CHAPTER 6

DIGITAL HERITAGE AND DATA INFRASTRUCTURES IN THE CITIES

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Summary: This paper theoretically resarges the possibilities of digital heritage in the age of interconnection through the Internet and practical ideas for preserving heritage precisely through its digitization, so that it remains recorded through data used within the concept of cognitive cities. Technology has influenced on the creation of modern cities where people live, cities are becoming increasingly dependent on the technological progress of society, and digital cities are becoming a concept of the modern era. A smart city uses information and communication technologies (ICT) to improve operational efficiency, share information with the public and ensure a better life for its citizens and it is strongly based on technology and technological progress. The work is based on analyzing examples of world achievements in the field of digital technologies as well as their use in order to improve the position of cultural architectural heritage in different contexts, urban-architectural, ecological, political, sociological, etc. The goal is to determine opportunities and solutions for achieving better results in the mentioned areas using different methods. The methods include the application of analytical and comparative studies, as well as case studies of existing projects in order to examine possible structures and define the initial model based on the use of modern technologies in the implementation of cultural heritage in smart cities. The task of the paper is precisely to present how and in what way digital technologies influence on the formation of a new heritage site and how the city will benefit from the use of technology.

Key words: *digital technology, digital heritage, folk architecture, smart city, smart infrastructure*

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1. Introduction

The paper proposes a theorization of digital heritage research and an understanding of the technologies that are considered in its operational efficiency (Hoel & Van der Tuin, 2013). We will analyze aspects of digital heritage research through an approach based on information practices using big data with the aim of researching public perceptions and experiences of the past in the present (Bonacchi et al., 2018). The integration of technology into the infrastructure of modern cities has produced a smart city, a place where traditional networks and services are made more efficient by using digital solutions for the benefit of its residents and businesses. Today, cities are becoming "smart" so that they can ensure improved delivery and quality of services through continuous monitoring of the needs of residents and modern infrastructure. This requires much reliance on automation, Internet connectivity and what is called the "Internet of Things" (IoT - Internet of Things, which refers to connecting devices to the Internet that can be controlled or used to send control information).

The development of digital technologies brought humanity into a modern era and the process itself is fast and continues even faster, so it was inevitable that this concept should be transferred to cities as well as to the heritage in cities. The study of space and social relations aims to determine whether and in what ways space influences socio-economic processes. Through these processes the environment develops and vice versa.

The representation of these historical connections should be preserved, or offer the possibility of using architectural design in contemporary interventions that are characteristic of regional styles, rather than based on coherence based on research. The analyzed examples in the paper arise in different locations in broad time contexts, but demonstrate the fundamental ideas that are interwoven in them, while noticing the nuanced social, economic, political and cultural influences. Many of these heritage elements are disappearing and decaying, but through their display through technology, the preservation of architectural principles and characteristics by transferring them to a digital format, we include these values in the contemporary flows and functioning of a wider system that will one day become part of the cognitive city.

This paper also aims to point out lesser-known objects of folk architecture as a model and representative of the national style. Representative examples of the national style were studied by, among others (Kadijević, 2007), while (Deroko, 1939) folk architecture is preserved in public memory through theory and practice. The paper will analyze various examples of folk architecture and traditional Serbian national style. The initial hypothesis is that certain types appear indepen-

dently of the place and environment, but depend of the culture of the people who lived in those areas, while the subtypes may have variations conditioned by the place and that it is therefore necessary to create a unique database, which would be used through the concept of a smart city. The obtained results and proposals for new concepts and applications represent the basis for the upgrade and inclusion of the cultural architectural heritage in the project of smart cities of Serbia.

2. Elaboration

Digital technologies refer to a wide range of technologies, tools, services and applications that use different types of hardware and software. The term "digital" comes from the Latin word digitus and refers to one of the oldest tools for numbers, the finger. When such information is stored, transmitted or transmitted in digital format it is converted into "zeros and ones" numbers known as the Binary System. Digitized information is recorded in a binary code of combinations of digits "0 and 1", also called bits, which represent words and images. Digital technology makes it possible to compress enormous amounts of information onto small storage devices that can be easily stored and transported. Digitization also accelerates the speed of data transfer. Digital technology has transformed the way people communicate, learn and work.

