, in Kyiv – 20 high-rise buildings (95% accuracy).

4. Integration of methods in management

Combined approach:

Scenario planning + TRIZ + AI → forecasting and innovation.

Agile + CCPM + IoT → speed and control.

BIM + AI → accuracy and optimisation.

For example in Bucha AI forecasts demand (scenarios), TRIZ optimizes designs, Agile+BIM accelerates construction, IoT controls energy (86% efficiency). In Kyiv, the same for high-rise buildings and transport (90%).

## Innovations in development projects for a “SMART city”

The concept of "smart city" (Smart City) is gaining increasing popularity in the modern world, in particular in Ukraine, where urbanisation and technological progress create new challenges and opportunities for development projects. Innovations in such projects are aimed at creating integrated systems that optimise urban life, increase energy efficiency, improve the quality of life of residents and contribute to sustainable development. In the context of development, "smart city" involves the use of advanced technologies, such as artificial intelligence (AI), Internet of Things (IoT), big data (Big Data) and BIM (Building Information Modelling), to implement projects that harmoniously combine physical infrastructure, digital solutions and human needs.

One of the key areas of innovation is the introduction of smart technologies in residential complexes. For example, projects such as the “Faina Town” residential complex in Kyiv use IoT systems to monitor energy consumption, which allows for savings of up to 30% on heating, and smart lighting that adapts to the needs of residents. Such solutions not only reduce operating costs but also increase comfort and safety, responding to the trend for energy efficiency and environmental friendliness.

Another important aspect is transport infrastructure. In smart city projects, innovations include the creation of transport hubs, such as the proposed hub on the Left Bank of Kyiv, where AI and IoT optimise routes, and reduce congestion (up to 12%) and CO2 emissions (up to 20%). The use of modular structures in such projects reduces costs by 15% and speeds up construction, which is critically important in conditions of limited resources and a turbulent environment.

Digital infrastructure also plays a central role. Development projects integrate platforms like Kyiv Digital, which provides data collection (2TB+) to analyse residents' needs and improve city services. This allows, for example, to automate waste management or provide online services, saving residents' time – up to 125 hours annually, according to Juniper Research.

Environmental innovations in “smart” development projects include the use of renewable energy sources (solar panels, wind turbines) and recycling systems (up to 70% of waste). An example is Stefano Boeri’s “forest city” concept, adapted for urban areas, where green areas are integrated with buildings to improve the microclimate and reduce CO2 emissions (up to 116 thousand tons per year in the Cancun project).

Managing such projects requires a proactive approach, where AI predicts risks (with an accuracy of 80–85%), and BIM provides modelling accuracy (95%), reducing errors by 15%. Ukrainian conditions, such as war and inflation (15–20%), add complexity, but innovations allow for adaptation: for example, local procurement of materials reduces logistics costs by 12%, and scenario planning helps to take into account uncertainty (probability of disruptions 0.6–0.7).

Thus, innovations in “smart city” development projects create synergy between technologies, ecology and social needs, forming a sustainable urban environment. They not only increase economic efficiency (ROI up to 20%), but also contribute to the integration of Ukraine into the global innovation space, making cities more comfortable, safer and future-oriented.

Let's consider the formation of synergy through innovations using the examples of the city of Kyiv.

Synergy in the context of innovation in smart city development projects arises from the integration of technology, environmental solutions and social needs, which together create an effect greater than the sum of the individual components. In Kyiv, where urbanisation, war and economic instability create unique challenges, synergy through innovation is manifested in projects that combine artificial intelligence (AI), the Internet of Things (IoT), Building Information Modelling (BIM) and social orientation. Below, we consider how this happens using the examples of the “Faina Town” residential complex and the Left Bank transport hub.

## Synergy in the “Faina Town” Residential Complex

Let's consider the components of synergy.

Technologies – use of IoT for smart systems (lighting, meters) and BIM for modelling (95% accuracy).

Ecology – energy efficiency (30% savings on heating), recycling of 70% of waste.

Social needs – housing for 15,000 people, infrastructure (3 km promenade, school, swimming pools).

Let's identify the mechanisms for forming synergy.

IoT systems monitor energy consumption in real-time, and AI predicts peak loads (80–85% accuracy), allowing you to optimise resources and reduce costs by 15%. BIM reduces design errors by 20%, which speeds up construction (from 18 to 15 months per turn).

