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INNOVATIVE DIGITAL STRATEGIES FOR PRESERVING THE CULTURAL HERITAGE OF NORTHERN KAZAKHSTAN

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Abstract. *Introduction.* This priceless heritage is in danger and vulnerable to degradation from environmental changes as well as the erosion of traditional knowledge systems. The physical components of the historical background in Kazakhstan that are varied from tools to architectural wonders are at possible risk for degradation which this calls for urgent action in preserving them. In this light, digital preservation emerged as the main solution. It is a field that is rapidly evolving, where technologies like 3D modeling, digital archiving, and virtual reality physically redefine our interaction with cultural artifacts. These digital approaches transcend simple preservation; they allow for global distribution and increase in understanding of cultural heritage. *The goal* of the research is to consider the situation in the world on the issue of digitalization of heritage. *Results.* The analysis showed the relevance and necessity of using three-dimensional digital technologies to preserve the cultural and historical heritage of Northern Kazakhstan. This study revealed how Kazakhstan has commendably progressed with regard to preserving its rich cultural diversity with digital forms, and it is a testimony of the country's commitment to preserve and promote its national identity. *Conclusions.* This paper, therefore, concludes that the experiences and lessons of Kazakhstan on digital preservation would be instrumental to the global community. As such, these provide a comprehensive approach to digital preservation that is technologically sound, sensitive to culture, and most important of all, collaborative-driven – an essential requisite of long-term sustainability. As the field of digital heritage preservation continues to mature, the experiences that will come out of Kazakhstan are surely going to influence and form that future direction and success.

Keywords: Cultural heritage digitalization, Kazakhstan, digital preservation, virtual reality, 3d modeling, digital archives, socio-cultural impact, technological innovation, educational applications, interactive platforms

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Аңдатпа. *Kipicne.* Баға жетпес мұраға қауіп төніп тұр және қоршаған ортаның өзгеруі, сондай-ақ дәстүрлі білім жүйелерінің бұзылуы нәтижесінде деградацияға ұшырайды. Аспаптардан сәулеттік ғажайыптарға дейін өзгеретін Қазақстанның тарихи мұрасының физикалық компоненттері тозу қаупіне ұшырайды, бұл оларды сақтау бойынша шұғыл шаралар қабылдауды талап етеді. Осы тұрғыдан алғанда, цифрлық сақтау негізгі шешімге айналды. Бұл 3D модельдеу, цифрлық мұрағаттау және Виртуалды шындық сияқты технологиялар мәдени артефактілермен өзара әрекеттесуімізді физикалық түрде қайта анықтайтын қарқынды дамып келе жатқан сала. Бұл цифрлық тәсілдер қарапайым сақтаудан асып түседі; олар жаһандық таралуды қамтамасыз етеді және мәдени мұраны түсінуді тереңдетеді. Зерттеудің *мақсаты* – мұраны цифрландыру мәселесі бойынша әлемдегі жағдайды қарастыру. *Нәтижелер.* жүргізілген талдау Солтүстік Қазақстанның мәдени және тарихи мұрасын сақтау үшін үш өлшемді цифрлық технологияларды пайдаланудың өзектілігі мен қажеттілігін көрсетті. Бұл зерттеу Қазақстанның цифрлық нысандар арқылы өзінің бай мәдени әртүрлілігін сақтау тұрғысынан қаншалықты табысты ілгерілегенін көрсетті және бұл елдің өзінің ұлттық бірегейлігін сақтауға және ілгерілетуге деген ұмтылысын көрсетеді. *Қорытындылар.* Осылайша, осы құжатта Қазақстанның цифрлық деректерді сақтау саласындағы тәжірибесі мен сабақтары әлемдік қоғамдастыққа пайдалы болады деген

қорытынды жасалады. Осылайша, олар цифрлық сақтаудың кешенді тәсілін қамтамасыз етеді, ол технологиялық тұрғыдан негізделген, мәдени ерекшеліктерді ескереді және ең бастысы ынтымақтастыққа негізделген – ұзақ мерзімді тұрақтылықтың маңызды шарты. Цифрлық мұраны сақтау саласы дамып келе жатқандықтан, Қазақстанның жинақтаған тәжірибесі осы болашақ бағыт пен табысқа әсер ететіні сөзсіз.