Digital technologies facilitate services or activities by electronic means for creating, storing, processing, transmitting and displaying information. In general, digital technologies include the use of personal computers, digital television, mobile phones, robots and other electronic devices and automatic systems that feed or process information. Extraordinary and revolutionary technological developments in the last few years include cloud services, robotics, Internet of Things (IoT), cyber security, artificial intelligence (AI), as well as blockchain and many others (Sentume et al., 2018).

The third industrial revolution, i.e. the rise of electronics, telecommunications and computers is usually referred to as the digital revolution. The digital revolution began between the late 1950s and 1970s, and the reason lies in the evolution of technology from mechanical and analog to digital. During this period, digital computers and digital record keeping became the norm of society. The introduction of digital technology has also changed the way people communicate, now via computers, mobile phones and the Internet. This revolution ushered in the Information Age. Analogous to the Agricultural Revolution and the Industrial Revolution, the Digital Revolution marked the beginning of the Information Age (also

known as the Computer Age, Digital Age, or New Media Age). This digital revolt includes mass production and widespread use of digital logic circuits as well as its derivatives such as computer, mobile phone, tablet and other devices.

Today, however, enormous amounts of information are uploaded and downloaded via this electronic leviathan. The emergence of Web 2.0 in the first decade of the 21st century was itself a revolution in the short history of the Internet, fueling the rise of social media and other interactive, crowd-based communication tools. The Internet was no longer just about exchanging information, but became a sophisticated multidisciplinary tool that provides people with a wide range of opportunities from communication to business (MinnaLearn, 2022).

By 2015, about 40% of the world had a permanent Internet connection, and smartphone ownership rates and tablet ownership rates nearly surpassed home PC rates. The ability to store information has increased exponentially with terabytes of storage now widely available. Today, in the year 2023, over 5.18 billion people (out of a total of 8 billion) use the Internet every day worldwide, which represents over 65% of the world's population (Statista, 2023).

Today, the digital revolution, along with the Internet, is gaining more and more momentum. Digital technology precisely implies the use of various devices that enable access to cyberspace, the use of digital audio/video and information communication technology (ICT). On a global level, people are increasingly dependent on the use of technology in their daily lives and the Internet has just become a necessity of the modern age. Digital technology is becoming an increasingly important condition for the advancement of modern economies and society as a whole and has the potential to affect many sectors of the economy (including transport, energy, agri-food, telecommunications, financial services, manufacturing and healthcare) and to transform people's lives. Moreover, artificial intelligence (AI) and advanced robotics are seen as an important manifestation of digital transformation, with a profound impact on the whole of society, including productivity, employment, business models and public services, which requires coherent public policies precisely aimed at the advancement and integration of digital technology in all aspects of society.

The use of the Internet at the global level in the period from 2011 to 2021
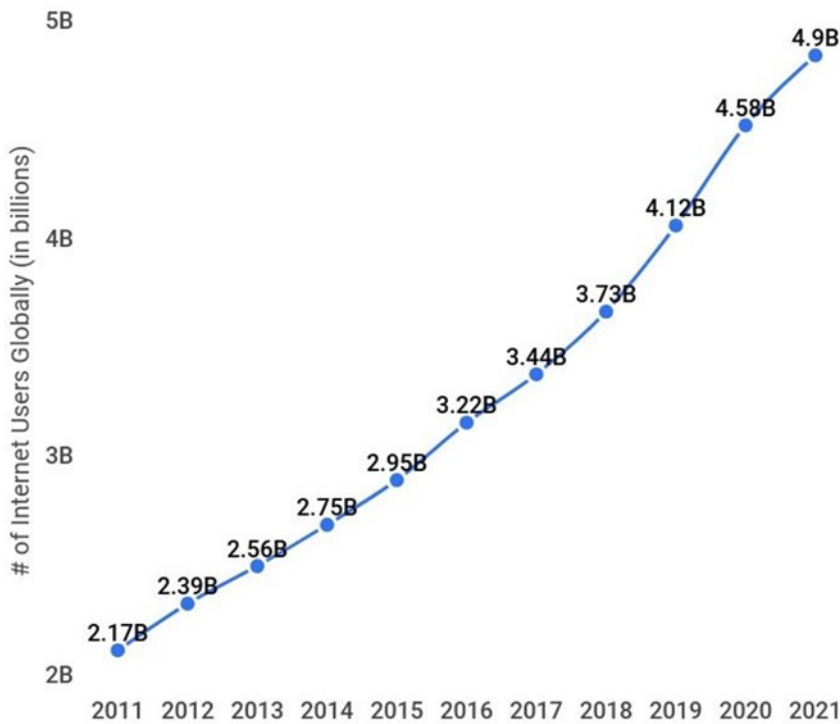
The field of digital heritage began to take shape in the 1990s, but has expanded significantly over the last decade, focusing particularly on the roles and impact of digital technology in museum and gallery contexts (Fahy, 1995; Anderson, 1997; Arvanitis, 2002; Parri, 2007). Since then, the material published in this area deals primarily with dealing with the past digitally or with the digitization of analog resources (Kidd, 2011; Geismar, 2012; Ridge, 2014; Were, 2015; Jones et al., 2017). This paper will also deal with that, but on the examples of the Serbian national style in architectural heritage and its preservation, classification and implementation through smart city data. By creating a unique database, the cultural heritage of Serbia, classified in this way, would represent an element of culture that would be further used through electronic networks in the project of smart cities of Serbia, which have come to life in some segments such as e-government, e-agriculture, etc.

