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DIGITAL TWINS AS A NEW ORGANIZATIONAL FORM: REAL ESTATE MARKET MANAGEMENT IN THE ERA OF ARTIFICIAL INTELLIGENCE

Abstract

The real estate market, thanks to the application of advanced technologies, has undergone a radical transformation in all its phases, from the design and construction of real estate, through its marketing, providing legal certainty for the ownership and maintenance, all the way to use of real estate by its users. This statement is universal and applies to residential, industrial, social real estate or facilities for leisure, sports, etc.

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The application of digital technologies and digital twins has eliminated the traditional information asymmetry that long prevailed in the real estate market, enabling all stakeholders across all stages of construction and real estate transactions, from investors and developers to buyers and end users, to gain insight into the actual condition of a property and access necessary information regarding the building's history, the quality of the land on which it was constructed, its structural stability and overall quality, as well as other relevant information contained in real estate passports. Particularly important are the information concerning the safety of buildings and their legal status, i.e., the legal security of real estate. Artificial intelligence adds a new level of quality by enhancing digital twins with additional information regarding the physical, legal, and energy condition of buildings, as well as potential challenges related to safety and risks of fire, structural collapse, soil subsidence, and other parameters used for property evaluation.

Key words: *digital twins, real estate transactions, artificial intelligence.*

JEL classification: L85, O33, M15, R30

Introduction

It has been demonstrated that the application of advanced technologies increases labour productivity both in the manufacturing and in the service sectors. Artificial intelligence (AI) is rapidly penetrating various industries and increasingly replacing human labour, to the extent that numerous functions traditionally performed by humans are now being assumed by artificial intelligence. It is dramatically transforming the design of organizations engaged in real estate transactions, resulting in a significant increase in labour productivity within the real estate sector and, consequently, in a reduction of the transaction costs associated with real estate transfers.

Artificial intelligence is capable of utilizing large databases in the valuation of real estate properties, taking into account numerous, even hundreds of parameters within a very short period of time. Investors in real estate are thus able to predict the future value of properties over a longer time horizon, thereby reducing investment

risk. Based on historical data, artificial intelligence can also forecast future trends in specific locations and, accordingly, assess the attractiveness of a location from the perspective of safety, environmental impact, and potential risks affecting the stability of the property.

Traditional marketing, based on the creation of universal advertisements, is now being transformed through the application of AI, enabling personalized advertising instead. As a result, mass marketing has been replaced by individualized advertisements targeting a specific person searching for a particular type of property. When a large number of buyers express interest, artificial intelligence can quickly select the most favourable offers and establish a ranking of the best options within a very short time. AI is also capable of drafting sales contracts, detecting certain errors and inconsistencies, correcting them, and identifying digital fraud and deception. In the maintenance sector, it can optimize the consumption of energy, water, and electricity. Digital twin technologies are able to detect malfunctions before they occur, as well as to plan maintenance and the replacement of specific systems and devices, such as elevators, heating and cooling substations, air-conditioning systems, and fire-protection equipment.

Hence, there is a growing need for greater attention to be devoted to digitalization and digital twins by all stakeholders involved in real estate transactions.

1. Digitization in Real Estate Transactions with the Application of "Digital Twins"

Digitalization has also affected traditional industries in which human labour, particularly manual physical work, previously predominated. This is especially evident in the construction sector, from conceptual, main, detailed, and final design stages to the issuance of the necessary documentation for transactions, registration in the real estate cadastre, and related procedures. Digitalization is not merely a transformation involving the transition from paper-based and physical forms of real estate management. Rather, it represents a comprehensive transformation of real estate governance,

encompassing construction and modifications through the use of data and information, as well as digital organization and management.

Developed EU countries have digitalized numerous sectors and activities, as can be seen from the following Table 1.