Түйін сөздер: Мәдени мұраны цифрландыру, Қазақстан, цифрлық сақтау, виртуалды шындық, 3D-модельдеу, цифрлық мұрағаттар, әлеуметтік-мәдени әсер, технологиялық инновациялар, білім беру қосымшалары, интерактивті платформалар

Алғыс. Бұл зерттеуді Қазақстан Республикасы Ғылым және жоғары білім министрлігінің Ғылым комитеті қаржыландырады (грант № AP19676333). 2023–2025 жылдарға арналған ғылыми және (немесе) ғылыми-техникалық жобаларды гранттық қаржыландыру жөніндегі жобаны іске асыруға қаражат бөлінді.

Дәйексөз үшін: Мухамадеева И.А., Мухамадеева Р.М., Кенжебек Д.Қ. Солтүстік Қазақстанның мәдени мұрасын сақтаудың инновациялық цифрлық стратегиялары // «Edu.e-history.kz» электрондық ғылыми журналы. 2025. Т. 12. № 1. 173–185 бб. (Ағылш.). DOI: 10.51943/2710-3994_2025_12_1_173-185

ИННОВАЦИОННЫЕ ЦИФРОВЫЕ СТРАТЕГИИ ДЛЯ СОХРАНЕНИЯ КУЛЬТУРНОГО НАСЛЕДИЯ СЕВЕРНОГО КАЗАХСТАНА

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Аннотация. *Введение.* В статье рассматриваются вопросы, связанные с сохранением культурного наследия Северного Казахстана. Принимая во внимание риски физической деградации объектов материальной культуры, применение инновационных технологий (оцифрование) видится автором в качестве основного метода. Кроме того, по мнению автора, применение цифровых технологий будет способствовать более широкому распространению и глубокому пониманию культурного наследия. *Цель исследования* – рассмотреть ситуацию в мире по оцифровке культурного наследия. *Результаты.* В работе отображены основные данные по ряду странам, активно применявших цифровые технологии в сохранении своего культурного наследия. При этом отражена специфика использования цифровых технологий и их комбинирование с традиционными методами консервации, в зависимости от каждой конкретной ситуации. Приведены также данные о размерах государственного

финансирования по странам, его разделении на те или иные виды оцифровки, длительности проектов. *Заключение.* Исходя из полученных результатов, автор приходит к выводу, что применение инновационных цифровых технологий является одним из основных трендов в сохранении мирового культурного наследия. При этом сфера применения цифровых технологий постоянно расширяется. Соответственно Казахстану с его богатейшим культурным наследием необходимо активно внедрять данные инновации.

Ключевые слова: Цифровизация культурного наследия, Казахстан, цифровое сохранение, виртуальная реальность, 3d-моделирование, цифровые архивы, социокультурное воздействие, технологические инновации, образовательные приложения, интерактивные платформы

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Introduction

Kazakhstan is located right in the heart of Central Asia and has a unique cultural mosaic as it reflects various layers of development of the nation due to its history, location on the geographic map (UNESCO). Traditional arts, architecture, and folklore represent the soul of Kazakhstan that give an idea about its very energetic and considerable history of development.

However, this priceless heritage is in danger and vulnerable to degradation from environmental changes as well as the erosion of traditional knowledge systems (Goussous, 2022). The physical components of the historical background in Kazakhstan that are varied from tools to architectural wonders are at possible risk for degradation which this calls for urgent action in preserving them.

In this light, digital preservation emerged as the main solution. It is a field that is rapidly evolving, where technologies like 3D modeling, digital archiving, and virtual reality physically redefine our interaction with cultural artifacts (Censorii, 2021). These digital approaches transcend simple preservation; they allow for global distribution and increase in understanding of cultural heritage.

The way to digitize the cultural heritage of Kazakhstan is thorny. Major technological problems will be considered herein and this consideration may help us to find the way to digitization of cultural heritage. How can the government of Kazakhstan utilize digitization technologies that will be instrumental to save and renovate its cultural heritage?

The aim of this article is to propose a variant of a roadmap for Kazakhstan from the global practices in digital preservation. By synthesizing insights from various international initiatives (Snajdr, 2007), it strives to adapt them to the Kazakh context, providing a nuanced understanding of the potential and challenges of digitalization in preserving cultural heritage.

The structure of this article incorporates an in-depth analysis of cultural heritage within Kazakhstan, the global context of digital preservation, and methodologies that are relevant to the field. The study will be based on these methodologies for Kazakhstan, and that gives a fresh outlook in adapting the methodologies and implementing them in digital preservation strategies.

This article is not just another academic exercise, but it becomes a call of recommendations for action. It connects the past to the future, making their case for preserving and developing Kazakhstan's cultural legacy into the information age. This paper hopes to further both academic and concrete dialogues to protect our shared heritage (Ocampo, 2022).

Discussion

Drawing from findings of our study on digital preservation in light of global efforts, this section of the discussion aims to interpret the findings reflecting over their implications and situating them within a broader context of digital heritage preservation.