In the world of big data, the technique is both part of the methodology used and the subject being researched (Rieder et al., 2015). We would not be able to decolonize collections and disrupt dominant ways of organizing and presenting information, if we are unable to follow the creation and circulation of data through search, collection and critique. There is a gap between theory and practice that emerged with the postmodernist turn of the 1990s. Rieder et al. (2015) also address a similar issue, noting the contrast between the highly rhetorical theory without detail in big data research as opposed to a-theoretical practice-oriented big data research (Bonacchi & Krzyzanska, 2019).

Big data is the foundation of a smart city, which is a city where a collection of sensors (typically hundreds or thousands) are deployed to collect electronic data about people and infrastructure to improve efficiency and quality of life. As we can see, the concept of a smart city includes numerous aspects and there are different definitions that provide a closer destination of what a smart city represents in specific ways. For Kumar, Goel and Mallik, a smart city is a city that concentrates on the environmental, economic and social aspects of urban life in a competent, convenient and smarter way to achieve a better quality of life while combining intelligent and sustainable technology (Kumar et al., 2018). In his work, Komninos argues that the concept of a smart city is mainly used to describe technologies that make cities more efficient and pleasant (Komninos, 2011). While Peirce, Freed and Townsend define a smart city as a place where information technology is used to improve city operations and management, enable innovation in public services and governance, and improve long-term city planning (Peirce et al., 2013). From all these definitions, we see that the smart city goes into different areas of functioning of the modern city, into different areas of human activities and life, and that it can be defined in different ways, but that in each definition the basic and primary and indispensable segment is technology.

The smart city is becoming a concept of modern times and modern society because it integrates modern technology and the needs of the city's population. In 2022, London was ranked as the smartest city in the world, followed by New York and Paris, according to research conducted by IESE, which examines the impact of modern technology on urban units (IESE, 2022). In these smart cities, residents are provided with applications that allow them to access city services, receive and issue reports on outages (city transport, electronic network, water), accidents and crimes, but they can also pay taxes, fees, and spread cultural heritage and similar. Energy efficiency and sustainability are emphasized in the smart city.

In the spirit of the aforementioned research, this paper will consider the issue of a smart city and how and in what way technology influences the concept of heritage implementation. A smart city uses modern technology and smart service

systems to optimize resources and the use of goods with the aim of increasing the quality of life of city residents, i.e. people. "Sustainable urban organization and sustainable urban design create places of distinctive character that meet the standard requirements of functionality, at the same time attracting and ennobing with their uniqueness, atmosphere or beauty, connecting people and space, movement and urban form, natural and created environment" (Stojanović & Đenadić, 2019).