Table 1. Digitization of activities in some EU countries

Countries	% Digitalization of population	Areas of application
Denmark	81	AL and e-government
Finland	81	HR and ICT experts
Netherland	84	Infrastructure
Swedish	77	Digital economy
Estonia	74	Digital public services

Source: European Commission – State of the Digital Decade Report 2025/2026

Although these data refer to the 2025/2026 period, given the rapid pace of digitalization, it may be concluded that these countries, as well as other EU member states, are actively pursuing the accelerated digitalization of all business activities. Among the five countries listed, the Netherlands is the leading example, with 84% of its population being digitally integrated. In addition, the Netherlands is a country that digitally connects various phases of infrastructure development and management.

Digitalization is transforming rigid and bureaucratic organizational structures, particularly through the introduction of digital twins, while converting them into agile and proactive data-driven systems. This is also dramatically changing management practices, replacing traditional vertical management models with network-based management. Digital twins integrate sectors within organizations engaged in the construction and real estate transaction process, substituting traditional intuition and historical reports, i.e., experience-based decision-making. Furthermore, digital twins contribute to decentralization, fundamentally altering the manner in which organizations are managed [11].

Digitalization has gained particular importance with the introduction of digital twins as a tool that transforms not only job design but also organizational form. Digital twins in real estate, in

effect, erase the boundaries that previously existed, and still exist, between the physical, tangible property and its virtual replica. This applies to areas such as ecology, particularly in relation to energy consumption, human flow, construction temperature conditions, equipment operation and maintenance, humidity levels during concrete pouring, and even in predicting certain types of damage or equipment failures, such as those affecting elevators, electrical systems, HVAC systems, and similar technical installations.

The application of digital twins is particularly significant and yields strong results in real estate transactions, which requires the digitalization of notaries, agents, and real estate cadastres. In digitized systems, paper is replaced by data and digital materials through which a potential buyer can gain insight into all the performance characteristics of a property even before it is built. An investor can obtain insight into the structural condition and stability of the building, as well as its energy efficiency, while a digital twin is capable of detecting deficiencies that cannot be identified through other techniques. It is clear that this protects all stakeholders in the construction and transaction process, as well as in the maintenance and use of real estate. In other words, sensors can optimize heating or cooling, predict failures, and simulate changes that could be implemented in functional, architectural, or structural terms.

Experiences in digitalized real estate management systems show that transactions can be carried out without physical presence and with access to far more detailed information than is available in traditional documentation. Digital documentation is transparent and, in many respects, cannot be falsified. Practice also shows that digital twins are already being integrated into urban digital twin systems. This means that city digital twins integrate real-time data such as traffic monitoring, air quality, congestion levels on specific roads, and the availability of parking spaces, among other parameters [6].

The problems that objectively exist at the current level of real estate management through digital tools and digital twins include high costs, a shortage of experts in data management and interpretation, and cybersecurity concerns. Nevertheless, the future of digitalization in construction and real estate transactions will

continue to evolve. It is becoming evident that properties without digital twins will not only be denied building permits but their transaction and circulation will also be restricted.

The essence of digitalization and the application of digital twins can be best understood through an analysis of the digitalization of notaries and land registries. These are the two most important institutions on which the efficiency of the real estate market depends, which calls for a more detailed analysis.

2. Digitization in Notary Services

The transition from paper-based to digital systems in real estate transactions, particularly in notarial practice, represents one of the most radical changes, significantly improving the efficiency of property transactions. The introduction of digital twins fundamentally alters the structure of the notarial profession, shifting it from the mere certification of documents to the comprehensive verification of digital data contained in contracts and other legal instruments. With the implementation of digital twins in notarial practice, the scope of work is expanded to include verification of whether the data in contracts correspond to the actual state represented in the digital model, as well as validation of the authenticity of relevant documents – from building permits to full ownership records and their historical chain of title. This, in turn, reduces the possibility of fraud.

Digital signatures and digital signing have been significantly developed within the EU, as can be seen from the following Table 2.