Environmental solutions (solar panels, insulation) not only reduce CO2 emissions but also increase the comfort of residents, creating social value.

Infrastructure (closed area, video surveillance) meets the demands for security and convenience, which increases demand (50% of economy-class apartments were sold in the first months).

Synergy is manifested in the combination of economic benefit ($5–7 million savings), environmental effect (30% reduction in energy costs) and social impact (housing for 5,000 families). The effect exceeds individual achievements: for example, energy efficiency

alone saves money, but together with smart systems and infrastructure, it improves the quality of life, which increases the market value of the project by 25%.

### Proactive management of smart development projects using examples from Kyiv

Proactive management of risks and opportunities of smart development projects involves predicting potential threats and prospects, analysing them and implementing strategies to minimise negative impacts and maximise positive outcomes. In the context of Kyiv, taking into account the turbulent BANI environment (Brittle, Anxious, Nonlinear, Incomprehensible), this is especially relevant due to war, economic instability and urbanisation challenges (Fig. 1). Below is an approach to proactive management using the example of two projects – Faina Town Residential Complex and a transport hub on the Left Bank (Table 2).

*Table 2 –* ***Proactive management of smart development projects***

| Method | Description | Process | Example |
|---|---|---|---|
| **Risk and Opportunity Analysis with AI** | LSTM models for forecasting (demand, prices, disruptions). | Data collection (2TB from Kyiv Digital).<br>AI forecast (80–85% accuracy).<br>Probability estimation (e.g., 0.6 for disruptions). | In Faina Town, AI predicted an increase in cement prices (+25%), which allowed purchasing materials in advance. |
| **Scenario Planning** | Scenario development (optimistic, baseline, pessimistic). | Identification of factors (resources, time, demand).<br>Scenarios (50% and 75% availability).<br>Strategies for each scenario. | A transport hub/packages/50% resource scenario involved modular construction. |
| **BIM for Risk Minimisation** | Digital modelling for precise planning (95% accuracy). | Project modelling (buildings, infrastructure).<br>Error detection (-20% defects).<br>Cost optimisation (15%). | At Faina Town, BIM reduced costs by $1.5 million. |

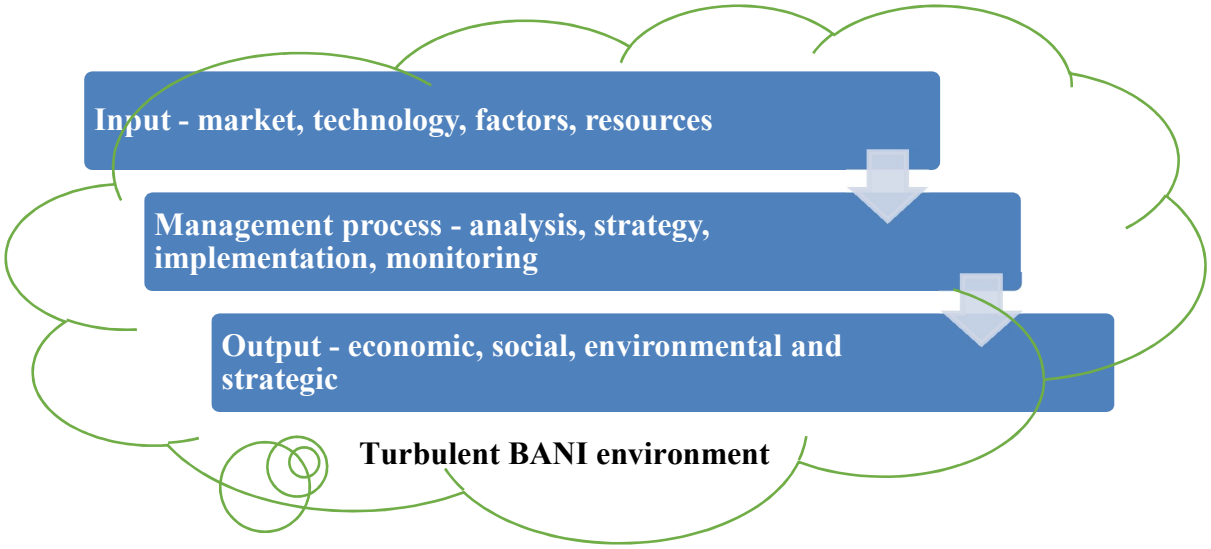


*Figure 1 – Elements of the conceptual model*

### Mathematical model

The model is formalised through the management efficiency function:

$E=f(A, S, R, M)=w_1 \cdot A+w_2 \cdot S+w_3 \cdot R+w_4 \cdot M,$

where $E$ – overall efficiency (0–1); $A$ – analysis and forecasting (AI accuracy, scenarios); $S$ – strategic planning (TRIZ, BIM); $R$ – implementation (Agile, AI-optimisation); $M$ – monitoring (IoT, correction); $w_i$ – weighting factors (e.g., 0.25 for each stage).

