

# Digital technologies in managing the competitiveness of commercial real estate

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**Abstract.** Currently, technological progress does not stand still and affects both the economy and society as a whole. The real estate market, like the economy as a whole, is subject to digital transformation: the use of new technologies is growing both in design, construction, and in real estate sales. The purpose of the study is to analyze the implementation of technologies in construction and assess the prospects for their introduction into the real estate market. To achieve this goal, the following tasks have been set: study and analysis of future technologies in construction; identification of positive aspects for the sphere from implementation; identification of barriers to implementation at the moment. Research methods include monitoring modern technologies; market research and analysis; modeling of the real estate market. The study examined the impact of innovation and technology on the real estate market. Possible prospects for the modernization of the market are considered and the given examples of innovative technologies are evaluated. The main reasons necessary for the introduction of innovations are revealed, their effect is assessed both for construction companies and for end users. The analysis of the impact of the implemented technologies on the real estate cost (construction cost) and service life is carried out. The main advantages of the introduction of technologies are highlighted, as well as the barriers to their implementation.

## 1 Introduction

Currently, the real estate market, like the economy, is subject to digital transformation: the use of new technologies is growing both in design, construction, and in real estate sales. As a result, there is a change in established business processes, as well as attitudes towards residential and commercial real estate.

Based on the trends in the introduction of technologies in modern life, I would like to analyze how they will affect the future of the real estate market. These ideas can be called bold, but like any modern technology, they have a right to exist. The development of the real estate market with the help of modern technologies and innovations is relevant due to the high demand for real estate as property for personal use and life, a site for business or

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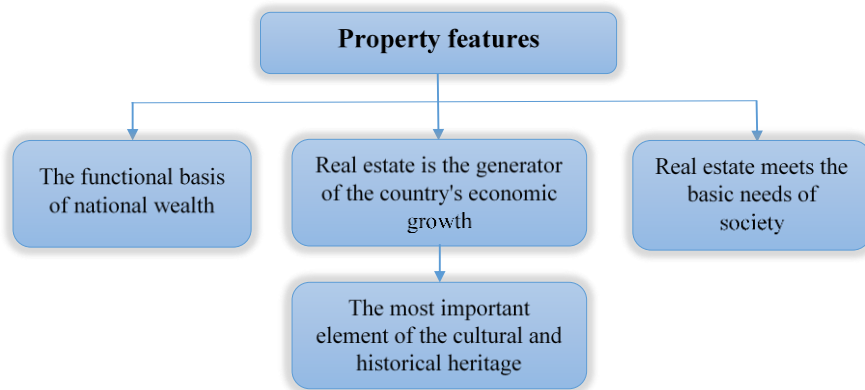
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an investment object, as well as in connection with the introduction of digitalization and innovation everywhere [2].

The current conditions of the pandemic introduce a number of difficulties in the real estate sector as a business, which has its consequences for both entrepreneurs and end consumers. The government of the Russian Federation has developed a number of priority measures to ensure sustainable development of the economy, including the construction industry, in the current conditions of the fall of the ruble and the coronavirus pandemic. Purpose of the study: to analyze the implementation of technologies in construction and assess the prospects for their introduction into the real estate market.

## 2 Materials and Methods

In many courses, there are currently several paid plans with different functionality, thus each student can choose the amount of feedback from teachers and additional functions. Figure 1 shows a comparative table of the two types of training.

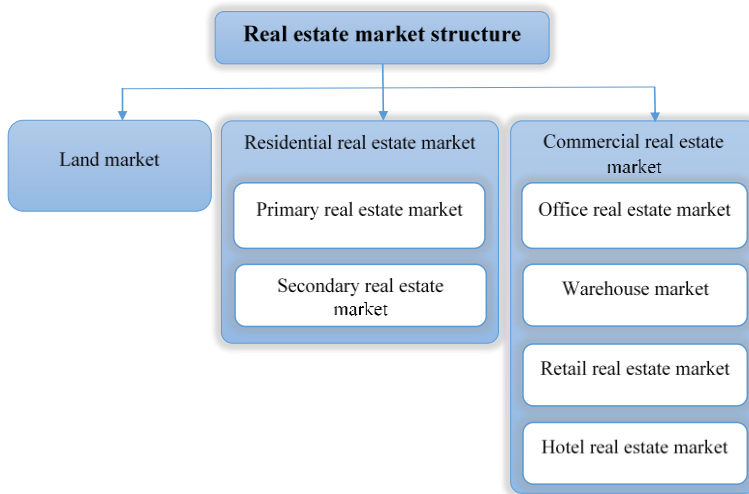


**Fig. 1.** Main characteristics of real estate.

The main functions of the real estate market are [2]:

- the function of establishing a balance between supply and demand;
- the function of regulating all processes in the market;
- the function necessary to obtain financial benefits in the real estate market, namely capital growth and profit;
- the function of eliminating market weaknesses;
- a function that stimulates market participants to make transactions for the purchase and sale of real estate;
- the function of attracting and popularizing the real estate market for the population.

By structure, the real estate market is divided into 3 elements, Figure 2:



**Fig. 2.** The structure of the real estate market.

There are 3 types of investment in the real estate market [3]:

1. Acquisition of a real estate object for the purpose of its subsequent sale or lease (possibly both commercial and residential real estate);

2. Purchase of a ready-made rental business (suitable for commercial real estate). RRB (ready-made rental business) is the purchase of liquid premises with lease agreements and stable cash flows. This is a convenient and highly profitable form of investment.

3. Contribution to a closed-end unit investment fund. This is the least risky instrument for investing in real estate: stable profitability, minimum entry threshold and the ability to invest in almost any property. Investors buy shares - conditional shares of the mutual fund's property, and portfolio managers choose an asset for investment, assess risks, invest funds and manage the facility.

A frequent event is real estate investment, which can be attributed to one of the more reliable and high-quality ways to invest money and free assets. The main goals of these investments are to save finances in an unstable economy and / or to earn income. The key feature and advantage is an increase in the price of existing objects and, accordingly, an increase in income [3, p. 65].

If we consider investments from the point of view of short-term investments of free cash: we should choose markets that are at the beginning of the recovery phase (locations where prices first fell significantly in recent years, and recently began to rise and still have a great growth potential). In such markets, it is profitable to engage in redevelopment projects: buy cheap real estate, repair and begin its rise, and in a year or two sell it more expensive due to rising prices and margins for renovation. You can also buy an object at the construction stage for speculative resale.

In 2018, the volume of investment transactions in the Russian real estate market amounted to \$ 1.84 billion – 31 % less than in 2017. After the events that occurred in 2020, the real estate investment market is gradually recovering and returning to the previous growth rates.

The decline in investor activity is due to the weakening of the national currency and the new sanctions imposed on Russia.

The residential real estate sector (zones for housing construction) became the leader in 2018 and attracted a record 29 % of investments. According to the data, retail real estate

was in the second place (26 % of the total investment volume). In the third place – the office real estate sector was identified with 25.6 %, in the fourth – warehouses (12 %).

About 26 % of the capital that was planned and spent on real estate in Russia at the beginning of 2018 is foreign investments. Interest in Russian assets from foreign investors remains, but the closing of transactions is held back by the volatility of the ruble.

Investing in real estate is much less risky than trading on the stock exchange, investing in startups and businesses. The explanation is simple: real estate is very rarely cheaper.

Currently, real estate investments are recognized worldwide as one of the most stable and reliable options for investing free cash. The exceptional group includes constantly unstable regions where the political, natural and geological situation is problematic. According to the results of long-term statistics, we observe the stability of real estate to inflation: housing is steadily increasing in value. Let's take a closer look at the strategies for investing in different types of real estate.

#### 1. Residential real estate.

This investment option is the most popular and is available to a wide range of potential consumers, for example, such as private investors. The advantage is the minimization of risks. There are two ways to achieve profit by investing in residential real estate:

- buying an object for the purpose of subsequent resale at a higher cost;
- purchase for rent.

Let's consider the main important criteria when buying residential real estate:

- location - the value of the criterion depends on the needs and goals of customers. Based on the preferences, a unique area is chosen according to the requests: a prestigious, residential or student area, environmentally friendly, remote from the city center;

- layout of the premises, the presence of a balcony, a combined or separate bathroom;
- condition – availability and quality of repairs;

infrastructure – how far are kindergartens, schools, clinics, public transport stops, shops.