Table 2. Digitalization of cadastre systems in selected EU countries

Countries	Online signing	Electronic archive	Digital identity
Estonia	Yes (all services)	Yes	Obligated
Lithuania	Yes (almost all services)	Yes	High degree
Latvia	Yes (video link)	Yes	Obligated
Austria	Yes (focus on business)	Yes	Intermediate degree
Germany	Yes (business and	Yes	In expansion

	protocols)		
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Source: Notaries of Europe: Annual Report 2025/2026

From the analysed countries, it is evident that all of them, in practice, provide for online signing as well as electronic archiving. The implications of this for the efficiency of real estate transactions are self-evident, as it shows that offices and physical business premises are no longer a necessity for conducting transactions, since everything can be completed remotely. Germany and France have hybrid digital models in which, for more complex legal arrangements such as wills, inheritance matters, or cases involving conflicting parties, in-person meetings and hearings are still required.

Digital twins and the physical presence of stakeholders in real estate transactions concern spatial dimensions, the subject of sale, the boundaries of space, and shared areas within residential properties. When a notary receives confirmation from a digital twin that a building has obtained an occupancy permit, the contract may be signed, and payment may also be initiated from an escrow account in countries where common law applies and where such deposits are mandatory. Notaries as public officials serve as a link between the state and citizens through digital tools, in such a way that neither citizens nor notaries need to visit traditional administrative counters to perform certain tasks. Thanks to the application of artificial intelligence, many procedures can be completed remotely from home, while saving significant time, often free of charge, provided that internet access is available. The Law on Public Notaries of Serbia includes measures for further digitalization of notarial practice, “introducing digital documents and automation of procedures, as well as a gradual alignment with European standards, such as the German model of electronic communication with registration courts and the concept of remote notarization”. Public notaries are required by law to pass a written and oral notarial examination [15].

Digitalization entails the use of electronic signatures in signing accompanying documentation. However, real estate purchase agreements must be signed in the presence of a notary in order to

establish and verify the identity of the contracting parties. Thanks to digital twins, notaries are able to inspect properties without physical presence. The digital system reduces the risk of double selling and fraud.

The main challenges in transforming notarial practice, or shifting its focus toward specific elements, lie in cybersecurity – namely, how to protect digital twins from hacking – and in legally ensuring that digital records are given the same validity as their analog originals. A legal obligation has been introduced to transition from paper-based to digital management of real estate transaction processes. This means that, when issuing a building permit, it will be possible to verify whether a property complies with the digital twin of the block or city in terms of views, access to natural light, building height, shading of neighbouring buildings, and similar parameters. Since 2026, Serbia has introduced digital communication between notaries and the cadastre, whereby cadastral entries are made based on digital records.

In 2023, Serbia formally joined the European digital network, which enables notaries to digitally verify documents related to real estate transactions originating from the European Union. In order to improve the notarial profession and prevent fraud and deception in the real estate transaction sector, the introduction of licensed digital surveyors is being considered, who would be responsible for the accuracy of digital twins.

3. Digitization of the Real Estate Cadastre

The real estate cadastre is one of the most important institutions in a country. It represents a higher level of quality in the recording of immovable property, in the sense that land registers have become redundant for the registration of real estate and ownership rights. The introduction of the real estate cadastre has created the conditions for cadastral digitalization, which ensures greater legal security as well as protection against corrupt practices.

Every state strives to organize the cadastre as a reliable record of property ownership rights. The digitalization of cadastral systems is correlated with the digital literacy of a country. Thus, the most

digitalized countries also have the highest share of digitized real estate cadastre systems, as can be seen in the following five presented EU countries (Table 3).