Let's look at an example of Buchi.

$A$=0.85 (AI-forecast), S=0.9 (BIM-models),
$R$=0.8 (Agile),
$M$=0.75 (IoT);

$E$=0.25·0.85+0.25·0.9+0.25·0.8+0.25·0.75=0.8375 (83.75% efficiency).

Consider the features of the model in the modern environment of Ukraine.

Turbulent. The model adapts to disruptions (energy, logistics) through scenarios and AI analytics.

Digital foundation. BIM and AI integrate data (500GB+ in Bucha) for accuracy and optimisation.

Social focus: Priority is affordable housing and infrastructure (70% of projects in Bucha).

Resource constraints. Use of local materials and modular structures (savings of 15%).

## Conclusion

The analysis presented underscores the critical need for development companies in Ukraine to transition from reactive to proactive strategic management, particularly within the context of SMART development projects operating in a highly turbulent environment. The prevailing economic instability, coupled with the imperative for post-conflict reconstruction and integration into the European space, necessitates innovative approaches that leverage digital transformation, prioritise sustainability, and adapt to evolving market demands.

The study has demonstrated that the integration of technologies such as BIM, AI, and IoT, coupled with proactive methodologies like scenario planning, TRIZ, Agile, and CCPM, offers significant potential to enhance project efficiency, mitigate risks, and capitalise on emerging opportunities. The examples from Kyiv and Bucha illustrate the practical application and benefits of these approaches, including cost reductions, accelerated timelines, improved accuracy, and enhanced adaptability to unforeseen disruptions.

Furthermore, the exploration of "smart city" development projects highlights the synergistic effects of combining technological advancements with environmental considerations and social needs, leading to more sustainable and liveable urban environments. The proactive management of risks and opportunities, facilitated by AI-driven forecasting and BIM-based planning, is crucial for navigating the complexities of the BANI environment and ensuring project success.

The proposed conceptual model, underpinned by a management efficiency function, provides a framework for evaluating and implementing proactive strategies. Its adaptability to the specific challenges of the Ukrainian context, including resource limitations and a strong social orientation, underscores its relevance and potential impact.

Ultimately, the adoption of proactive strategic management and the integration of SMART technologies are not merely advantageous but essential for the sustainability and competitiveness of development companies in Ukraine. By embracing these innovative mechanisms, the industry can not only overcome the challenges posed by the turbulent environment but also contribute more effectively to the nation's economic recovery and long-term development goals. Continued research and practical implementation of these proactive approaches will be vital for shaping a resilient and forward-thinking development sector in Ukraine.

## References

1. Iansiti, M. (1995). Shooting the Rapids: Managing Product Development in Turbulent Environments. California Management Review, 38, 37 – 58. https://doi.org/10.2307/41165820.

2. Wang, W. (2021). The concept of sustainable construction project management in international practice. Environment, Development and Sustainability, 23, 16358 – 16380. https://doi.org/10.1007/s10668-021-01333-z.

3. Dröge, C., Calantone, R., & Harmancioglu, N. (2008). New Product Success: Is It Really Controllable by Managers in Highly Turbulent Environments? Journal of Product Innovation Management, 25, 272–286. https://doi.org/10.1111/J.1540-5885.2008.00300.X.

4. Chen, Y., Qiu, W., & Xiao, M. (2025). Influence mechanisms of digital construction organizations' capabilities on performance: evidence from SEM and fsQCA. Engineering, Construction and Architectural Management. https://doi.org/10.1108/ecam-03-2024-0373.

5. Liu, Y. (2013). Sustainable competitive advantage in turbulent business environments. International Journal of Production Research, 51, 2821 – 2841. https://doi.org/10.1080/00207543.2012.720392.

6. Buganza, T., Dell'Era, C., & Verganti, R. (2009). Exploring the Relationships between Product Development and Environmental Turbulence: The Case of Mobile TLC Services. Journal of Product Innovation Management, 26, 308–321. https://doi.org/10.1111/J.1540-5885.2009.00660.X.