Vodak, Šulyova and Kubira (2021) conducted a research entitled "Advanced Technologies and Their Use in Smart City Management" and the work focused on the use of technologies and creation of strategic plans by leading leaders in Singapore, London and Helsinki. This paper examined how and in what way technology is adapted to the needs and demands of citizens, thus connecting the technological aspect with managerial and social aspects. In their research work, the authors found that large cities with a population of more than 1,000,000 mainly focus on urban infrastructure management (transportation, security). Medium-sized cities have around 500,000 inhabitants, and they usually focus on increasing the efficiency of waste management and the use of limited resources. Small cities of 100,000 or less must improve the quality of life while adequately protecting limited resources. Based on the work, it was established that IoT as a trend is used to connect multiple devices, which is the essence of IoT, but also that it follows a new trend, i.e. IoE, i.e. Internet of Everything. Under that concept, all elements of people, data, processes and things will be connected. Based on this research, the satisfaction of the citizens of these three cities was examined and it was established that citizens support the development of smart cities and smart buildings in these cities because they improve their work, activities, education, but also their whole life (Vodák et al., 2021).

A review of adequate literature tells us a lot about the numerous advantages and opportunities that a smart city, and therefore a smart building, brings with it for the modern era in which we live. In Serbia, this is still a very new concept and the implementation of technology in this form of infrastructure is proceeding very slowly. E-administration is a system that has proven to be very successful in implementing the modern concept of smart administrations. As in thair work Prigoda, Bogavac i Čekerevac (2022), under the name "Serbia and smart cities" state that the national e-government portal was launched in 2010 with the main goals - reducing queues, preventing corruption and increasing the transparency and efficiency of city administrations. From the very first day, e-governance encouraged the development of e-services not only in Belgrade, but also in other cities, and in 2014 the e-governance Olympiad was held, after which awards were presented to the best city and municipal e-governments. In 2020, about one million

active users registered on the portal, who had access to 900 electronic services of various state authorities. In addition, the work also dealt with the development of the 5G network on the territory of Serbia, but also with other technologies in the cities of Niš, Belgrade, Kruševac and Pančevo (Prigoda et al., 2021).

As we can see, digital technologies in Serbia are less well used and implemented, unlike other cities and metropolises in the world. "The increasing prevalence of computers in households in Serbia makes accessibility to digital media greater" (Radosavljević & Ljubisavljević, 2020). In the EU, a large number of countries have at least one city that is included in the list of smart cities, while Serbia persistently lags behind other cities. The reason for this lies primarily in the economic situation in the country, but for many authors, it is also in the aversion and mistrust of the population towards technologies and technological progress.

2.1. A history of the heritage of digital presentation objects

The formation of the Serbian national style in architecture between the two world wars proceeded gradually with occasional mixing with the previous forms of Baroque, Classicism and Romanticism. However, the final outcome is the existence of a new style based on broad knowledge, education and skills, following the contemporary needs of the time, but with a foothold in tradition, which created an architecture of timeless values, which represents the basis of culture and identity. Using the historical method, the results of research into the genesis of the original elements recognized on buildings from different areas in certain time periods, which belonged to the same style among others inspired by folk architecture, which must be preserved digitally, since the architectural heritage in these times is full of challenges for its survival, are presented. , often disappears. The goal is to determine similarities and differences through comparative analysis and a characteristic typology through classification and to identify lesser-known objects as well as some of the already researched ones of importance that still exist today and should be preserved as representatives of these historical connections or, based on research, offer the possibility of using a digital record and data on their architectural design during modern interventions that have the characteristics of a regional style as opposed to uniformity. In this way, traditional styles would be transmitted and transformed, with the possibility of distinguishing the authentic, especially in conditions when many villages are dying and there is a possibility of their disappearance in the future. Old plans, drawings and literature have been analyzed. We will confirm the initial hypothesis that certain types appear independently of the place and environment but depend on the culture of the people

who lived in those areas, while subtypes can have variations conditioned by the place and that it is therefore necessary to create a unique database, which would be used through the concept of a smart city.

At the beginning of the 19th century, in the period after the first Serbian uprising, rural real estate was developed and houses were built spontaneously. They were mostly monolithic, modest houses with a main central room around the hearth. This space is great for family gatherings, meals and celebrations. It was concluded that the log house is the oldest method of construction in the areas inhabited by Serbs, brought by settlement in the Balkans, and the bondruk (wooden skeletal system made of hewn material with jointed carpentry of beams and columns) is of western origin and from Turkish citizens who brought it from the Levantine shores of the Mediterranean Sea (Deroko, 1939). There are two main types, which are not originally Serbian, but are processed in a specific way in these regions. The documents also mention stone constructions, especially in places where these materials could be found in nature. The balance between the strategy of building and preserving heritage, through the development of a sustainable structure in the present, and the tendency of sustainable development in the future is one of the main goals of the modern world (Živković, Kurtović-Folić, Jovanović, Kondić , Mitković, 2016).