Table 3. Cadastre digitization in some EU countries

Countries	% of digitalization	Name of appropriate institution	Status
Estonia	100	eLand Register	A fully digitized system
Denmark	100	Ringlysning Uvela	The first digitization of land registers
Netherlands	98	Kadaster	Integration of geographic space
Finland	95	Maanmittauslaitos	Mandatory digitalization of data
Swedish	92	Lantmateriet	Testing blockchain technology

Source: Digitalisation in Europe – 2026 edition, Eurostat 2026

The prevailing trend is to eliminate paper documentation from use and introduce digital records. Digitalization also enables greater user satisfaction, as individuals can access information regarding their own real estate without visiting the Cadastre office, i.e., from home, quickly and free of charge. In order to achieve this, property owners, as well as other stakeholders who are professionally involved with the Cadastre, must themselves be digitally literate. This issue is particularly evident among the older population, which lacks the skills to use digital tools, as well as in rural areas where access to the internet is limited or its stability and bandwidth are insufficient to transmit higher-resolution documentation.

In the Serbian Cadastre, two innovations have been introduced compared to the previous system: first, that an applicant may submit a request for registration in the real estate cadastre via an e-counter (e-window), and second, that both the request and communication between users and the Cadastre are carried out through professional intermediaries, namely lawyers or surveying organizations. This

means that citizens cannot submit applications independently, which is also one of the criticisms of this solution, as the involvement of professional intermediaries and organizations entails additional costs, thereby increasing the overall cost of real estate transactions. Another innovation is the change in the designation of the former land registry certificate, which is now referred to as an Extract from the Real Estate Cadastre Database. This is regulated by the Law on the Procedure for Registration in the Real Estate Cadastre and the Cadastre of Infrastructure [16].

The application of legal solutions related to state surveying and cadastre reduces the possibility of fraud and corruption, such as double or even multiple sales of the same property. In practice, the most common issue is the so-called conflict between factual and registered status, i.e., when there is a discrepancy between actual ownership and what is recorded in the digital database. In cases where the cadastre has made an error in registering ownership rights, such damage can, in most legal systems, be compensated through civil litigation against the state, whereby the state would be held liable for the resulting damage.

Digital Cadastre carries significant risks because it is vulnerable and frequently becomes targets of cyberattacks. They are particularly exposed when “all eggs are placed in one basket,” i.e., when all data is stored on a single server. Denmark applies an approach based on system architecture that ensures data resilience, meaning that data cannot be permanently deleted or altered without detection. If a hacker attempts to change the name of an owner in the database, the system responds to such an attempt. A digital cadastre can be protected through digital backups, or by storing copies of critical registers in other countries in so-called “digital embassies,” which are granted diplomatic immunity. Developed countries have concluded that digital cadastres are vulnerable due to the complete centralization of data storage, which is why they are increasingly opting for decentralized cadastre systems.

Experience and research show that the weakest point of a digital cadastre arises when artificial intelligence performs a property registration and it later turns out that the property is disputed and the

registration is incorrect. Additional issues also emerge in relation to copyright in the design of real estate when such work is performed by artificial intelligence. This implies that AI is not a perfect tool and that its outputs must be reviewed and validated by humans before being used. It also indicates that appropriate legal regulation is necessary in this area.

In a digital cadastre, digital twin technologies can be applied, enabling a 3D cadastre, i.e., precisely defined boundaries of apartments, corridors, and shared terraces. This technology is used for mapping underground infrastructure such as utilities, heating pipelines, and electrical installations, as well as for defining rights to vertical extensions and automatically detecting changes to a building that are not recorded in the database. Unlike a digital cadastre, a digital twin is capable of managing the entire building and its full life cycle, which represents a significant advantage compared to a digital cadastre that is limited to measuring land parcel area. In contrast, a digital twin is able to measure the volume and height of real estate properties.

4. How do Digital Twins Shape the Organizational Form?

It is well known that the introduction of new instruments, particularly advanced technologies, changes organizational form, i.e., it establishes new relationships between individual elements of the organization, as well as between the organization and its external environment. In other words, the introduction of new tools changes everything, which is the most challenging part of the transformation process, since it shows that while almost everything can be changed relatively quickly, the most difficult element to change is the human factor, particularly habits and ways of working. Digital twins fundamentally transform the “lifeblood” of an organization, its management system, as well as its overall performance.

