CULTURAL HERITAGE IN THE CONTEXT OF DIGITAL TRANSFORMATION PRACTICES: EXPERIENCE OF UKRAINE AND THE BALTIC STATES

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Abstract. *The purpose* of the article is to analyze digitization as a global trend of the early 21st century and to develop a cultural model for studying the scope of application of digital transformation practices as a new way to preserve and promote cultural heritage based on the experience of the Baltic States and Ukraine. The study of the impact of digital transformation practices in the field of cultural heritage in Estonia, Latvia, Lithuania and Ukraine has demonstrated the need to deepen ties between these countries by establishing a cultural dialogue, exchanging information and experience on the use of technological innovations in the field of cultural heritage, as well as increasing the value and content of joint cultural projects. *Methodology.* The theoretical basis and methodology of the study is the historical and cultural method, which contributed to the study of the historical dynamics of digitization; typological and comparative methods – for the study and analysis of cultural heritage objects as phenomena and artifacts. A special role is played by the cultural method, which is meaning-forming through the study of interdependent cultural processes – representation, identity, etc. *Results.* The authors, involving the professional community, which emphasizes the problem of the lack of a general electronic register of cultural heritage sites in Ukraine, as well as the lack of a strategy for digitizing such sites, draw attention to the fact that the situation began to change rapidly in 2022. It has been proved that the experience of Estonia (museum information system MuIS, five-year action plan for the digitization of cultural heritage for 2018–2023), Latvia (project "Digitization of cultural heritage content"), Lithuania (creation of the Council for the Digitization of Lithuanian Cultural Heritage, virtual electronic information system of cultural heritage VEPIS, museum information system LIMIS) will contribute to the strengthening of technological and cultural innovations in the field of protection and promotion of cultural heritage of Ukraine. Digitization is a task that requires significant financial and intellectual investments, but the authors prove that this direction can become a source of income for creative industries (economic value) and a resource for creating new meanings (symbolic value). *Practical implications.* The analyzed experience of the Baltic countries will be a valuable source of information for intensifying digital transformation in Ukraine. Deepening Ukraine's cultural ties with Estonia, Latvia and Lithuania in order to exchange experience in the field of cultural heritage is of practical importance, as a number of implemented Baltic projects will help Ukrainian specialists to increase the efficiency of using modern technological tools in the field of culture. The article pays attention to European and Ukrainian public and private cultural projects and initiatives that are being implemented to digitize the preservation and promotion of historical and cultural heritage. *Value/originality.* It is advisable to study the prospects of cultural heritage tokenization and NFT as a tool for preserving, supporting and promoting cultural heritage.

Key words: digital culture, digital transformation, cultural heritage, museum information system, digital museum, cultural policy.

JEL Classification: I23, D83, F68, Z13

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1. Introduction

The potential of cultural development in the context of digital transformation is of great interest to researchers. In our opinion, the cultural heritage deserves special attention, which requires a thorough study of scientific sources of various directions. Understanding the essence of this phenomenon in the new digital environment requires analysis of cultural, historical, sociological, economic and IT literature, as well as official reports of relevant government agencies.

It should be noted that despite the increased interest of modern researchers to this issue, the problem of digitization of cultural heritage is currently at the stage of active professional discussions in the scientific environment, which will eventually contribute to the formation of relevant theories. This state of scientific development of this topic is due to continuous technological innovations that contribute to the regular emergence of new meaningful and valuable aspects arising from the introduction of new digital practices in the field of cultural heritage. Researchers regularly receive new data (e.g., new technical possibilities that expand the boundaries of interaction with cultural heritage and cultural projects that affect the changing experience of specialists and visitors to memory institutes) to understand and form new scientific concepts. Exploring the current socio-cultural situation through the prism of professional cultural studies, we note that digital technologies increasingly cover a number of interdependent cultural processes, such as representation, identity formation, production, consumption, etc. (Rusakov, 2020) The "digital transition" from the systems and processes of industrial and post-industrial (information) culture to the "digital culture" and "digital society", which occurs due to the spread of digital transformation practices, should be more actively explored. Such changes contribute to the formation and establishment of unique systems and processes that create new opportunities for cultural experience when interacting with cultural heritage objects in digital format, through a combination of scientific, technological, value, social, economic aspects.

The purpose of the article is the digitization analysis as a global trend of the beginning of the 21st century and the development of a cultural model for the study of the scope of modern practices of digital transformation as a new way of preserving and popularizing cultural heritage based on the experience of the Baltic states and Ukraine.

The theoretical and methodological basis of the research is the historical and cultural method, which made it possible to analyze the historical dynamics of the development of digitization; typological and comparative methods (for the study of objects of cultural heritage as phenomena and artefacts); culturological approach (the theoretical basis of the study of culture as a meaning-making system in the context of digital transformation due to the analysis of interdependent cultural processes – representation, identity, etc.).