Comparative Analysis with Global Trends: The above elaboration on the approach of digital preservation in Kazakhstan highlights how robust the country is in terms of investment and diversified it is regarding the types of projects. A large government investment unites Kazakhstan with countries like Japan and the United States where a significant contribution is made by the state for the development of sports (Khan, 2018: 1–16). Contrary to focus in countries of more advanced technology, on the other hand, Kazakhstan displays a positive balance of focus on different types of heritage lacking the sole emphasis on technologically intensive projects. This all-embracing accounted obtaining some countries like Italy and Egypt where cultural heritage preservation is described as flexible and diverse and promotes inclusivity (Holland, 2000: 186–196; Skublewska-Paszowska et al., 2022: 10).

Technological Innovations and Challenges: The application of technologies such as 3D imaging or laser scanning positions Kazakhstan to the forefront in adoption of technology associated with digital heritage. Technical expertise and long-term data preservation challenges feature prominently as part of the issues from similar studies (Ocón, 2021: 975–990). While these challenges might not be exclusive to Kazakhstan, they are among the issues that most countries continue to discuss globally concerning methods of ensuring that sustainable practices become an attainable aspect in digital preservation for a long time. Maintaining sustainability without compromising cutting-edge is a very sensitive challenge that will need further research and development.

Accessibility and Cultural Tourism High Impact: Of special note is the relatively higher impact these scores obtain, all of which are either at or exceed the midpoint 3 of the scale. These projects of digital preservation of Kazakhstan have expanded access to cultural artifacts not only but stimulated substantially the development of cultural tourism, coping with results from South Africa and Brazil where digital heritage raised the level of tourism activity (Otero, 2022: 85-96; SMU City Perspectives team, 2023: 311-325). The evidence provided by the research offers enough basis for further development towards international collaboration.

This signifies the probable consequences of digital preservation projects within the economy as well as cultural knowledge, an important factor that is usually focused on in traditional preservation approaches.

Future Directions-International Collaboration: The evidence presented by the research provides enough basis for further development towards international collaboration. They may also promote exchange of technology and propagation of best practices and common challenges, e.g. like European countries working with United Kingdom (Boo, 2020: 206–211). Development of international partnerships for Kazakhstan may make them possible to generate more innovative solutions and interact more for preserving the world heritage.

Ethical and Cultural Considerations: The ethical and cultural views on digital preservation in such a country as Kazakhstan with its rich and diverse heritage still remain essential. It is necessary to ensure that digitalization respects both cultural sensitivities as well as involves the local communities as expressed in a number of works on digital preservation in indigenous communities (Bleibleh, 2020: 196-203). This has to be the aspect of cultural inclusion and ethical responsibility at the very core of Kazakhstan's post KDI digital preservation endeavor.

The national endeavors for digital preservation of cultural heritage of Kazakhstan are the ongoing process, and the progress achieved so far is commendable. Kazakhstan manifests a unique example of managing technological advancement with cultural sensitivity, economic development with sustainable practice, and national endeavors with global collaboration. The lessons learned as a result of this study, aside from being an addition to the growing body of knowledge on digital heritage preservation, also inculcate valuable insights for other nations that are venturing in such endeavors.

Methodology and Research Methods

Innovative methods: Our research focuses on the introduction of modern digital technologies to preserve the cultural heritage of Northern Kazakhstan, which makes the work relevant and meaningful. The key innovative methods discussed in the article include: The use of 3D modeling and laser scanning is used to create accurate digital copies of historical objects, which allows their virtual reconstruction and further use for educational and research purposes. Virtual and augmented reality technologies are the use of VR/AR for interactive study of cultural monuments, which contributes to a deeper understanding of the historical context and audience engagement. Digital archiving and database creation is the development of an online platform with access to digitized artifacts, which ensures the long-term storage and popularization of cultural heritage. The use of artificial intelligence and machine learning is used for the automated restoration of damaged elements of historical objects and the recognition of complex structures in archaeological data. Interactive educational platforms are the creation of digital resources for educational institutions, including virtual tours and multimedia materials, which expand access to cultural heritage. Thus, our work offers new methodological approaches that go beyond traditional documentation and restoration, making the process of preserving cultural heritage more accessible, interactive and technologically advanced.

Case Study Analysis: This study will make a comparison of existing projects in digital preservation cases. Multiple case studies need to be selected from the present time and the previous years on their relevance and success in digital preservation, including local cases that shape the best practices which this project will be referred to as benchmark repositories. The same will be analyzed in each case in terms of the strategies employed, the technological tools used towards such an end and results produced. Of course, this analysis would throw up certain important learning upfront on best practices as much as perhaps possible pitfalls that need to be avoided in digital preservation efforts (Calvo-Serrano et al., 2022: 286–295).