#### 2. Commercial real estate.

Investors who want to professionally realize their potential in real estate choose office and retail areas of small size at the first stages, as well as large buildings designed to accommodate warehouses, supermarkets and bring special profitability when renting out.

Due to the universal digitalization and mass online purchases on the market, there is a special need for warehouse real estate and free space, as well as a large number of hubs and logistics centers.

Rent is a classic option for obtaining passive income. The investor's profit in this case is not correlated with the working time spent.

#### 3. Land plots.

If it is necessary to consider the option with the least investment of money, then you should study the land market, where the cost of square meters is significantly lower than in urban real estate.

The main advantages of investing in land plots:

- the probability of fraud is minimized;
- the repair option as such is not needed;
- there is no payment for utilities;
- simplified purchase procedure than for other real estate;
- relatively low taxes;
- there is no need to resort to the help of realtors.

These green objects can be classified according to the purpose of use. If we consider short-term investments with minimal costs, then by all standards, the plots that are used for construction will be suitable. Longer-term investments should be made in land intended for use in agriculture and industry, which are also in demand now, due to the popularization of agriculture in the regions.

#### 4. Suburban real estate.

Steadily generating income from investment activities is the acquisition of suburban real estate objects and their subsequent sale. There has always been a demand for dacha among residents of large cities, so you can always consider it as a profitable occupation.

There are several options for investing in suburban real estate:

- acquisition of objects under construction;
- investing in ready-made cottages;

#### 5. Real estate under construction.

Despite the fact that the riskiness of this option is somewhat higher, but you can also get a much larger profit.

The main attraction of this type of real estate is the minimum purchase price in comparison with the secondary real estate market. The main drawback is the high risks of not receiving the object on time, due to different tenders of developers. Therefore, if you invest funds at the initial stage, after the completion of construction, prices are likely to increase significantly. As a result, the investor will receive a tangible profit.

Risks when investing in real estate under construction are most often associated with the developer company.

All types of housing investment are inherently related to the search for an investment object.

Development activity in the real estate market has a number of features that cause the emergence of uncertainty - risk [4]:

1. A development project is an innovative process, the result of which is a new unique product, therefore, it becomes difficult to predict the market reaction to its appearance.

2. A development project is a complex technical, economic and social system in which a number of participants are involved, and the final result depends on the effectiveness of their activities. Each of the participants is a risk carrier that requires preventive measures.

3. A development investment project involves raising funds from investors, who are the main source of financing, are also interested and are responsible for minimizing the risks of the project.

4. Also, development projects have a long-term nature, high cost and durability of the product.

5. The specificity of development activities also lies in the fact that the risks arising during the implementation of the project are considered from the side of negative consequences, since the initial planning is focused on the maximum benefit.

The main risks of investment activities in the real estate market [5]:

- Low liquidity of the investment asset;
- Possible presence of hidden defects in the property, which cannot be detected initially;
- Serious size of the invested capital;
- Decrease in demand from tenants caused by an increase in supply;
- Long payback period of the investment project.

These risks can negatively affect three key project indicators: project costs, project revenues and capitalization rate. Most often, risks arising in the course of the implementation of development activities increase the costs of the project, and, consequently, its cost [6].

The real estate market is broadly classified and subdivided into segments and sectors. Each type of real estate is an investment object, aimed at increasing capital and making a profit. Development investment activity can be carried out by different methods, but it is also associated with a group of risks, which increase the uncertainty of the investment result [7].

### 3 Results and Discussion

In order to determine the relevance of the introduction of innovative methods in the field of real estate construction, it is necessary to analyze the real estate market and draw a conclusion about its prospects and development trends. Innovative construction methods are relevant for both residential and commercial real estate, since their benchmark is to reduce the cost of construction [7, 8, 9, 10]. Therefore, the analysis of the real estate market must be carried out in the context of segments of the real estate market.

Analysis of the current state of the commercial real estate market should be carried out in the context of its segments: retail, office, warehouse.

Consider the dynamics of supply and demand in the commercial real estate market.

#### 1. Retail property

At the end of the third quarter of 2020, the supply of high-quality retail real estate in St. Petersburg remained at the level of 3.1 million m<sup>2</sup> (Table 1)

**Table 1.** Main indicators of the retail real estate market [6].

Indicator	3Q 2018	3Q 2019	3Q 2020
Total supply of retail space, thousand, m <sup>2</sup>	3073	3073	3105
Number of operating classic and specialized shopping centers, pieces	120	120	122
Vacancy rate,%	3.7	2.8	4.5

According to the data for 2020, the segment of food retailers holds a stable and confident position. Since during the pandemic, many large grocery hypermarkets relocated to online sales.