2.1.1. A traditional Serbian house type

Despite the fact that over time the houses began to change and progress with their current financial situation, but the foundations of gathering and that central room still remained the most important space of the house. The mentioned house type is known as the original Serbian house type. Houses are made from materials that existed in the area, their materials were stone, water, earth and wood. The roof covering is also made by hand and made of stone or wood.

With reference to the whole of Serbia, where houses were mostly built without planning, there were strictly defined regulations in Vojvodina for the construction of the city, villages, streets and the appearance of houses and other residential buildings. Residential houses, known as "old Vojvodina houses", were built in the period before the First World War and are characteristic of the area of Vojvodina.

Their development can be traced throughout history since the 18th century. One of the basic characteristics of Vojvodina houses is that the houses are built and placed along the streets, and the plots on which they are placed thus form courtyards that look like elongated rectangular bases. The spatial orientation of the house itself is shaped like a courtyard, as an elongated rectangle, with a facade that is more oriented towards the street. The functional organization of the house

basically had only a few spaces and that is the porch, the kitchen and a room or several rooms, all depending on the type of house.

2.2. Types of digital heritage presentation

We will present and analyze in the paper three types of digital presentation of heritage, which together can be found in a large database of resources and will be the basis for the inclusion of heritage in Serbia in the concept of a smart city when it takes root in these areas. In order for this to be possible, the objects need to be digitized in different ways and this research will present some new as well as some existing types and ways as a scientific contribution.

- The first way of digitalizing heritage is the well-known example of the "Digital Studenica".
- The second is the rendering and drawing with AutoCAD of architectural heritage objects, which were designed long before computers even existed.
- The third type is the digitization of old projects and drawings of architectural heritage, which are currently in analogue form in libraries, archives and museums.

2.2.1. Project "Digital Studenica"

The project "Digital Studenica" was created in 2018 in the form of a digital superstructure of the monastery complex and the creation of a modern interactive installation in the visitor's center, i.e. the dining room of St. Sava. An educational and information platform was created with the help of new media and technologies that presents the sights and cultural and historical heritage of this monastery complex in an interesting and innovative way.

At the entrances to the monastery complex, interactive info boards with basic information about the project and instructions for using the application have been placed. VR vertical is a concept created with the idea of using HTC Vive virtual reality glasses to enable visitors to experience a symbolic ascent, i.e. a vertical VR 360 video climbing inside and above the Church of the Virgin. The VR sequence consists of three scenes. After St. Sava's sermon, vertical movement inside the computer-generated church provides the opportunity to view the physically inaccessible frescoes from a different perspective, while a video shot using a drone with an 8K 360 camera presents a panorama of the monastery complex from the

air. Along with 3D models and animations, numerous photos and short films present the sights of the monastery within the interactive catalog "Digitalna Studenica" (Digitalna Studenica, 2018).

Digital panorama of the Studenica monastery complex from the air

Source: https://studenicainfo.rs/wp-content/uploads/2018/10/Manastir-Studenica-AR.jpg

In addition to the creative creation and digital superstructure of exhibits, the project also implemented technical solutions that represent how augmented reality technology can enrich the existing experience of certain objects and improve the presentation of cultural and historical heritage in a high-quality way. Faintly visible architectural drawings, engraved on the northern facade of the Church of the Virgin Mary, appear in their entirety with the help of the application, along with the 3D models of the objects for which they are the basis. Also, the sundial replica reveals the story of its origin and use in the Middle Ages (Digitalna Studenica, 2018).