This article will examine the phenomenon of cultural heritage in the context of digital transformation practices, analyze a range of current problems related to the preservation and popularization of historical and cultural heritage in digital format according to the normative and legal documents of UNESCO and the European Union, and study the experience of creating the integrated informational digital resources of cultural heritage in Estonia, Latvia and Lithuania regarding what can serve as a source of experience in the context of the European integration processes of Ukraine.

2. Review of relevant publications

The study of cultural heritage by Estonian, Lithuanian, Latvian and Ukrainian scientists has a long history, but the focus will be made on contemporary cultural studies. In such studies, cultural heritage has broader aspects of consideration, not just as the result of spiritual and material activity of the previous generations, but also as a source of creation of new meanings in modern culture. In addition, in modern research more and more often the aspect of digitization of the cultural heritage field is being studied.

The topic of cultural heritage finds a prominent place in the monograph by the culturologist Olha Kopiyevska, who has examined state institutions and organizations in the culture field as a component of the state mechanism through the prism of political, cultural, economic and social transformations of Ukraine. Analyzing the state of preservation of cultural heritage, the author concludes that "the state of protection of Ukrainian historical and cultural heritage, has not yet responded to requirements of the international communities and those commitments that Ukraine undertook by signing the International Convention on world cultural and natural heritage protection." (Kopiyevska, 2010) Considerable contribution to the development of the topic of cultural heritage was made in numerous scientific articles by a researcher of the Institute for Cultural Research of the National Academy of Arts of Ukraine Marina Mishchenko, whose work with professional scientific editions leads to rely on in this research (Mishchenko, 2020).

The topic of digital transformation needs an emphasis on cultural and sociocultural aspects of digital culture, after all its phenomenon indicates the dominant form of modern socialization

society – informational and virtual [26]. Interconnection of digitization and digital transformations with cultural heritage studied by Marina Mishchenko, as well as researchers in the professional journal "Digital platform: innovative technologies in sociocultural sphere", where in the framework of the permanent rubric "Preservation of cultural heritage and access to digital resources" thematic articles are regularly published (Trach, 2020; Volynets, 2021).

Simultaneously, one can state an insufficient number of publications which comprehend the prospects of digitization spheres of cultural heritage in general. It is worth noting that Ukrainian experts mostly focus on digital transformation of memory institution, and museums (Lelyk, 2019). Summarizing a number of materials about museums' digital transformation the authors note that "today museums are looking for innovative ways for solving social problems and conflicts," (Hlushchuk, Karpets, 2019) and therefore relationships between informative technologies and museum space become increasingly tighter. Keeping the main function of museums toward preservation of cultural heritage, informational technologies strengthen the main destination and at the same time popularize collections and museums, that helps to attract the additional flow of visitors, increase budgets of museums and create better conditions for protection and exhibition of historical and cultural objects.

In the monograph "Transformative processes in the social and sociocultural spheres of Ukraine" is allocated attention to digitization of cultural and historical heritage in Ukrainian libraries. The authors believe that "important strategic directions for library activities in modern stage are integration of information databases of historical and cultural funds, development of representation of cultural heritage in international digital projects." (Yavorska, 2021)

Estonian researchers conducted interviews with employees of memory institutions to define their roles as users and creators of digital cultural heritage due to the need to adapt to communication models of the new generation. According to this paper, such research may successfully supplement the culture of gaining cultural experience in the modern world. The authors write that "it is important to realize the necessity of digitization at the institution and at the national level; that it does not focus only on data storage and availability, but the goal of digitization will be to draw attention to the needs of the audience and also to the information exchange, provision of interpretation opportunities." (Aljas, Pruulmann-Vengerfeldt, 2009)

It should be noted that Estonian researchers, having significant theoretical and practical groundwork regarding cultural heritage and digitization, currently consider not just the benefits of digitization or

scanning, but also perspectives of cultural heritage in the context of Digital Humanities for the field. Such a direction, according to this paper, requires the attention of cultural experts, since it combines technological and worldview aspects. For example, in the article "Cultural heritage and digital reading: between the book and the platform" the authors emphasize the importance of transmedia texts and offer new methods (e.g., digital reading) to save cultural memory and identity (Ojamaa, Torop, 2020).