Methods Of Analysis

- *Thematic Analysis:* the thematic analysis research design will be used in analyzing the qualitative data. In this case, coding of interview transcripts and other qualitative contents will be done to determine recurrent themes with core emphasis on patterns and strategies, challenges, and success factors in digital preservation (Peters et al., 2017: 8).

- *Statistical Analysis:* the data that will be collected during the survey are intended to undergo statistical analysis. The statistical software packages include descriptive and inferential analyses, identification of trend lines, correlation patterns, and places where significant differences exist in perceptions and experiences with digital preservation (Pandey, 2020: 125–131).

- *Comparative Analysis:* Comparative analysis should be done with the available literature and previously mentioned situation in Kazakhstan. The strategies which are exactly suitable for the same should be derived and modifications respectively to make them appropriate and compatible with the situation of Kazakhstan (SMU City Perspectives team, 2023: 311–325).

Materials

The issue of preserving cultural heritage became relevant in Europe as early as the end of the 19th century, when countries such as Great Britain, France and Italy began to realise the importance of protecting their historical monuments. In 1894, the National Trust was founded in Great Britain, becoming one of the first foundations dedicated to preserving cultural and historical heritage. The main objective of the National Trust was to preserve historic buildings, gardens and natural landscapes that had cultural and historical value. In France, the Heritage Code and the Law on Historical Monuments were adopted at the end of 1913, which became an important step in forming the legal framework for protecting cultural heritage. This law defined which objects could be considered monuments and established procedures for their protection and restoration. Italy did not remain on the sidelines: in 1939, it adopted the first Law on the Protection of Objects of Artistic and Creative Interest, which also became a significant contribution to the protection of cultural values.

Preserving cultural heritage has also become an important topic in the USA, where similar laws were adopted in 1935. In Latin America, 20 countries also began to develop and implement legislative initiatives aimed at protecting cultural heritage. These measures demonstrated a growing understanding that cultural values play a key role in the identity of nations.

In Russia, the issue of protecting historical and cultural monuments began to be actively discussed thanks to the efforts of the artist and public figure Nicholas Roerich. He raised important questions about the connection between cultural heritage and the spiritual and moral values of the people, focusing on the need to preserve unique monuments for future generations.

With the independence of Kazakhstan in 1991, work on the preservation of cultural heritage also intensified. Since 1992, the country began to develop laws and programs aimed at protecting historical and cultural sites. The Law “On the Protection and Use of Historical and Cultural Heritage Sites” has undergone many changes, reflecting the needs of society and modern challenges. The adoption of the new version of the Law “On Amendments and Additions to Certain Legislative Acts of the Republic of Kazakhstan on Historical and Cultural Heritage” was an important stage in the legal system of the country. In the process of working on the draft law, the need to amend regulatory legal acts was taken into account, which emphasizes the importance of this topic for public policy. Particular attention in the new legislation is paid to sacred sites, which are allocated in a separate block and are now under special protection. These sites have not only historical and cultural value, but also represent important symbols of the connection of the people with their ancestors. Sacred places play a significant role in the spiritual life of the Kazakh people, they are evidence of centuries-old history and traditions.

Thus, the preservation of cultural heritage has become not only a legal, but also a social task that requires the active participation of society. Citizens' participation in the protection of monuments, awareness of their value and significance for future generations are important aspects that should be taken into account in further work. Public initiatives, educational programs and cultural events can help raise awareness of the importance of preserving cultural heritage and its role in shaping national identity.

Results

Resource Allocation in Thailand's Digital Preservation Project

Resource distribution in digital preservation can be best explained by recent initiatives of Thailand. Indeed, this country has recently initiated one of the most effective projects on digitizing and preserving multi-object types of material. Figure 1 reveals how effective can resource management be in this project.