Architectural drawings engraved on the northern facade of the Church of the Virgin

Source: https://studenicainfo.rs/wp-content/uploads/2018/10/AR-crtezi-na-fasadi-1.jpg

2.2.2. House of folk architecture in the village of Raduhovce

Rural objects that bear witness to the folk architecture of the village of Raduhovce in the Raško district, through the master thesis Visualization of the rural folk architecture of the village of Raduhovce in the Raško district, student Almedina Nurović under the mentorship of prof. Dr. Katarina Stojanović. Apart from the color pictures, the houses are presented in the AutoCad program as well as a hand-sketched plan. In this way, the traditional way of building will be transferred to a digital format, permanently saved from oblivion, and since the houses are in a really bad condition, they may remain the only witnesses of this form in the area of the origin of the Serbian state. "The problems of poverty and serious demographic change happening in Serbia, most often caused by large numbers of people, especially young people, migrating from rural to urban areas, are indisputable facts that require concrete activities to be undertaken through various programs and projects within rural development" (Stojanović, Đenadić, 2020). "Accelerated urbanization enables employment of large numbers of workers, at the same time generating new jobs, which is what prompted a new wave of transition from villages to towns, while the first wave was fueled by the development of industry after World War II" (Stojanović & Lošonc, 2017).

The chosen object is located in the village of Raduhovce. The owner was Meta Etemović. As the locals remember, this was one of the first houses in the village. It was built in 1900, and people lived in it until the 1980s.

The house of Meta Etemović in the village of Raduhovce
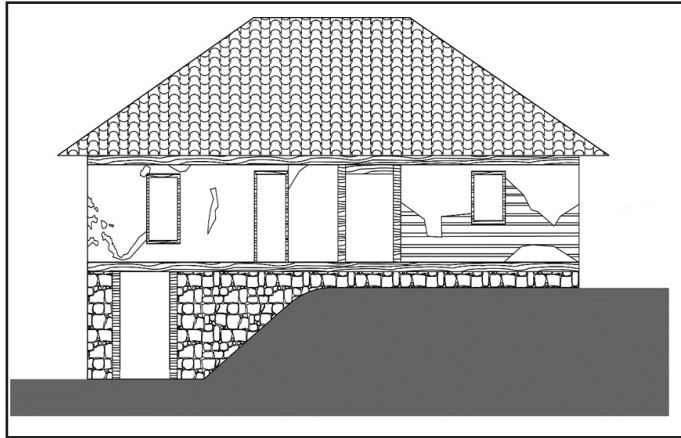

Source: Almedina Nurović

After the owner's death, the heirs moved to Novi Pazar. The house has been abandoned since that moment and, as we can see in the picture, it is very damaged. The foundation stone is bound with mud. "Hazel rods" and wooden "direcs" were used, ie columns and beams. The cane is woven between the sticks and plastered with mud. The right part of the house was later finished, so a more modern technique for that time was used - instead of beams, "basjka", i.e. spaced beams, which were hewn by hand and forged for poles, were used instead of beams, 43°02′03.6″N (north) 20°24′25.5″E (east).

Sketched house dimensions as a basis for the transition from analog to digital
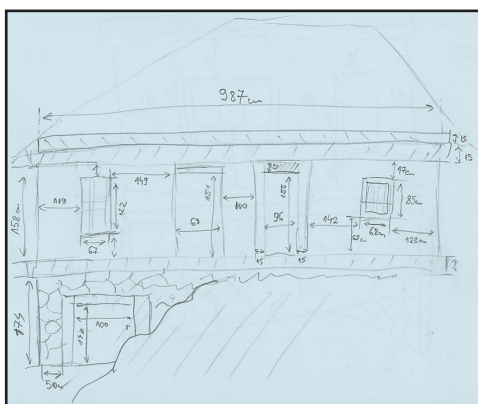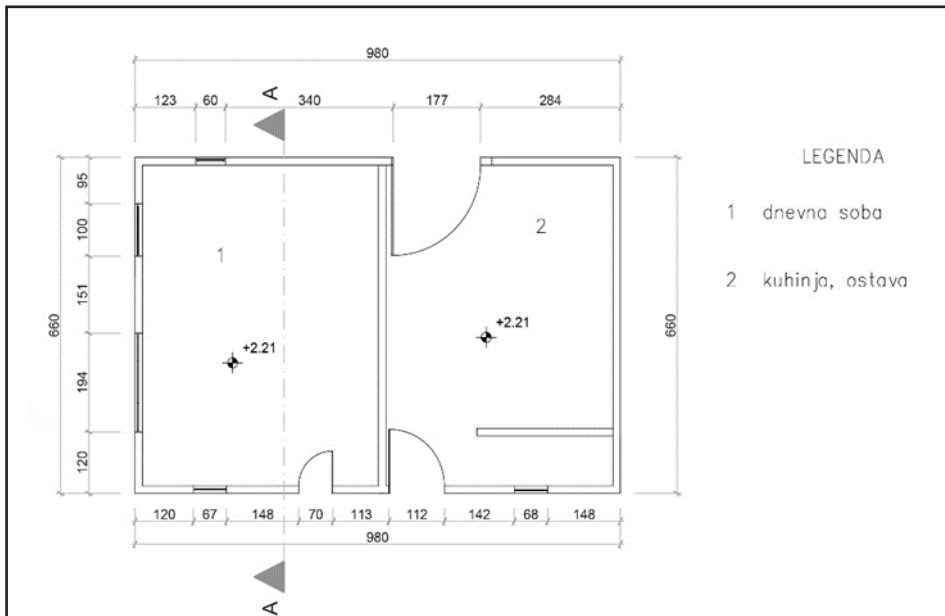