In contemporary real estate management, digital twins are becoming the “brain of management.” They have eliminated the traditional vertical hierarchical structure, which was based on the authority of some to issue orders and the obligation of others to execute them. It is clear that such relationships can undermine

organizational climate and interpersonal relations, which also represent a key factor in overall performance and success.

With the introduction of digital twins, centralized organizational structures are being abandoned in favour of decentralized ones, meaning that traditional hierarchies are disappearing and being replaced by network-based, predictive systems and informal organizational structures, being typically stronger than formal ones. This is well established in organizational theory, as it has been shown that informal structures emerge on the basis of shared goals, empathy, and common values among organizational members, whereas formal structures are imposed, often by individuals who do not necessarily share mutual respect or the same goals, aspirations, or needs.

It is important to note that digital twins are becoming the centre of organizational activity, since functional divisions and so-called “silos,” which previously retained information and were not willing to distribute them further across the depth and breadth of the organization, are being eliminated. In other words, each department acted independently, following its own goals or plans, while neglecting the interests of the whole, even though the whole is always more than the mere sum of its parts [13].

The most important contribution or impact of digital twins in real estate market management lies in shifting the emphasis toward a proactive approach, rather than the traditional approach focused on addressing consequences. It has become evident that every consequence has its underlying causes, and that it is far more effective to eliminate the sources of a problem than to treat its effects. Today, the success of top management is no longer measured by the speed and effectiveness of correcting errors, but by the prevention of their occurrence. Therefore, risk assessment, alongside digital twins, represents an additional tool for enhancing organizational performance and efficiency.

Digital twins can simulate individual solutions, and based on the best outcomes, the most appropriate solution can be selected. Experts working with digital twins focus on data management, analytics, analysis, and responding to potential failures and malfunctions. The

emphasis is placed on prevention rather than repair, since breakdowns often lead to the shutdown of entire systems, resulting in irregular supply, disruptions in supply chains, and a loss of trust between partners.

Changes have also occurred in the financial aspect of real estate management. Invoicing is no longer performed in a linear manner or based on subjective assessments, but rather on actual consumption or the degree of utilization. The new methodology for property valuation not only accelerates processes but also makes them more transparent, while ensuring more objective assessments, particularly with regard to energy efficiency and carbon footprint.

In a word, the introduction of digital twins in real estate management leads to a centralization of knowledge, skills, and experience, as hundreds of properties, even across different countries, can be managed from a single point. At the same time, operational and executive tasks are decentralized. This reduces the so-called span of control, as discussed by classical organizational and management theorists, which can be illustrated in the following representation (Table 4).

Table 4. Characteristics of classical and digital management

Characteristics	Classical way	Digital way
Management	Centralized	Decentralized
Making decisions	Intuition	Data
Structure of teams	Functional silos	Interdisciplinary
Reaction	Reactive	Proactive
Relationship with the tenant	Passive	Active
Method of collection	Manuel	Automatization

Source: Created by authors

From the previous illustration, it can be concluded that there is a significant qualitative difference among systems that implement digital twins. It has been shown that decentralized management is a more efficient solution than centralized management in times of dynamic change. Digital twins have dramatically transformed the decision-making process, as intuition is replaced by artificial

intelligence tools that perform operations and defined tasks in real time.