Scientific articles and monographs of Latvian specialists are full of organizational and theoretical studies, as well as philosophical and cultural studies. For example, Uldis Zariņš proposes the creation of conceptual models for strategic planning of digitization of cultural heritage (Zariņš, 2012), and Zinaida Manzuch, who has been practicing the development of the topic of digitization of cultural heritage for a long time, believes that it is worth considering the processes of digitization of cultural heritage in a broader worldview context. The author noted that digitization is not only related to computerization and technology of memory institutions, but also "enriches the study of digitization with philosophical, social, cultural, managerial, political and economic aspects" (Manžuch, Huvila, Aparac-Jelušić, 2005) that forms a new direction of development of the research and educational models which should provide libraries, museums, archives. In a more contemporary study, the author actualizes the ethical issue of digitization of cultural heritage, which reflects "fundamental changes in the understanding of the role of memory institutions and how they fit into higher-level social processes of memory." (Manžuch, 2017) The researcher believes that ethical issues are likely to influence the overall structure as well as the duration and cost of digitization issues in the future.

3. Generalization of the main provisions

3.1. Cultural heritage as a meaning-making resource

The introduction of digital technologies into the sphere of culture and art began in the 20th century and contributed to the formation of several new artistic trends. Thus, in 1958, the artist Wolf Vostell laid the foundations of media art in the installation "Black Room Cycle", using computer codes for the first time. However, in the second half of the 20th century, world cultural institutions, which are memory institutions (archives, libraries, museums), began to use computers and other technical means to organize, catalog and coordinate historical and cultural sources and artifacts. The period of 1980–1990 can be called the conditional first wave of mass creation

of electronic catalogues by the largest international archives, museums and libraries due to digitization of sources. However, quickly enough, this activity was separated into a separate independent direction, which began to focus not only on providing "user access to diverse information of documentary treasures and physical preservation of original documents by creating their electronic copies, but also on the implementation of international and national projects, programs of digitization of cultural heritage objects." (Prykhodko, 2019)

The end of the 20th and the beginning of the 21st century brought further transformational processes in culture which was a result of digital innovations and encouraged theorists and practitioners to increasingly turn to cultural heritage, digitizing its most valuable objects. Lyudmyla Prykhodko notes that in the late 1990s of the 20th century. The topic of preservation of cultural heritage in digital form began to actively develop in the European Union in connection with the development of the information society, the creation of information infrastructure of the European continent, "digitalization" and the spread of digital technologies in all spheres of European society (Prykhodko, 2019).

Based on these and other globalization processes, starting from the 90s of the 20th century, the conceptual principles of UNESCO's cultural heritage protection are based on the strategies of using digital information technologies for the formation of documentary resources. The founding programme "Memory of the World", adopted in 1992, became the starting point for the emergence of a number of international and national projects aimed at the registration of digital resources of historical and cultural heritage and was embodied in the portal "UNESCO – Heritage" (Official website of the World Heritage List, 2005), dedicated to the protection of cultural, natural and documentary heritage (Dychkovskyi, 2019).

In the 2000s, one of the main tasks of libraries, archives and museums was the digitization of exhibits, so this period is marked by the creation of both public and private projects that declared different objectives of their activities, but the primary goal remained the preservation and promotion of cultural heritage in the context of modern lifestyle. According to the latest key European directives, cultural heritage is considered as a public resource of the future (Official Journal of the European Union, 2014). "It is a unique non-renewable resource that is undergoing cultural, environmental, social, economic and technological transformations that affect all aspects of modern life." (Musiienko, 2019) Within the framework of the cultural understanding of this topic, which is becoming increasingly relevant due

to globalization and digital transformation, cultural heritage can also be considered as a meaning-making resource that represents our values, worldview, lifestyle and shapes one' daily life. That is, cultural heritage contributes to giving greater meaning to human life, so it should be studied through the prism of cultural studies. Within this approach, cultural heritage is considered as a means of identity formation and correlation with the value-semantic dimension.

3.2. Comparative analysis of Ukrainian and Baltic projects on digital cultural heritage

Researcher Yuliya Trach draws attention to the long-term absence of a list of cultural heritage items in *Ukraine*, which are subjects to digitization, as well as standards for the creation of a digital resource to ensure its accessibility, active and effective use, compatibility and data exchange at the local and international levels, preservation of created resource and its updating (Trach, 2020).

Kateryna Kotsiubivska also notes that "in Ukraine, we can say, there are no fully integrated digital technologies, a system of online presentations of digital heritage and user service, as well as the level of modernity, informativeness, attractiveness and relevance; the available technologies, unfortunately, are difficult to compare with the main world models." (Kotsiubivska, Baranskyi, 2020)

Only in July 2022, the Ministry of Culture and Information Policy of Ukraine officially announced the creation of a digital platform for the management of national cultural heritage, which is defined as the core of cultural policy. The activation of this area is due to the understanding of the need to create a modern ecosystem of cultural heritage in Ukraine and to provide legislative and IT infrastructure in accordance with EU standards (Official Facebook page of the Ministry of Culture and Information Policy of Ukraine, 2022).