7. Calantone, R., Garcia, R., & Dröge, C. (2003). The Effects of Environmental Turbulence on New Product Development Strategy Planning. Journal of Product Innovation Management, 20, 90–103. https://doi.org/10.1111/1540-5885.2002003.

8. Pavlou, P., & Sawy, O. (2009). The 'Third Hand': IT-Enabled Competitive Advantage in Turbulence Through Improvisational Capabilities. IO: Productivity. https://doi.org/10.2139/ssrn.1557866.

9. Budiningsih, I., & Soehari, T. (2021). Strengthening Innovative Leadership in the Turbulent Environment. Leadership - New Insights [Working Title]. https://doi.org/10.5772/intechopen.100456.

10. Suikki, R., Tromstedt, R., & Haapasalo, H. (2006). Project management competence development framework in turbulent business environment. Technovation, 26, 723-738. https://doi.org/10.1016/J.TECHNOVATION.2004.11.003.

*The article has been sent to the editorial board 12.04.2025*

**Мурованський Гліб Анатолійович**
Аспірант кафедри управління проєктами,

*https://orcid.org/0009-0003-4610-9087*
*Київський національний університет будівництва і архітектури, Київ*
**Бушуєва Наталія Сергіївна**
Доктор технічних наук, професор кафедри управління проєктами,
*https://orcid.org/0000-0002-4969-7879*
*Київський національний університет будівництва і архітектури, Київ*

## ПРОАКТИВНЕ УПРАВЛІННЯ ПРОЄКТАМИ РОЗУМНОГО РОЗВИТКУ В ТУРБУЛЕНТНОМУ СЕРЕДОВИЩІ

***Анотація.*** *Нинішнє турбулентне економічне середовище в Україні, що характеризується високою інфляцією (15–20%), волатильністю обмінного курсу та нестабільністю енергопостачання (відключення електроенергії з імовірністю 0,7), створює значні проблеми для девелоперських компаній, що призводить до збільшення вартості проєктів (10–15% у 2024 році) та зниження попиту. Традиційних стратегій реагування недостатньо для вирішення цих проблем. У цьому документі обґрунтовується необхідність проактивного підходу до стратегічного управління в проєктах розвитку SMART, інтеграції цифрової трансформації (BIM, AI, IoT), акценту на стійкість та енергоефективність, а також адаптації до мінливих вимог ринку щодо доступного та екологічно чистого житла. Аналізуючи глобальні тенденції та специфічні умови в Україні, зокрема в контексті постконфліктної реконструкції (наприклад, Бучі), дослідження підкреслює обмеження поточних практик реагування та потенціал проактивного управління для підвищення конкурентоспроможності й адаптивності. Метою дослідження є розробка інноваційних механізмів розвитку програм компаній шляхом впровадження проактивного стратегічного управління. Воно досліджує такі методи, як планування сценаріїв на основі штучного інтелекту, ТРВЗ (теорія розв'язання винахідницьких задач) з автоматизацією штучного інтелекту, гнучке управління з оптимізацією штучного інтелекту, метод критичного ланцюга з Інтернетом речей та штучним інтелектом, а також управління BIM за допомогою аналітики штучного інтелекту. Крім того, у статті досліджено синергію, створену інноваціями в проєктах розвитку «розумного міста», на прикладах Києва (наприклад, ЖК «Фаїна») та запропоновано концептуальну модель проактивного управління ризиками та можливостями в таких проєктах у середовищі BANI (крихкому, тривожному, нелінійному, незрозумілому). Ефективність моделі демонструється через математичне представлення та її застосовність до унікальних викликів українського контексту, включаючи обмеження ресурсів і соціальну спрямованість.*

***Ключові слова: проактивне управління; проєкти розвитку; турбулентне середовище; SMART city***

---

**Link to publication**

APA Murovansky, G., & Bushuyeva, N. (2025). Proactive management of smart development projects in a turbulent environment. *Management of Development of Complex Systems*, 62, 24–31, dx.doi.org\10.32347/2412-9933.2025.62.24-31.

ДСТУ Мурованський Г. А., Бушуєва Н. С. Проактивне управління проєктами розумного розвитку в турбулентному середовищі. *Управління розвитком складних систем.* Київ, 2025. № 62. С. 24 – 31, dx.doi.org\10.32347/2412-9933.2025.62.24-31.