Source: Almedina Nurović

House made in AutoCAD

Source: Almedina Nurović

The floor plan of the house done in the AutoCAD program

Source: Almedina Nurović

2.2.3. Old heritage drawings

Deroko's documents and collections collected in the mountainous regions of southern and southwestern Serbia, northern Montenegro and southeastern Bosnia, then in the valleys of the rivers Morava, Raška, Lima, Tara, Piva, Drina, bear witness to the elements of folk architecture, which, even in when the architect took notes, it disappeared. He noticed the tendency to forget, so he strove to revive some of the historical motifs in his architectural work. Even then, he recognized the causes of the disappearance of folklore, accelerated after the First World War, when modern civilization penetrated into previously inaccessible regions, which brought new materials, replaced manual production with machine production and introduced other people's forms into the design (Deroko, 1939). He stated that under different conditions of life, different forms develop. Similar influences and situations are still noticeable today.

Drawings by the architect Deroko before the Second World War

Source: (Deroko, 1939)

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It was concluded that the log cabin is the oldest way of building in the areas where Serbs lived, brought back when they settled in the Balkans, and the bondruk is of western origin and was spread in the towns by the Turks, bringing it from the Levantine shores of the Mediterranean Sea (Deroko, 1939). These are the two main types, which are not originally Serbian, but have been processed in a specific way in these regions. The documents also mention stone construction, especially in places where it is found in nature.

We have established that some solutions from the past and ideas on how to preserve the identity of a place, before the emergence of universal and global styles, can be useful even today in the face of similar challenges. Architecture unites the peoples of different areas, it testifies to their existence, relationships and connections that are somehow different from today's. Cultural monuments, parts of the architectural heritage thus constitute material facts that are not easily obscured. By transferring the cultural treasure that is in paper form in museums and archives, it would contribute to its inclusion in contemporary trends and giving it a new life in order to be the basis for new learning and education of future generations.

2.3. Proposal of the application as a result of this research

The "Smart Cities of Serbia" project can be the beginning of thinking in the direction of the implementation of technology in all segments of society, including cultural heritage. The "Smart Cities of Serbia" project can be the beginning of thinking in the direction of implementing technology in all segments of society, including cultural heritage. Above all, it is possible to create an application modeled after the applications made within the "Digital Studenica" project, where users could have their own login account and from which they could be informed about all questions and topics related to the cultural heritage of Serbia, and at the same time, cultural institutions, such as museums, archives, or simply to physically visit certain objects. "Serbian cultural institutions, including foundations and museums, are faced with various ongoing challenges. One of them is an increasing lack of interest in cultural events by cultural consumers" (Radosavljević & Ljubisavljević, 2019). The application would be specially designed to provide practical information and functionality where everyone would access their own database through their accounts and where they could see basic information related to what they are interested in or what they do, but also to schedule visits to facilities and request some services as tourists, for example Such a system would be supported in the form of virtual tours, where users would be able to follow

events, changes and information without being physically present. Thus, frequent travel would be reduced, institutions' expenses would be reduced (less heating, less air-conditioned rooms for the purpose of ecological sustainability), but users would be encouraged to a new learning system and the experience of experiencing heritage and its connection would be improved. It was this work that proved and showed the connection of the architectural heritage that is located in different places and is not physically close, it belongs to different cultures today, but it can be summarized and displayed digitally on one site, for which a hundred years ago, for example, a century of professional career was needed to visit, research and compare all these objects. Today, it would be possible with the help of a few clicks. "Numerous and diverse media content can contribute to the development of the awareness of cultural property importance among the local population" (Sančanin et al., 2023).