The Ministry of Culture and Information Policy of Ukraine has identified six points on the positive role of digital transformation in the field of cultural heritage: 1) key state registers will interact with each other to provide electronic services; 2) increasing trust in public e-services through the creation of a secure infrastructure; 3) integration into the global space through data exchange and compliance with platform requirements; 4) professional development and job creation in the digital industry; 5) digitized process provides anti-corruption effect; 6) innovation for the country in the field of cultural heritage.

Deputy Prime Minister of Digital Transformation Mykhailo Fedorov is convinced that using the experience of the Baltic States will help accelerate the digital transformation of Ukraine (Ukrinform, 2019). Therefore, it is appropriate to consider the experience

of digital transformation practices in the field of cultural heritage on the example of Lithuania, Estonia and Latvia.

The emergence of powerful European digital projects in the field of culture implemented at the state level was preceded by the development of a common EU strategy. It was determined that digitization and preservation of cultural memory should be carried out by digitizing printed materials, photographs, museum objects, archival documents, music and audiovisual materials, monuments and archaeological sites (Trehub, 2019).

According to the authors, it may be effective for Ukrainian specialists to study the experience of Lithuania, which began in 2005 with the approval of the concept of digitization of the cultural heritage of **Lithuania**. In the same year, the Council for the Digitization of Lithuanian Cultural Heritage was formed and work began on the creation of the Virtual Electronic Heritage Information System (VEPIS), which united the collections stored in libraries, museums and archives into a single digitized cultural heritage infrastructure on the portal www.epaveldas.lt. Currently, the digitized database of Lithuanian cultural heritage contains more than 4.8 million items, including pages of extremely valuable digitized old prints, newspapers, works of art, manuscripts, church books, audio recordings and classic works of Lithuanian literature (Lietuvos nacionalinė Martyno Mažvydo biblioteka, 2021). In 2021, the cloud information system www.naujas.epaveldas.lt was created, which ensures the long-term preservation of digital cultural heritage content, its security, uninterrupted operation and integration of various standards, as well as the correct maintenance of previously created data.

Lithuania has also implemented the museum information system LIMIS, which aims to consolidate the data of museums and other memory institutions located in the country into one register. A similar system was developed in **Estonia** in 2004 under the name MuIS. Estonian museums are obliged to describe and digitize their collections for this system. The history of digital transformation in Estonia, as well as in Lithuania and Latvia, began immediately after the collapse of the USSR. It is worth noting that then the three Baltic countries gained independence at the same time and today these countries can be confidently called the respective leaders in the field of digitalization, especially in comparison with other post-Soviet states.

In Estonia, more than 900 million heritage objects are stored in various state cultural and art institutions, but only about a tenth of this amount is digitized. Therefore, in 2018, the Ministry of Culture of Estonia prepared a five-year action plan for the digitization of cultural heritage. The goal of the plan is to digitize one third of the cultural heritage stored in museums, libraries and archives by 2023, to provide access to it in digital format, as well as to update the infrastructure of information storage in memory institutions. Thus, the action plan focuses mainly on the heritage from 1900 to 1940. According to the Estonian Ministry of Culture, "the goal of the action plan is that by 2023, 3% of documentary heritage, 32% of artifact heritage, 60% of film and photo heritage and 28% of printed heritage will be available in digital format, i.e., a total of approximately 33% of our cultural heritage." (Ministry of Culture of Estonia, 2022) The total cost of the project is 9.02 million euros, of which 8.19 million euros is planned at the expense of investments from the European Union structural funds.

In **Latvia**, since 2019, a project called "Digitization of cultural heritage content" has been implemented at the state level. The main task of which is to provide wide access to the cultural heritage of Latvia for public consumption in the digital environment, which serves as a basis for strengthening national identity, development of culture, science, knowledge society and creative industries, as well as ensuring sustainable long-term preservation of the national cultural heritage in digital form; and the possibility of its reuse in new products and services, as well as inclusion in the unique digital space of European and world culture. The project is scheduled for completion in 2022 and envisages the digitization of 976,000 pages of textual materials, 150,000 units of descriptions of various images and cultural values, including maps, photographs, reviews of cultural monuments and descriptions of things, 350,000 minutes of audio and video materials, 660 minutes of film materials, 50,000 museum objects, as well as 3D digitization of 30 cultural monuments, recording of 30 cultural events and 15 intangible cultural heritage objects (Latvijas Nacionālā arhīva, 2019).