5. Digital Twins as Tools in Preventing the Destruction of Architectural Heritage

If life after death is possible, and often even better, this is sometimes illustrated through digital twins. This technology is becoming an effective tool in the hands of conservators, endowment managers, and historians engaged in the protection and revitalization of architectural heritage, and through it, of national and global history, i.e., the history of the world or of a particular nation. While investors in new construction emphasize the phrase: “There is space here for a new property,” digital approaches that favour demolition of old structures often adopt the view: “This building is old, non-functional, and disrupts the appearance of the street.” The term that has the greatest impact on the realization of demolition initiatives is “unsafe.” The older a property or structure is, the more it is assumed to be dangerous to safety, and the more realistic the idea of demolition becomes. Certain structures that are oriented against preservation even contribute to making old buildings appear more unsafe, thereby increasing the likelihood of demolition and the erasure of their traces from official records, as well as from collective memory and from the awareness of future generations about their roots and history [12].

Digital twins can, in various ways, help prevent the demolition of old and significant properties, as well as revitalize them, or reconstruct retrospective models of demolished buildings, so that they can be rebuilt in the same form and architectural style as they were centuries ago. Digital twins enable the creation of “precise digital replicas of historical structures using 3D laser scanning and photogrammetry, as well as predictive maintenance [2]”.

Digital twins represent an advanced technology in the construction and in the prevention of demolition of real estate. However, investors, especially when backed by political actors, often lack sensitivity toward the value of old and historically significant buildings, while it can be difficult to argue against decisions even

when supported by evidence generated by digital twins. Without going deeper into this issue, even in the case of ruins or damaged historically valuable properties, it appears that structures such as the General Staff building in Belgrade, as well as other globally significant buildings destroyed in war, should ideally be conserved, with their remains stabilized and preserved as monuments. Such monuments would serve as reminders of a particular era and civilization that attacked and sought to destroy the property, and thus also as symbols of a nation and its resistance.

An instructive example of preserving historical heritage is the city of Vienna, which seeks to reconcile history with the present and the future while also applying digital twin technologies. By using photogrammetry, Vienna has successfully scanned historically significant buildings such as St. Stephen's Cathedral and Schönbrunn Palace. Through laser scanning, it is possible at any time to detect potential changes such as cracks, fractures, displacement, or corrosion. Digitalization also enables visualization of heat distribution in the urban core, in order to increase greenery and vegetation coverage or to plan the installation of water sprinklers. In construction practice, the submission of a digital record, i.e., a digital model is mandatory prior to the issuance of a building permit. If it is determined that a proposed structure visually obstructs important historical buildings or casts shadows over surrounding objects, the project cannot be granted a construction permit [10].

The experience of preserving historical heritage in the case of Vienna can serve as a reference for planners and urbanists, as well as historians in Serbia, regarding the construction of new properties and the preservation of historical heritage. In this way, two objectives are achieved. First, the city is modernized and follows the use of advanced technologies, and second, it does not lose its identity and history. The successful application of digital twin technology in Vienna has led to the creation of a “digital geo-twin – a virtual, semantic 3D replica of all elements and objects of the city.”

6. Digitization of Construction and Real Estate Transactions in Serbia

The real estate market in Serbia shares the fate of other markets. It is diverse and encompasses a large number and variety of properties, including real estate of significant value. The real estate market is largely under state control, both in terms of construction, where the state is the largest investor in real estate, and in establishing the legal and institutional framework, as well as in the technological advancement of institutions involved in the development and transaction of real estate. It should be noted that Serbia, together with other republics of the former SFRY, had a long period of social ownership, with strategic and legal frameworks that supported this form of property ownership.

The basic prerequisite for the successful management of any sector, including real estate, is the existence of appropriate national policies and strategies. The Republic of Serbia has not formulated a national policy or strategy for real estate management, which leads to the conclusion that there is uncertainty regarding the direction in which this market is developing and how its objectives can be achieved in the most efficient and effective manner. At the same time, the EU does not have a unified strategy for real estate management, as property ownership falls under the jurisdiction of individual member states. Nevertheless, EU member states seek to manage their assets and real estate in line with relevant EU directives. The Republic of Croatia, for example, has adopted a national real estate management strategy. Another issue is that even if such a strategy is adopted, it remains uncertain to what extent and how effectively it will be implemented.