The application can also provide the electronic possibility to download electronic materials, electronic books, brochures, catalogs, which would reduce the consumption of natural resources necessary for their production and create a more environmentally friendly society.

The application could provide insight into its research results, and it would also have a notification for notification of some new events, etc. depending on what the particular user is interested in. At the same time, the application could have an online payment option, where you would directly pay certain taxes, membership fees, tickets, etc.

Once they download the app, they can access a variety of important information, then notifications about numerous cultural and entertainment events happening nearby, or in the area of interest. This would create a stronger commune and improve interaction between the users themselves. All these functionalities of the application can also trigger a series of additional ideas and suggestions on how and in what way to make the heritage building smarter and more attractive for new generations. Such an application would make life easier in many ways, would create a more modern system of learning and studying, would reduce living costs, would preserve the living environment and would affect the sustainability of the cultural architectural heritage.

Conclusion

The paper points to a paradigm shift in the study of heritage. Paradigm shifts occur suddenly, driven by an achievement that is unprecedented "enough" to attract a permanent group of adherents away from competing learned ways of doing things, yet open-ended enough to leave all kinds of problems for a redefined group of practitioners to resolve (Kuhn 1962). Here, the idea of data-intensive ethnography, or the use of data-intensive techniques to navigate and explore big data is proposed, revealing the spectrums of diversity that are present in our modern world, but which we cannot fully measure or quantify (Bonacchi & Krzyzanska, 2019). Discovering, thinking about them with a renewed critical apparatus that arises through observation itself and analyzed techniques, consists in reshaping the role of heritage researchers.

The latest challenge brought by the Covid-19 pandemic has tested the capacity of cities but has also forced cities to integrate technology in order to provide safety and security to their citizens. Smart cities and buildings are becoming a concept of the 21st century, and all over the world there is more and more talk about the integration of technology into the infrastructure of buildings and cities, including heritage buildings.

The terms 'smart cities' and 'sustainability' are often intertwined. Smart urban planning involves the implementation of environmentally friendly projects that improve the quality of life in society while respecting the environment. Inclusion of heritage in these flows contributes to sustainability. Smart cities can use information and communication technologies to collect data, optimize operations and improve management so that cities can respond to specific problems and provide solutions. From recycling waste into compost to treating wastewater for construction or cleaning purposes, there are many ways in which smart cities can promote sustainability, one of which is the preservation of cultural heritage.

What used to be just scenes from science fiction movies is now becoming a reality. Futurists have always imagined smart cities of the future where residents and visitors thrive. Coordinated and smoothly functioning, these modern urban environments are filled with advanced multimodal transportation systems, autonomous energy networks, clean and safe streets, integrated services, and smart governments and local governments. At the forefront of all these concepts is the smart building as the cornerstone of the existence of smart cities (Koca, 2023). It could also be a smart cultural heritage building.

Although progress has been made towards a brighter future, cities and communities continue to face complex challenges, including maintaining infrastru-

cture, population growth and migration, and sustainability issues. From schools to businesses and from transport to energy, a holistic vision helps find solutions for every aspect of urban life. By working together, new ideas and new technologies can be concretely implemented in order to improve the lives of citizens and create a better future, especially for less developed cities and towns, such as Serbia abounds.

Architectural quality and preservation of rural characteristics is the goal of designing facilities for a sustainable environment. The environment has a different function for different societies, creating a wide range of meanings. The protection and preservation of traditional rural architecture are also important for: mitigating the consequences of unsustainable rural changes and preserving cultural heritage.

In the paper, specific typologies were considered and it was determined that some solutions from the past and the idea of preserving the identity of a place can be useful even today against similar challenges, such as the emergence of universal and global styles. The architecture that is shown through the style of the houses that are emphasized in the work are witnesses of how they used to be with materials that could be found in the environment such as water, earth, stone and wood and without the current mechanization of houses built with style and above all quality structures that they are stable even after 100 years. Such tradition and knowledge need to be preserved and transferred into the new digital era.

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