Separately, it should be noted the consultations held by specialists of Ukrainian institutions and active exchange of experience with Baltic colleagues on the digitization of cultural heritage. For example, in the framework of the diplomatic initiative "Lublin Triangle", which unites Ukraine, Lithuania and Poland for in-depth cooperation in political, economic, social and cultural spheres. On February 28, 2022, the Ministers of Culture of Lithuania, Poland and Ukraine signed a Declaration of Intent on trilateral cooperation in the format of the "Lublin Triangle", which commits to pay more attention to the dissemination of information about the cultural heritage and history of the countries, to promote the development of cultural institutions and cooperation of experts in order to stop Russia's military aggression in Ukraine and protect the cultural and historical heritage. Therefore, in May 2022, a trilateral meeting was held, during which the project of digitization of Ukrainian

cultural heritage was presented and the prospects for its implementation were discussed. "Lithuania, together with Poland, is ready to provide financial, expert and other necessary assistance to the project of digitization of the Ukrainian cultural heritage in the format of the Lublin Triangle, as well as to mediate in possible support from the European Union," said the Minister of Culture of the Republic of Lithuania Simonas Kairis (Lietuvos Respublikos kultūros ministerija, 2022).

Latvia is also actively involved in the preservation and restoration of Ukraine's cultural heritage. In June 2022, with the support of the Ministry of Culture of Latvia and Riga Technical University, a group of specialists visited Ukraine and carried out 3D scanning of four cultural heritage sites. Latvian experts together with Ukrainian colleagues conducted a three-dimensional scanning of cultural heritage sites, recorded the damage and obtained data for planning the strengthening and restoration of cultural monuments affected by the war, transfer of experience and training of Ukrainian specialists. Specialists worked on 3D scanning of two monuments in Chernihiv (Museum of Ukrainian Antiquities "House of Vasyl Tarnovsky", Youth Cultural Center and the cinema building), as well as two monuments of sacred architecture in the Lviv Region (Church of the Holy Virgin, Lviv Region) and in Kyiv (St. Cyril's Monastery, which is planned to be included in the UNESCO World Heritage List). It should be noted that this project of support to Ukraine is similar to the technical assistance to Iraq in 2005–2006, which was provided by the Government of Latvia for a similar procedure for the preservation of prestigious cultural sites in the Middle East, which are included in the UNESCO World Heritage List (Riga Technical University, 2022).

Digitization and preservation of information is a very expensive task, especially when it comes to digitization of European cultural heritage. For example, in Latvia the cost of the project is 3,900,000 euros, of which 3,315,000 euros (85%) are ERDF funds and 585,000 euros (15%) are state co-financing. At least 50% of eligible project costs are the costs of digitization of cultural heritage content. In Estonia, the total cost of the project is 9.02 million euros, of which 8.19 million euros is planned at the expense of investments from the European Union structural funds.

However, digitalization is not only an investment in the preservation of cultural heritage, but can also become a source of income for many creative industries – an economic segment that contributes 3.3% of the annual GDP of the European Union and creates thousands of jobs. Therefore, Ukraine can get a unique opportunity to introduce the latest technologies in the field of preservation of cultural heritage and construction of new commercial and

symbolic meanings. It is worth repeating the opinion of theorists and practitioners that Ukraine still lacks a strategy and policy for the systematization and processing of cultural heritage, but at the same time it is worth noting the existence of various initiatives that have been supported by new cultural institutions, for example, the Ukrainian Cultural Foundation and the Ukrainian Book Institute.

Head of the Analytical Department of the Ukrainian Cultural Foundation Iryna Chuzhynova noted that digitalization is one of the cross-cutting themes of many projects supported by the new Ukrainian cultural institution. "Among the 12 proposed priorities of the UCF, there are two priorities directly related to the digitization and development of digital media. It is about promoting the introduction of innovations, digital technologies and digitization in the field of culture and arts, the development of an electronic information resource of cultural heritage and artistic values, the use of modern information technologies in the field of museum activities." (Trehub, 2019)

The Ukrainian Cultural Foundation was established in 2017 as a state institution that proposed a new model of providing state support on a competitive basis and promoting initiatives in the field of culture and creative industries. Over the years, the Foundation has supported several important projects on digitization of cultural heritage in different regions of Ukraine. For example, in 2020, the Borys Voznytsky Lviv National Art Gallery in Lviv announced that it had started the process of digitizing its collections to create a digital archive. At the first stage, priority exhibits from the 64 thousandth collection were identified. It is reported that more than 300 works of art were selected by the project experts from the collection of the gallery, which is stored in the Olesko Castle (a branch of Borys Voznytsky Lviv National Art Gallery), including ceremonial and representative portraits from the early works to the 18th century and sculptures from the 16th and 18th centuries, among them the authorship of Pfister and Olenskyi, many of which are widely unknown.