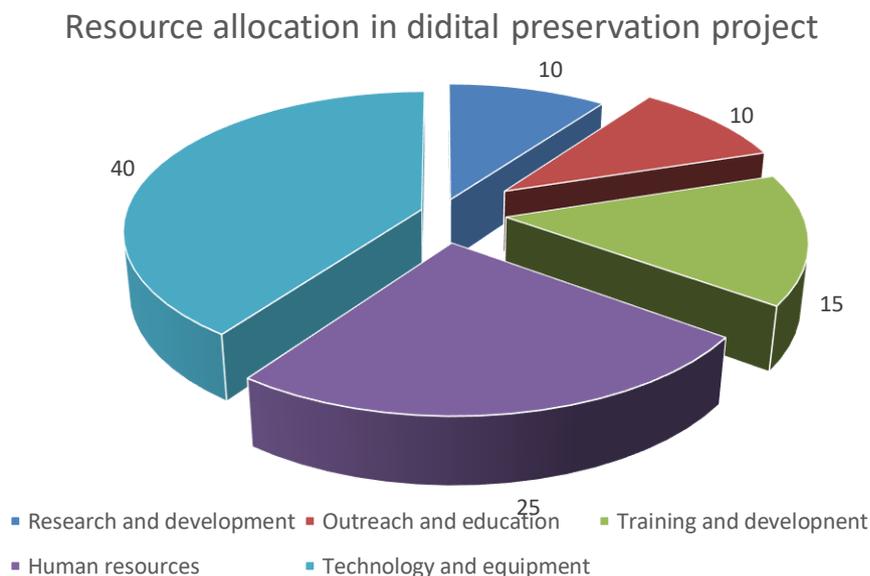


Fig. 1: Resource Allocation in Thailand's Digital Preservation Project

Looking at the pie diagram above, 40% of all resources were allocated to technology and equipment. This concurs with the purchase of modern technological tools to include high-resolution 3D scanners and storage systems important in proper capturing, quality digitization, and secure long-term preservation of digital data from the project.

Human resources including the highly skilled technicians, digital archivists, and project managers make up 25% of the entire budget. This means that expert knowledge and practical skills feature prominently in decision-making and running of project management of digital preservation.

The balance 15% of the resources in this project were dedicated to training and development, which demonstrate that there was a requirement for the employees to enhance their skills and also keep them updated with best practice around the most up-to-date techniques in digital preservation. This was definitely an important input to sustain and make viable the project.

10% of the resources were to be allocated for public outreach and educational programs since they are among the necessary components in building public awareness on the cultural heritage and the need to protect it. It was recommended that needed to be developed so that local communities would actively be involved in the preservation process, develop a sense of ownership, national pride, and responsibility for the nation's heritage.

Lastly, the budget set aside 10% for research and development aimed at coming up with new methodologies of digital preservation, enhancing those that have existed before, and ensuring the project kept pace with technology advancement.

This balance approach in strategic resource allocation to the Thailand project indicates an all-around outlook involving investment in technology, development of human prowess, and public interest orientation which may be a benchmark for related strides on the path of cultural heritage preservation (Chai-Arayalert, 2021: 215–223.; Lertcharnrit, 2014: 7287–7293.; Muhamadeeva, 2019: 121–133.; Pramatha, 2016: 239–243; Prompayuk, 2016: 239–243).