The key issue in real estate management is not limited to property ownership rights alone, but also extends to its role as a basis for combating climate change, reducing energy consumption and pollution, and ensuring sustainable development, given that buildings, as mentioned, account for over 40% of total energy consumption in the EU. Germany and France have introduced restrictions on the sale of properties with low energy efficiency, in line with the so-called Green Strategy, which aims for all buildings

in the EU to have an energy performance certificate, so-called the energy passport by 2050.

Instead of a single, unified strategy covering all aspects of construction and real estate transactions in Serbia, there are so-called sectoral strategies and a legal framework that address this issue in a partial and secondary manner. It appears that without a national strategy, sectoral or individual strategies cannot exist in a coherent form, as this relationship should be understood as that of a whole and its parts, meaning that a part cannot exist without the whole, although the whole may exist without one or more of its parts. Therefore, it is first necessary to adopt a national policy and strategy, followed by sectoral strategies derived from it [1].

The legal frameworks regulating real estate in Serbia do exist, but they are considered deficient, as laws alone cannot define the manner of achieving a goal that, in this particular case, does not exist. Practice shows that legal frameworks serve as tools for the implementation of strategic objectives. In other words, laws come after the formulation of a strategy and are often used, through obligations and the threat of legal sanctions, to compel relevant actors to act or refrain from acting in accordance with the implementation of that strategy.

As an operational strategy addressing technical aspects of real estate, there is the “Real Estate Management” project developed by the Republic Geodetic Authority and the World Bank, which focuses on introducing a system for property and building valuation. This is important for determining property taxes, as well as for ensuring the objectivity of real estate appraisal. The essence of this project lies in the transition from manual and subjective valuation methods to mass valuation of real estate [14].

The State Ownership Strategy, as its name suggests, relates to real estate and assets under state ownership, or properties in which the state holds a share. The focus is on state-owned enterprises, which possess significant asset value, with the aim of transforming them into centres for value creation rather than mere custodians of state property. A high degree of politicization is present in the management of state ownership, given that these enterprises are often

used as a voting base for the ruling party. These companies fall under the jurisdiction of the state, i.e., the Ministry of Economy, and through the appointment of management and governing bodies, control over this political support base is exercised. It is evident that this Strategy excludes private property, i.e., real estate that is often more efficient and effective. As such, the Strategy is incomplete, since both forms of ownership exist in an iterative relationship, with ownership status frequently shifting from state to private property. With changes in ownership, changes also occur in the methods of management and disposition, although in Serbia the direction of ownership change is predominantly from state to private, often below market conditions and sometimes accompanied by elements of corruption [8].

The National Housing Strategy is also partial in its nature and aims to address the social problems of specific target groups, such as young people, through investments in housing for young married couples, which is facilitated via subsidized loans. In this way, demand for real estate – primarily residential property – increases, with the aim of retaining or reducing the emigration of young and educated people, which is considered a national interest. However, this Strategy also suffers from politicization and political opportunism, as investment cycles aimed at resolving youth housing issues are often initiated for the purpose of achieving political goals, particularly in pre-election periods.

The Urban Development and Energy Efficiency Strategy focuses on urban areas, while neglecting rural regions, which means that it is partial in nature, as it excludes the interior of the country and does not provide a comprehensive response to construction and real estate transactions. This Strategy primarily emphasizes ecological construction and the introduction of energy performance certificates, i.e., reducing energy consumption, particularly in the renovation of older buildings and properties.