In 2021, with the financial support of the Ukrainian Cultural Foundation, the creation of the first digital archive of Mykola Yaroshenko, one of the key figures in the history of Poltava and Ukrainian fine arts of the 19th century, began. The project envisages the digitization of 55 canvases and 100 graphic works of the artist, as well as the creation of a separate section on the website of the Poltava Art Museum, through which each visitor will be able to virtually get acquainted with the artist's work (Artifact Magazine media platform, 2021).

In the same 2021, with the support of the Ukrainian Cultural Foundation, a large-scale project of the Museum of Theater, Music and Cinema Art of Ukraine called "Open Kurbas: Digital Collection" was launched.

As a part of the project, 12,000 museum objects have been digitized and a bilingual Ukrainian-English site was created with open access to the collection of monuments related to the activities of the outstanding director of the 20th century Les Kurbas (Official website of the Open Kurbas: digital collection, 2021).

3.3. Digital representation of cultural heritage

At the beginning of the 21st century, the concept of "cultural heritage" underwent a semantic and substantive expansion, due to the expansion of the possibilities of using the latest technologies. A new concept of "digital heritage" is being formed, which has a double meaning – cultural heritage in digital form or digitized (electronic) cultural heritage (Prykhodko, 2019). Consider the second option when it comes to creating electronic (digital) copies of cultural heritage objects – valuable documents and artifacts.

The modern information age is characterized by various opportunities to transmit and receive information, especially it affects the availability and speed of knowledge transfer. The basis of these opportunities is digital transformation, which we consider as a modern way of applying digital technologies and digital strategy in various spheres of human activity, including culture. Lithuanian researchers note that "strategically managed digitalization of cultural heritage is becoming an important tool that ensures the development of society and creates added value of social, cultural, innovative and financial capital." (Laužikas, Varnienė-Janssen, 2015)

In the process of creating these values, new ways of representing cultural heritage play a significant role, expanding the worldview through the process of popularizing the cultural heritage of mankind by finding new ways of applying digital technologies in the field of art and culture. In order to be able to fill the virtual space with museum content, it is necessary to carry out a significant amount of research, scientific, restoration and other types of work on the preservation and presentation of historical and cultural heritage. The main areas of IT use in restoration, conservation and preservation of cultural heritage are virtual reconstruction, 3D scanning, restoration of paintings, digitization of works of art (Hlushchuk, Karpets, 2019; Kotsiubyvska, Baranskyi, 2020).

Virtual reconstruction involves the use of computer technology that allows scientists to collect and process a large number of image sequences, thus improving the photorealistic display of texture when creating their 3D models. Creation of a virtual model of a cultural heritage object is a visual representation of a cultural heritage object. This will make it possible to preserve it in the digital dimension.

Usually, virtual reconstruction is carried out by means of 3D modeling, which allows collecting, interpreting, analyzing and, most importantly, visualizing data thanks to special digital technologies. The created 3D models make it possible to develop a variety of multimedia and virtual reality products to stimulate interest in cultural heritage and its condition, as well as to stimulate visits to the original physical site. 3D models have also been prepared to provide an opportunity to view them using 3D navigation tools – to zoom in, zoom out, rotate and view from different angles and sides; to perform measurements (distances, areas, volumes) and publish them on the Internet with 3D navigation capabilities.

The use of ***3D technologies*** in the field of modelling of three-dimensional technologies is associated with the creation in the 90s of the 20th century of specialized software. It is mainly about 3D-engine technology, which is still one of the most promising in three-dimensional graphics. This technology gives interactivity to a pre-created three-dimensional space, allowing you to take a virtual walk through it, interact with objects, characters, etc. "3D scanning is a promising direction not only for those industries in which it has been traditionally used for a long time. People can use this technology quite effectively to modernize the methods of protection of immovable objects of cultural heritage and museum sphere." (Mishchenko, 2020)

In Latvia, for example, the plan of the project "Digitization of cultural heritage content" stipulates that the Intangible Cultural Heritage Administration should digitize 30 cultural monuments using 3D laser scanning and photogrammetric methods, geophysical survey of the underground part of cultural monuments by radar method and bathymetric survey of the underwater part of Koknese. Thanks to modern technologies of documenting cultural monuments of national and regional significance, as well as those under state protection, it is possible to obtain accurate data on the content, volume, form and materiality of cultural monuments, which can be used to clarify the state of preservation, restoration and documentation of history (National Heritage Board, 2021).