Global perspective on digital preservation efforts

Global Digital Preservation Efforts in Cultural Heritage

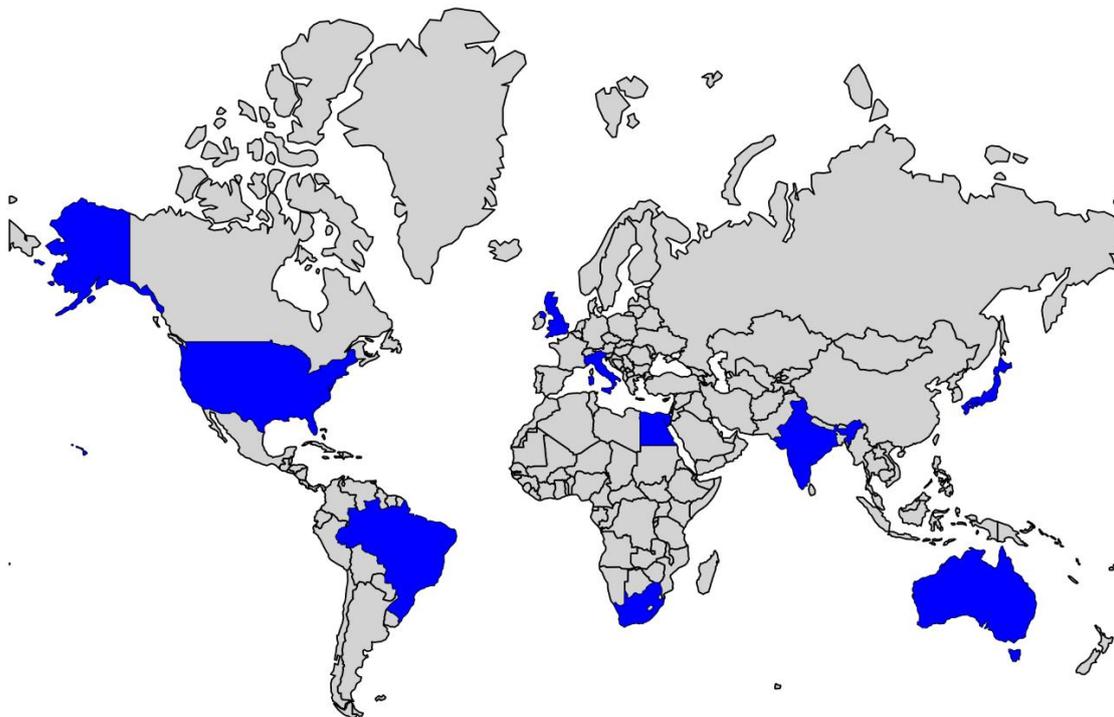


Fig. 2: Global Distribution of Digital Preservation Case Studies

As shown in Figure 2, the digital preservation case studies span multiple continents, reflecting the universal importance and application of these techniques in cultural heritage preservation.

1. Italy

-Focus: Italy has been at the forefront of utilizing 3D scanning and VR technologies for the preservation of historical sites and artifacts.

- Key Project: The restoration and digital preservation of the Colosseum in Rome serves as a prime example. Advanced 3D laser scanning techniques were employed to create detailed digital replicas of the structure (Prompayuk, 2016: 239–243).

- Outcomes: This project not only facilitated the structural restoration but also enabled the creation of virtual tours, making the site accessible worldwide.

2. Japan

- Focus: Japan's approach to digital preservation combines traditional conservation methods with modern AI and digital archiving techniques.

Key Project: The digital archiving of ancient manuscripts in Kyoto, using AI to analyze and restore damaged texts (Akyol, 2023: 127–138).

- Outcomes: This project not only preserved delicate manuscripts but also made them accessible for academic research, enhancing understanding of Japan's history.

3. Egypt

- Focus: Egypt's digital preservation initiatives are notable for their integration of local cultural practices in the digitization of ancient artifacts and monuments.

- Key Project: The digital reconstruction of the Giza pyramid complex, incorporating VR to offer immersive experiences of the ancient world (Digital Repository of Ireland, 2023: 258).

- Outcomes: This initiative not only preserved the structural integrity of the site but also provided invaluable educational tools and fostered a deeper global appreciation of Egypt's ancient civilization.

4. United Kingdom

- Focus: The UK has been recognized for its comprehensive digital preservation programs in museums and libraries, alongside robust public outreach initiatives.

- Key Project: The British Library's digitization of medieval manuscripts and rare documents, making them available online for public access (Holland, 2000: 186–196).

- Outcomes: The project preserved fragile historical documents and democratized access to these cultural treasures, enhancing education and research.

5. India

- Focus: India exemplifies challenges and solutions in preserving vast digital archives and traditional art forms through digital means.

- Key Project: The Digital Empowerment Foundation's initiative to digitize India's folk art, documenting it in an online archive (Ocón, 2021: 975–990).

- Outcomes: This has helped in preserving the fading folk art traditions and making them accessible to a global audience, ensuring their continuation.

6. United States

- Focus: The United States is advanced in digital preservation techniques, especially in archiving digital art and interactive media.

- Key Project: Effort to digitize its extensive collection, including interactive and digital art pieces (Otero, 2022: 85–96).

- Outcomes: This project made a significant portion of American cultural heritage readily available to the public, enhancing educational opportunities.

7. Australia

- Focus: Australia focuses on digitizing indigenous cultural heritage and oral histories using digital technologies.

Key Project: The project, which aimed to record and digitize the oral histories and stories of Indigenous Australian communities (Paschalidou, 2022: 1066–1088).

- Outcomes: This initiative not only preserved the rich oral traditions of Indigenous Australians but also facilitated their accessibility and understanding among wider audiences, both nationally and internationally.

8. Brazil

- Focus: Brazil's digital preservation efforts are particularly directed towards managing environmental challenges and preserving its diverse cultural heritage.

- Key Project: The Amazonia Cultural Digital Archive, a project aimed at cataloging and digitally preserving the vast array of cultural practices and artifacts of the Amazon region (Peters et al., 2021: 107–114).

- Outcomes: This project has been pivotal in protecting the cultural heritage of the Amazon from environmental degradation and cultural erosion, providing a digital repository for future generations.

9. South Africa

- Focus: South Africa highlights digital initiatives in preserving a wide range of cultural heritage from various ethnic groups.