#### 2. Office real estate

At the end of 3 quarters of 2020, there is a significant increase in the supply of retail space. The total supply of office real estate in St. Petersburg increased by 89.3 thousand m<sup>2</sup>, which is more than 5 times more than in the same period in 2019 (table 2) [11].

**Table 2.** Main indicators of the office real estate market [12].

Indicator	3Q 2018	3Q 2019	3Q 2020
Total supply, mln m <sup>2</sup>	3.08	3.28	3.65
New construction, thousand m <sup>2</sup>	27.3	16.5	89.3
Net absorption, thousand m <sup>2</sup>	34.8	24.6	27
Vacancy rate,%	8.0	5.1	6.8
Weighted average rental rate, rub / m <sup>2</sup> / month			
Class A	1520	1629	1549
Class B	1040	1063	1054

The main consumers of office real estate are still: energy and resource processing enterprises (29%), information technology companies (28%), and manufacturing companies (18%). At the same time, there is a drop in demand for office real estate among construction and development companies (from 7% to 4%), the segment of professional services (from 14% to 6%), and retail retailers (from 8% to 6%).

#### 3. Warehouse property

Analysis of the dynamics of warehouse real estate must be carried out by assessing the main market indicators (table 3).

During the period from Q1 to Q3 2020, four new warehouse premises were commissioned in St. Petersburg and the Leningrad Region. The total area of the facilities was 107.2 thousand m<sup>2</sup>. The result for 2020 is 20% higher than the same for 2019.

**Table 3.** Main indicators of the warehouse real estate market [13].

Indicator	3Q 2018	3Q 2019	3Q 2020
Total supply, mln m <sup>2</sup>	2.88	3.04	3.19
Commissioning volume, thousand m <sup>2</sup>	0	89	107
Total volume of transactions, thousand m <sup>2</sup>	95	211	208
Share of vacant premises, %	3.0	2.7	1.9
Average rental rate, rubles / m <sup>2</sup> / year	3600	3960	4100

The demand for warehouse property remained stable: the total volume of transactions in the first three quarters of 2020 amounted to 208 thousand m<sup>2</sup>, which is 3 thousand m<sup>2</sup> less than in the same period in 2019.

After analyzing the real estate market, one can draw a conclusion about the investment attractiveness of the commercial real estate market. However, there are high barriers to entry into the market, as well as dangerous risks associated with development investment activities. It is proposed to use the following innovative products in development investment activities. The first modern technology that can be used in construction activities is a 3D printer. The essence of using 3D printing in construction is that the printer squeezes out the building mixture according to a given three-dimensional computer model.

The use of this technology has a number of advantages:

1. A mixture of cement and recycled waste is used as raw material. Such a mixture is a cheap material, and also has a beneficial effect on the environment, since it implies the recycling of waste.

2. Reducing the need for manual labor allows you to reduce the cost of construction

3. In addition, during a pandemic, the number of workers plays an important role. Reducing them allows you to meet sanitary standards without losing the speed and quality of construction, as well as reduce the possibility of the spread of coronavirus.

4. In the future, it is possible to build using 3D printing remotely, which will not allow freezing construction in a pandemic, incurring equipment downtime costs, and, consequently, increasing the cost of construction and increasing the project duration.

The use of 3D printing can reduce the cost of real estate by 30-50% (the average is 40%). [14].

According to the data of the commercial director of the MIG-real estate group of companies, the average cost of 1 sq. m. housing in St. Petersburg is about 60,000 rubles. [15]

This technology will reduce, as a result, the cost of real estate for 1 sq. m. While maintaining the current extra charge of the construction company, equal to 42.5%, the calculation of the price is presented in table 4 [16].

**Table 4.** Calculation of savings per 1 m<sup>2</sup> from the introduction of 3D printing technology.

Housing type	Cost of 1 sq. m	Price for 1 sq. m	Extra charge
Without technology	60 000	85 500	42.5%
Using 3D printing technology	60 000*(1-40%)= 36 000	36 000*(1+42.5%)= = 51 300	42.5%
Saving	24 000	34 200	-

The savings for the construction company are tangible, the cost of production will decrease, which will have a positive effect on the company's profit by reducing the indicators of resource capacity, both labor intensity and material consumption.