In modern museum ***restoration*** practice, technical and technological research is an integral part of an integrated approach to the study of works of art. Every year there are new methods of such research and new devices that allow more and more accurate analysis of works of art without damaging them. Of course, technical and technological expertise cannot give answers to all questions. But the best results are formed from comprehensive research conducted in cooperation with technologists and art historians (Andrianova, 2019). For example, in

2019, with the support of the Ukrainian Cultural Foundation, a manual was published, which reviews the most common optical and physicochemical methods. It was used to study five paintings selected for the project from the Bohdan and Varvara Khanenko National Museum of Art. "Unfortunately, only one of them turned out to be original. However, the most important result of the project is that restorers, technologists and art historians have gained new, much deeper knowledge about the studied works and learned to interpret them more accurately and preserve them better." [p. 3]

In a scientific article, Lithuanian researcher Loreta Meshkelievichin examines the preparatory processes, procedures and initial results of the project, as well as the technical possibilities of digitization, which took place in the Lithuanian Art Museum as a participant in the program "Creation of an integrated virtual library information system".

The author writes that "as part of the initial efforts, a Digitization Center for the collection was established and the necessary digitization equipment was purchased with funds from the museum and project sponsors. The center has two digitizing cameras and a unique Cruse CS 185ST FAS artifact scanner that can produce 2D base images of the highest quality. With the help of additional equipment, it is possible to obtain three-dimensional images. The material selected for digitization is grouped into six main categories: exhibits of paintings on paper; collections of historical and artistic photography; documents, maps and drawings; collections of bonistics, sphragistics, numismatics; exhibits of textiles; paintings." (Meškelevičienė, 2009)

Digitizing of artworks is one of the best and, in some cases, the only way to ensure that heritage is adequately preserved and made accessible to as many people as possible. According to culturologist and art historian Diana Klochko, the process of digitization of all our museum collections will significantly change the perception of our heritage and, accordingly, the attitude to culture. "If the state allocated (and not so much) funds for the total digitization of the funds of all art museums, it would be done now. So that all museums would have full digital catalogues. In order to be able to go to the full website of the museum, read annotations, the history of each item, its nationalization and exhibition and, finally, to imagine what a visual fund of artistic values is – this should be a normal state support. Real digitization and digitalization." (Dnistrovyi, 2021)

In 2020, in the V. Vereshchagin Mykolaiv Art Museum the collection of graphics, which had not previously been exhibited to the audience, was digitized. Specialists focused on the most valuable works of the 18th, 19th and the first half of the 20th centuries – paintings by Danylo Krainev, Roman Semashkevych, Vasyl Shukhaev, Borys Kustodiev, Ivan Shishkin, Nicholas Roerich, Vasyl Vereshchagin and other artists were selected for digitization among 500 graphic museum exhibits. Previously, museum visitors did not have the opportunity to get acquainted with these works. Digital copies are planned to be presented in the format of a web resource and a separately printed catalog. At the same time, the project involves the creation of 3D models based on five digitized works. These will be animated models that can be read with a smartphone by pointing at the code or image of this particular work. The implementation of such a project will allow users to remotely get acquainted with the museum graphics of the Mykolaiv Museum.

During the implementation of the project "Digitization of cultural heritage content" in Latvia, text documents, as well as audio and video materials are being digitized. And the only copies of books published in the country, fiction literature by Latvian authors to support digital research, as well as periodicals will be digitized to ensure as full as possible availability of newspapers in the digital environment in the period up to 4 decades of the 20th century. Text materials stored in Latvian museums will also be digitized. In addition, it is planned to digitize a collection of audio and video cassettes produced in the 1990s and early 2000s from the LNB collection.

A separate area worth considering is the ***tokenization of cultural heritage***. In Ukraine the IT sphere is one of the most dynamic. According to Hacker-Rank, Ukraine takes the 11th place among 50 countries with the best software developers. Therefore, Ukraine is rapidly adapting new models to various fields of activity, including culture and art. An example of cultural heritage in digital format can be both an electronic copy of paper documents, monuments, paintings, etc. and the original, which exists only in digital form. For example, in the last few years in Ukraine there is a growing interest in such a phenomenon as NFT – a unique digital asset built on blockchain technology. NFT tokens provide artists and content creators with a unique opportunity to monetize the results of their creative activity, which is why the digital art sphere has become the first to massively use the new technology. Such interest is due to the ability of blockchain technology to provide a unique signature and ownership of NFTs. With the beginning of a full-scale war in Ukraine in 2022, the role of such a phenomenon as NFT is changing significantly. For example, Ukrainian artists use it to raise funds for urgent military and humanitarian needs. Recently, the META HISTORY war museum was created, which sells a collection of NFT art called Warline – a set of digital works chronologically representing every critical event of the Russian-Ukrainian war.

According to the authors, tokenization of cultural heritage can be one of the promising, although currently little implemented areas. Currently, blockchain projects are becoming increasingly popular around the world, including in the arts, although these trends have not yet been reflected in the digitalization of cultural heritage.