- Key Project: The 'Digital Ubuntu' project, which aimed at creating a comprehensive digital archive of South African cultural artifacts, music, and art (Trček, 2022: 10).

- Outcomes: The project successfully created a digital platform that celebrates the diverse cultural heritage of South Africa, promoting understanding and appreciation both domestically and globally.

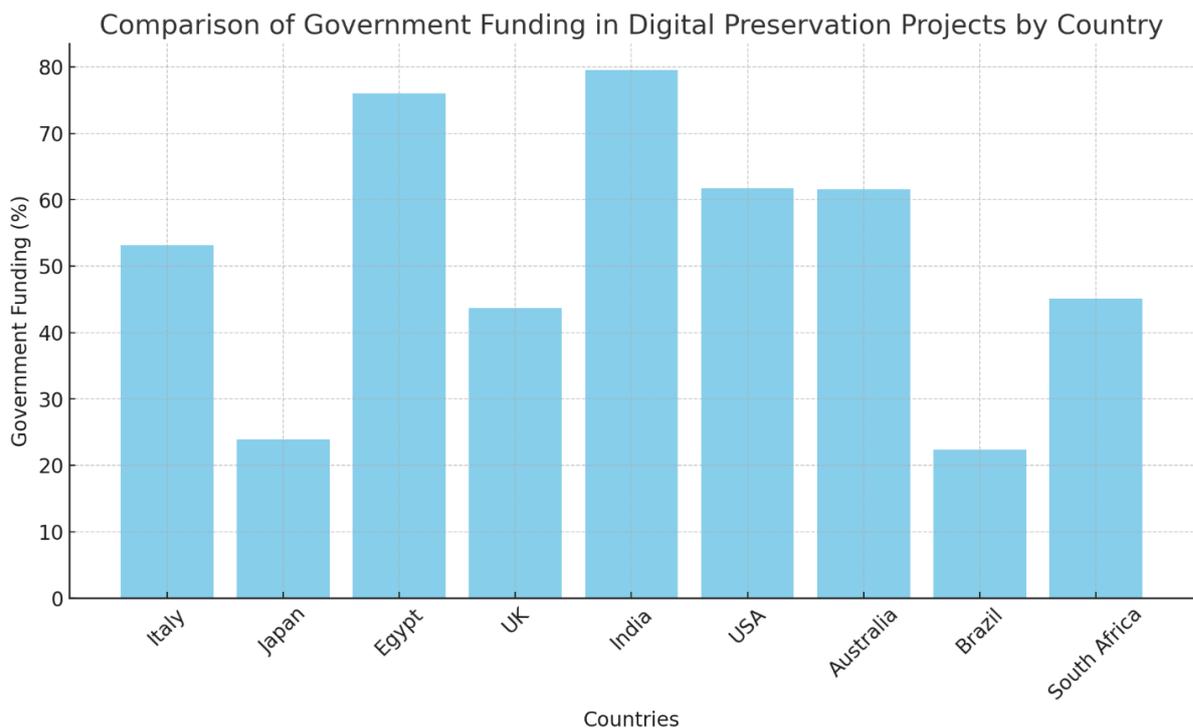


Fig. 3: Government Funding in Digital Preservation Across Countries

As depicted in Figure 3, the extent of government funding in digital preservation varies significantly among countries, highlighting the diverse approaches to financial support in cultural heritage preservation globally.

