

2.2 Digitalization of the construction sector in the context of developing the rental housing market through financial leasing mechanisms

In the current conditions, one of the key tasks facing the state is to ensure access to affordable housing for the population as a prerequisite for the post-war recovery of Ukraine's economy. An effective solution to this challenge requires the application of innovative financial and economic instruments, among which financial leasing deserves particular attention. Its significant advantage lies in enabling broader access to housing without the need for substantial initial investments. However, the effectiveness of this mechanism largely depends on the level of digitalization within the construction sector.

Digital transformation of the construction industry opens up substantial opportunities for optimizing all stages of residential development — from design to commissioning. The implementation of Building Information Modeling (BIM) technologies enhances the precision of planning, optimizes resource use, reduces costs, and improves construction quality. Digital tools facilitate the formation of integrated information systems that enable efficient interaction between developers, financial institutions, government bodies, and end-users.

In the context of implementing housing financial leasing mechanisms, digital platforms can serve as the foundation for automating processes such as the selection of lessees, calculating financing conditions, monitoring contract execution, and managing legal documentation. The use of electronic digital signatures, blockchain technologies, and identity verification systems minimizes time expenditures, reduces administrative burdens, and ensures procedural transparency. Moreover, digitalization promotes more efficient implementation of housing programs targeted at vulnerable population groups, including internally displaced persons, veterans, and young families. The creation of a unified digital housing ecosystem that integrates construction, financial, and public institutions enables a comprehensive approach to state housing policy based on public-private partnership principles.

The digitalization of the construction sector has a transformational impact on housing provision mechanisms, particularly those based on financial leasing. Digital technologies enhance efficiency, lower costs, and improve project management quality – all of which are crucial to simplifying access to housing.

The integration of digital construction management tools with innovative financial models is key to this transformation, as it provides the construction sector with new opportunities to meet housing demand. This digital shift not only optimizes construction processes but also reshapes the financial strategies supporting housing provision through leasing mechanisms.

Digital innovations such as GPS, 3D design, the Internet of Things (IoT), and Artificial Intelligence (AI) are being integrated into construction processes, enhancing their precision and efficiency [41]. These technologies assist in cost control and risk management, which is essential for financial leasing models that require predictable and manageable expenditures [41].

Innovative financial models, particularly microfinancing and public-private partnerships (PPPs), are effective in implementing housing financial leasing programs. These models involve the integrated use of public and private resources [42], thereby generating positive impacts on the social and environmental spheres and fully aligning with the objectives of financial leasing in ensuring access to affordable housing [42].

Digitalization also serves as a tool that facilitates housing search. Online platforms provide access to relevant information about the housing market, help reduce search costs, and expand options available to potential tenants. These platforms can streamline the leasing process, making it more efficient and accessible to a broader range of potential consumers [43].

The shift from asset ownership to service access models, enabled by digital technologies, corresponds with the principles of financial leasing. Companies are thereby encouraged to integrate advanced technologies and adapt to regulatory changes to maximize the benefits of leasing in the digital age [44].

The development of housing financial leasing can be strengthened through a set of tools aimed at simplifying access to housing finance while maintaining real estate

market stability:

1. Technological integration. The implementation of digital technologies such as AI and IoT can streamline leasing processes, enhance user convenience, and improve efficiency. Ensuring data security is crucial for maintaining consumer trust and complying with regulatory requirements [44].

2. Institutional innovation. Adopting best international practices through targeted education and knowledge transfer can help improve the regulatory environment for financial leasing, contributing to its growth within the housing sector [45].

3. Legal framework improvement. The example of Turkey may support the integration of financial leasing into housing finance systems, offering useful insights into regulatory modernization [46].

4. Mortgage rate management. Monitoring and adjusting mortgage interest rates can influence housing supply and demand, as fluctuations significantly impact pricing and investment attractiveness [47]. In parallel, increasing consumer awareness of financial leasing options can strengthen their participation in the housing market and stimulate housing demand [46].

Although this toolkit demonstrates the potential of financial leasing for housing, challenges such as market volatility and regulatory compliance remain significant barriers to achieving sustainable growth in this sector.

The development of housing financial leasing is increasingly intertwined with the digitalization of the construction sector. This integration not only enhances operational efficiency but also responds to the growing demand for affordable housing solutions.

While digitalization presents substantial benefits, it also introduces a range of challenges, such as data security and regulatory compliance. However, addressing these issues can unlock the full potential of digital technologies in transforming housing provision through financial leasing. Such a balanced approach ensures that digitalization will positively contribute to the evolution of the housing sector.