It is important to note that in real estate management in Serbia, private interest is often placed above the public interest, which includes green construction, social justice, and the preservation of cultural and national heritage. Profits and the interests of capital

owners frequently override legal public interests and cultural-historical heritage, which represents one of the greatest spiritual assets of any country, while heritage properties constitute the most valuable national assets through which identity is affirmed and the roots of a nation are preserved and understood. Nevertheless, as a country on the path towards EU integration, Serbia must adopt numerous standards related to property and real estate management, including the introduction of energy performance certificates and the digitalization of the Cadastre. In these areas, Serbia has achieved notable results that are often described as revolutionary, particularly in terms of abolishing traditional service counters and paper documentation, and introducing a Digital Cadastre and digital twins that facilitate and accelerate processes while also increasing security in real estate transactions. This has also resulted in higher productivity within cadastral services. According to the report of the Republic Geodetic Authority, in 2024 the number of resolved cases increased with the same number of employees, while the average performance rating of the Cadastre in Serbia was 3.41 out of a maximum score of 4, with the Vojvodina region leading in this regard [9].

Conclusion

The paper highlights the application of artificial intelligence in real estate construction, particularly from the initial phase, which largely determines the success of subsequent stages in real estate management. Special emphasis is placed on the use of digital twins and their role in the issuance of building permits, with attention drawn to the objectivity of their assessments. This means that a building permit cannot be issued for a construction project if the findings of the digital twin indicate that it would negatively affect the existing environmental conditions, in terms of spatial disruption, obstruction of natural light, degradation of the existing ambient setting, and similar factors.

The introduction of digital tools is increasingly being applied in real estate transactions, where the Cadastre and the Public Notary Service play a central role. These institutions are essential for

establishing and ensuring the legal security of real estate. Artificial intelligence can relieve professionals in the notarial sector, as well as in cadastre services, of a range of routine tasks, thereby making these institutions not only economically sustainable but also reducing operational costs. This, in turn, may lower property transaction prices and make the real estate market more competitive.

The paper also addresses real estate market management with an emphasis on digital twins. It is pointed out that the real estate market is imperfect, meaning that it is not primarily focused on profit generation, which should be its fundamental function, as also noted by P. Drucker in his statement: “The market has one and only one motive – the creation of profit.” Digital twins have also changed the organizational form, as the emphasis has been placed on the use of data instead of paper, as well as on proactive rather than reactive action [3].

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DIGITALNI BLIZANCI KAO NOVA ORGANIZACIONA FORMA: UPRAVLJANJE TRŽIŠTEM NEKRETNINA U ERI VEŠTAČKE INTELIGENCIJE

Apstrakt

Tržište nekretnina je, zahvaljujući primeni naprednih tehnologija, doživelo radikalnu transformaciju u svim svojim fazama, od projektovanja i izgradnje nekretnina, preko njihovog stavljanja u promet, obezbeđenja pravne sigurnosti za vlasništvo i održavanje, pa sve do korišćenje nekretnine od strane korisnika. Ova konstatacija je univerzalna i odnosi se na stambene, industrijske, socijalne nekretnine ili objekte za odmor, razonodu, sport, itd.

Primena digitalnih tehnologija i digitalnih blizanaca je ukinula tradicionalnu asimetriju informacija, koja je dugo vladala na tržištu nekretnina, i omogućila je svim akterima u svim fazama izgradnje i prometa nekretnine, odnosno od investitora, graditelja, do kupaca i korisnika, da steknu uvid u stvarno stanje nekretnine i dobiju potrebne informacije o istoriji objekta, kvalitetu zemljišta na kome je izgrađen, njegovoj stabilnosti i kvalitetu, kao i u druge relevantne informacije iz pasosa nekretnina. Posebno su važne informacije o sigurnosti objekata i njihovom pravnom statusu, odnosno o pravnoj sigurnosti nekretnine. Veštačka inteligencija daje novi kvalitet u dopunjavanju digitalnih blizanaca sa novim informacijama po pitanju fizičkog, pravnog i energetskog stanja objekata, ali i mogućim izazovima kada su u pitanju sigurnost i potencijalna opasnost od požara, rušenja, sleganja tla i drugih parametara za ocenu nekretnine.

Ključne reči: *digitalni blizanci, promet nekretnina, veštačka inteligencija.*

JEL klasifikacija: L85, O33, M15, R30