One of the world's first examples of such an application is CryptoJewish, which seeks to demonstrate the promise of developing valuable multidimensional content using a new and innovative digital language, bringing elements of millennial culture to the digital revolution. 25 of the rarest items in the Crypto-Jewish collection are housed in the fourth-largest synagogue in the world – "rather, in its digital version in Decentraland, which Chief Rabbi Peter Deutsch and Rabbi Daniel Channen, along with the entire CryptoJewish NFT collection, have already declared kosher".

In 2022 two significant events took place in the Ukrainian cultural and artistic environment, which may indicate the beginning of the tokenization of cultural heritage. This is a new experience for the National Museum of Art of Ukraine (Kyiv) and Andrey Sheptytsky National Museum in Lviv. At the beginning of the year, the capital's museum, having started selling licensed NFT tokens, became the first museum in Ukraine to create an NFT collection based on works from its art collection. It should be emphasized that programmers, designers and art critics, who worked for more than three months, focused exclusively on the masterpieces of Ukrainian artists – the digital collection will include works by Vsevolod Maksymovych, Oleksandr Murashko, Oleksandra Ekster, and Petro Rybka. The Lviv Museum continued to expand the horizon of the vision of Ukrainian museums by announcing the creation of the NMT collection "Alternative Dimensions" in 2022, which will include works by prominent Ukrainian and European artists that have never been included in the permanent exhibition of the museum due to their physical properties, in particular, excessive sensitivity to moisture and light, as well as insufficient protection of museum premises. In particular, digital versions will receive Rembrandt's etchings, drawings by Italian artists of the 17th-18th centuries, and Ukrainian folk engravings in the woodcut technique of the 18th-20th centuries.

The Ukrainian Heritage Hub project (https://www.heritagehub.org), which proposes the preservation of Ukrainian cultural heritage through the reliable data storage algorithms of blockchain technology, is an ambitious project that has no analogues. In addition to preservation, the project aims to record Ukraine's rights to cultural heritage in the digital world on the blockchain.

Thus, in the modern world there are new trends for art in general and museums in particular. NFT allows these works to travel virtually from museum collections to the world. In addition, the museum has the opportunity to receive certain funds that it can use for its development, to digitize collections, to show these collections to the world, and, as far as possible, to help Ukrainian cultural institutions that suffered during the war.

4. Conclusions

One of the promising areas of research on the digitization of the cultural sphere and the introduction of digital practices in the field of cultural heritage is cultural studies, which, offering an interdisciplinary approach (involving theoretical and practical developments of economics, philosophy, cultural studies, psychology, visual studies), considers cultural heritage as a meaning-making resource in the context of modern culture. This approach expands the disciplinary and ideological boundaries of the study of cultural heritage from the aggregate of material and spiritual heritage of mankind to consideration as a special type of capital – economic, cultural, creative.

Analysis of the implemented technological and cultural projects on digitization of cultural heritage in the Baltic States shows that this process requires significant financial costs. At the same time, studies show that these investments are necessary for long-term strategies for the implementation of the cultural policy of any modern state, as they are converted into economic capital (growth of the share of the creative economy in the country's GDP), human capital (new jobs for a number of specialists in both humanitarian and technological fields) and cultural capital (formation of identity in the modern digital world, growth of tourist attractiveness of cultural institutions and the country as a whole).

Obviously, digital practices in the field of cultural heritage do not guarantee the physical protection of original cultural objects, which can be confirmed by the fact that 186 cultural heritage sites of Ukraine were destroyed or damaged during the Russian invasion in 2022 (information as of September 5, 2022 according to UNESCO open information). The developed digital tools of the Baltic States for work in the field of cultural heritage show that modern technologies can be an effective way to preserve reliable information in case of its destruction, damage or theft. For example, specialists of Riga Technical University are already actively cooperating with Ukrainian colleagues on the restoration of historical and cultural heritage in Ukraine. The ongoing war on Ukrainian territory demonstrated the insecurity of cultural heritage objects in the 21st century, which became the reason

for the revision of the cultural policy of a number of European countries and contributed to the active exchange of experience and information between Ukraine and other countries. Thus, the study of electronic museum, archival and library information systems (prerequisites, methods of implementation, user experience) of Estonia, Latvia and Lithuania will help to accelerate the digitization of these areas for the protection and promotion of Ukrainian cultural heritage, and the consideration of legislative acts of these countries will help in the implementation of legal norms and standards of the European Union in Ukraine.

The authors believe that the sphere of cultural heritage is characterized by high digital potential, and one of the promising directions of digitization of cultural heritage can be tokenization. In the context of the technologies of the future, this format of preserving the characteristics of valuable cultural objects will help not only to further adapt to the requirements of, for example, Metaspace, but also to protect data and create additional financial and symbolic value. However, this topic requires further research, as it raises a number of issues: legal, economic, educational, environmental and, most importantly, ideological.

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