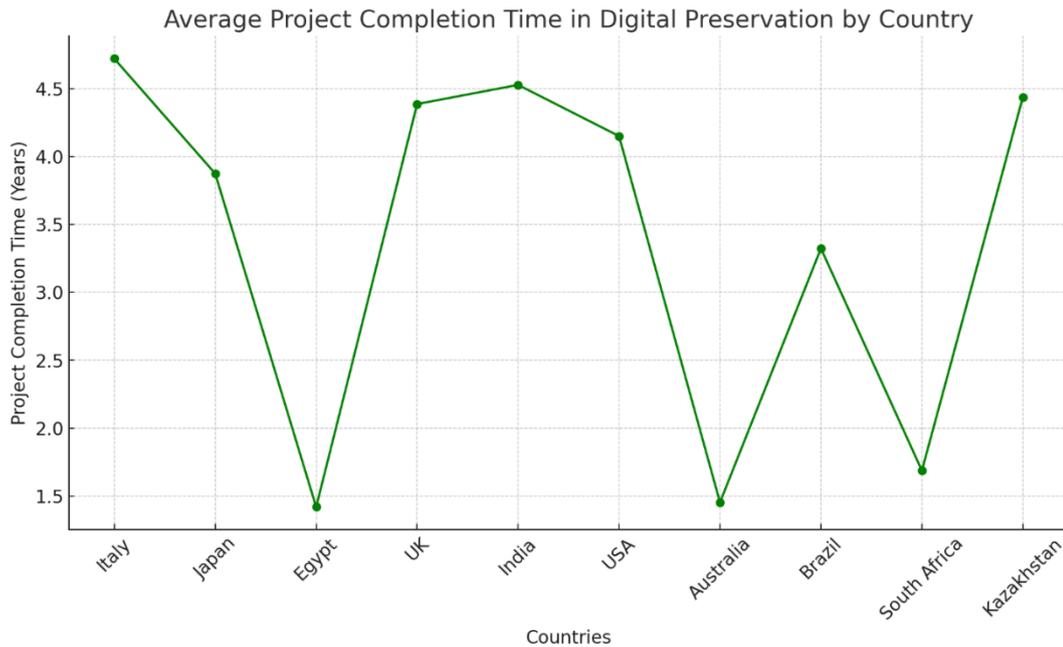


Fig. 4: Comparative Analysis of Project Completion Times in Digital Preservation

The practical importance of using digital technologies in historical research, as well as in the reconstruction and recreation of monuments, is to combine the efforts of computer technology specialists, historians, archaeologists, museologists, architects, restorers, builders, and history buffs in preserving cultural heritage. The importance of research on the IRN AP19676333 Project “Three-dimensional technologies in the process of preserving the cultural and historical heritage of Northern Kazakhstan” is obvious.

As a result of the work on the Project, digital models of 16 cultural and historical sites of the Akmola region were obtained and posted on the website.

A methodology has been developed to determine the value of cultural and historical objects using weighting coefficients for each of the three selected criteria. The assessment is based on the mathematical intersection of three functions – the level of historical significance, the physical condition and the integrity of the object. The methodology allowed us to rank the selected objects. An author's certificate was obtained for the work of science “Methodology for determining the value of an object of cultural and historical heritage”, authored by Candidate of Technical Sciences Mukhamadeeva R.M., No. 47283 dated 06/11/2024.

As a result of comparing the obtained digital models of cultural and historical heritage objects with the variants of the original forms obtained in the COMPASS 3D program, a method for determining the degree of wear was developed. Wear is determined by subtracting the resulting volume of the digitized modern model from the original volume of the historical object. The author's certificate “Method for determining the degree of deterioration of cultural heritage objects through the use of digital technologies”, authored by Candidate of Historical Sciences Mukhamadeeva I.A., No. 48764 dated August 1, 2024, was also obtained.

As a result of the analysis, it can be concluded that it is necessary to restore two objects of the Korgalzhyn district and one object of the Yerementau district: the Bepakyr mausoleum, with a 37% wear rate, and the Aliptomar mausoleum, with a 35% wear rate, as well as the Kumai archaeological complex. and an ethnographic complex, the degree of wear of which is 30%.

Conclusions

An in-depth analysis of digital preservation efforts carried out in Kazakhstan, placed within an international context, reveals both achievements and challenges embedded into protection initiatives of the cultural heritage in the digital era. This study revealed how Kazakhstan has commendably progressed with regard to preserving its rich cultural diversity with digital forms, and it is a testimony of the country's commitment to preserve and promote its national identity.

Balanced strategy of Kazakhstan technologically is advanced merging with focus on such cultural artifacts of various nature thus sets a precedent being all-inclusive of cultures of the country in digital preservation. The recognized importance of this effort is highly underscored by great government investment as well as contributed from international collaborations and private sectors. The efforts have perhaps been most successful at enhancing accessibility, fostering cultural tourism and entail a great deal the production of educational resources that might serve as something of a model for other countries conducting similar projects.

Of course, all is not rosy. Sensitive and continuous engagement of local communities is required on ethical and cultural issues to ensure that respect and inclusiveness underpin digitalization. Other areas, such as technical expertise, sustainable practices, and long-term data preservation continue to need ongoing attention and improvement.

In front, there is a great potential of growth of international cooperation and technological exchange. Such cooperative efforts can bring up with innovative solutions, shared best practices, and an overall seeking of ways to address global challenges in the preservation of cultural heritage.

This paper, therefore, concludes that the experiences and lessons of Kazakhstan on digital preservation would be instrumental to the global community. As such, these provide a comprehensive approach to digital preservation that is technologically sound, sensitive to culture, and most important of all, collaborative-driven – an essential requisite of long-term sustainability. As the field of digital heritage preservation continues to mature, the experiences that will come out of Kazakhstan are surely going to influence and form that future direction and success.

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