Given that housing financial leasing allows households to gradually acquire

property without relying on traditional mortgage loans, its development requires a comprehensive approach. This includes the use of both financial-institutional and digital tools to ensure transparency, accessibility, and efficiency in the implementation of leasing schemes. In this context, the digitalization of the construction sector creates favorable conditions for improving each of these tools [41-53]:

1. Digital platforms for managing housing leasing programs. Online platforms integrated with real estate registries, financial institutions, and developers form the backbone of modern leasing infrastructure. They enable:

- automation of application processes and creditworthiness verification of potential lessees;
- creation of personalized payment schedules;
- conclusion of digital contracts using electronic signatures;
- online monitoring of contractual obligation fulfillment.

Digital construction processes contribute to immediate integration of residential properties into such platforms through BIM models and electronic technical passports.

2. BIM (Building Information Modeling) as a foundation for leasing object transparency. The use of BIM technologies in the design and implementation of residential properties enables the creation of digital twins of buildings, providing:

- improved lessee awareness of property characteristics;
- real-time construction cost monitoring;
- auditing of the housing's technical condition prior to ownership transfer.

As such, BIM forms the basis for building trust among developers, financial intermediaries, and end users.

3. Fintech solutions for automating leasing calculations. Integrating leasing programs with fintech platforms (via APIs) enables:

- automatic payment calculation;
- dynamic price recalculation based on macroeconomic indicators;
- formation of digital credit histories to promote financial inclusion.

This enhances construction financing stability and reduces the risks of default.

4. Digital property rights registries and cadastral integration. Safe leasing

contract execution requires access to:

- electronic registers of real estate ownership rights;
- cadastral information;
- the "e-Housing" platform, developed within the framework of the digital transformation of property management.

The digital integration of data on properties, land plots, and legal documents helps prevent double sales, fraud, and reduces the time needed for leasing object verification.

5. Smart contracts and blockchain for transaction automation. The use of blockchain technologies ensures:

- automatic contract enforcement (via smart contracts);
- immutable storage of transaction histories;
- decentralized verification of property data accuracy.

This is particularly relevant for ensuring transparency in the implementation of state-supported housing leasing programs.

6. Digital public-private partnership (PPP) tools. The creation of open electronic platforms for implementing government co-financed leasing programs allows for:

- transparent selection of developers and financial partners;
- open tender processes under systems like ProZorro or other public e-procurement platforms;
- digital auditing of public fund usage.

7. Financial sharing and automation. The application of digital economy mechanisms and financial sharing helps eliminate information exchange barriers between businesses and financial institutions, standardize processes, and improve management efficiency in construction companies. This opens new opportunities for enterprise development, particularly through the creation of financial sharing centers that support integration between the construction sector and financial systems within construction organizations [54].

Financial leasing serves as an effective instrument for investing in the digital infrastructure of the construction industry. It enables the attraction of investment for

equipment renewal and the implementation of advanced digital technologies, thereby enhancing the efficiency and competitiveness of enterprises.

The financial operations of construction companies, particularly financial leasing, positively contribute to the digital transformation of the sector. Research indicates that financing through leasing and other financial instruments reduces financial constraints on the implementation of digital solutions such as automation, digital modeling, and blockchain. This allows enterprises to adopt new technologies more rapidly and improve their performance [55-57].

Digitalization acts as a key driver of change in construction, encompassing all stages of the construction process. The implementation of digital technologies such as Building Information Modeling (BIM), automation, digital twins, and other innovations becomes possible through access to modern equipment, which is often financed via leasing mechanisms. This contributes to greater transparency, enhanced efficiency, and reduced risks in the financing of supply chains [57-60].

Digital integration in financial leasing and the construction sector opens new opportunities for automation, transparency, and operational efficiency. However, it also requires overcoming technical, organizational, and regulatory barriers.

Key challenges include a relatively low level of digital skills, the need for frequent updates to models, substantial investment requirements, issues related to data interoperability, and limited organizational budgets [61-62]. These challenges necessitate close collaboration among all market participants to enable full integration of digital solutions, as well as the development of standards, policies, and mechanisms to overcome fragmentation within the industry [63-65].

In light of the above, it can be concluded that digitalization in the construction sector is a critical factor in improving the mechanism for providing housing to the population through financial leasing. The implementation of digital platforms, BIM technologies, blockchain-based solutions, and state support contributes to increased transparency, efficiency, and accessibility of housing leasing for the population. Further development of these tools will ensure the sustainable development of the housing market and improve housing availability for citizens.

Financial leasing, when combined with digitalization, is a powerful instrument for modernizing the construction industry by fostering investment, enhancing operational efficiency, and reducing financial risks. The advancement of digitalization will promote the creation of a transparent and sustainable housing market, increase the investment attractiveness of residential construction, and ensure social equity in housing access.