If the company leaves the current markup in the formation of the market price, then housing for the population will become more affordable and the price for 1 m<sup>2</sup> will decrease by 34 200 rubles. Thus, the cost of 1 m<sup>2</sup> to wages will decrease and the ratio will be 1.12, housing will become more affordable by 40% [16]. As a result, the effect of the introduction of this technology is tangible for the end user, without losing profitability for developers. In turn, allowing housing will increase demand for it and bring additional income to construction companies, which will have a positive effect on all market participants.

So far, the buildings erected with the help of printers are isolated, but in the next decades this process will become widespread. At the moment, the strength of houses and the format of the structure in certain climatic zones is the most important barrier to the introduction of this technology everywhere, at the moment it is possible to create with the help of this technology not all architectural solutions. The head of WinSun, Ma Yihe, believes that in the future, using 3D printers, it will be possible to carry out much more ambitious projects, for example, to build skyscrapers. As a result of the application of this technology, the process of erecting buildings will become cheaper and faster [17].

The second technology is the introduction of currently popular nanotechnologies, which in the analyzed area will be able to reduce the cost of construction, as well as increase the standard life of the building, which is important for the reputation of the construction company, customer loyalty to it, while the company will reduce the cost of building maintenance in connection with an increase in the durability of materials.

As an example, the main building material is given, the service life of which is estimated without and using the technology in Table 5.

**Table 5.** Service life of concrete.

Indicator	Without technology	Using nanotechnology	Difference
Years	125	500	+375

According to the analyzed information, the service life of a building material such as nano concrete (concrete containing nanoparticles) has a service life of 500 years, which will have a beneficial effect on the service life of the entire building itself. In general, nanotechnology will allow building houses with a service life of up to 400 years, at the moment without the use of technologies this value is equal to 200 years, thus the standard service life of buildings will almost double, which will be beneficial for the company and, of course, for the end user.

The development and implementation of nanotechnology in the construction industry will allow the use of new topical building materials and construction technologies. This introduction of innovative technologies in construction will lead to a reduction in the cost of real estate, including a reduction in the cost of building materials and personnel costs. There will be an opportunity to optimize work in a pandemic thanks to remote technologies and the reduction of employees in the workplace to comply with epidemiological standards.

The main problem in these technologies is the laboriousness of the search and development of materials, as well as the specificity of this work requires large investments in development, but the benefits of implementation will have to cover the costs, so that companies can profitably invest in the development of nanomaterials as an intangible asset valuable for real estate.



## 4 Conclusion

Currently, digitalization has become an integral part of the scheme of buying and selling, as well as renting real estate. A period of stability has come in the sphere of Russian real estate, this is due to the increased interest of foreign investors. The interest of foreign investors is explained by the fact that the commercial real estate market in Russia has not yet reached its peak of growth, therefore, this is a rather promising direction for financial investments. The real estate market is currently considered one of the most dynamically developing markets with an ever-increasing level of competition. In view of this, real estate market participants are improving existing ways and looking for new tools to promote their goods and services. Many companies are already using information technologies to promote their products, but there are also those who are just planning to introduce them. In order to overtake their competitors and become leaders, market participants are increasingly using modern information technologies and constantly monitor all innovations in this area.

Each type of real estate is an object of investment, aimed at increasing capital and making a profit, and therefore the real estate market is a relevant sector of the economy for analyzing and developing directions to improve the efficiency of activities. The current conditions of the pandemic introduce a number of difficulties in the real estate sector as a business, which has consequences for both entrepreneurs and end consumers. These circumstances force the market to look for new ways and means of development to support entrepreneurial activity and optimal functioning of development companies. The introduction of new innovative technologies into the development environment can help in this problem.

During the study, it was revealed that the emergence of innovative technologies in construction will change the real estate market and will contribute to an increase in the competitiveness of commercial real estate. These trends will have a positive effect about the company and will undoubtedly be a plus for the end users of construction companies. Development companies will be able to introduce remote technologies in the construction process, which will help not to stop work and incur additional costs during possible quarantine, as well as to protect their employees.

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