

Protection, Sharing and Management in the Area of Cultural Heritage and in the Field of Digital History

edited by

Aziz Mullaev, Mariusz Dzieńkowski





Protection, Sharing and Management in the Area of Cultural Heritage and in the Field of Digital History

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Preface

The next volume of the monograph is a continuation of previous volumes published by the Lublin University of Technology Publishing House in 2021: *Tangible Cultural Heritage of the Silk Road from the Area of Modern Uzbekistan* (editors: E. Miłosz, D. Mukhamedova) and *Intangible Cultural Heritage of the Silk Road from the Area of Modern Uzbekistan* (editors: M. Miłosz, G. Mukhamedov) and two in 2022: *Cultural Heritage of Uzbekistan – from Petroglyphs to the Present Days* (editors: J. Montusiewicz, B. Eshchanov) and *Computer technologies in sharing the cultural heritage and education of the Silk Road from Uzbekistan* (editors: J. Montusiewicz, U. Abdullaev). All the mentioned monographs are available free of charge on the Lublin University of Technology library website at: <https://hdl.handle.net/20.500.14629/107>.

The question may be asked: where did the cooperation between the staff of the Department of Computer Science at Lublin University of Technology and scientists from Uzbekistan and Central Asia come from, and what might it concern? The case is quite unusual since this collaboration involves people representing completely different fields: technical sciences, in particular the computer science discipline on the part of the staff of the Department of Computer Science, and the humanities, in particular art historians, archaeologists, historians and linguists on the part of universities and museums in Uzbekistan. The history of the collaboration, the joint activities and the results obtained are described by Dr Elżbieta Miłosz in the first chapter of this volume.

The area of scientific interest of the works included in this volume fits perfectly into the growing trend of digital humanities, digital history, digital art history, digital archaeology or digital tourism. It is noteworthy that there are as many as nine chapters in this volume devoted to the Khorezm region – a rather small area of Uzbekistan lying in the northern part of the country, which is partly isolated by the sprawling steppe and desert areas. This region is very important to the history of Uzbekistan, as it is here that the city of Khiva lies, which was the capital of the Khanate of Khiva until 1920 and is now on a UNESCO World Heritage Site. Other topics taken up in this volume deal with various aspects of the history of the Silk Road, including the social aspects of the digitisation of Uzbekistan's history and the culture of the Kelteminar and Saka tribes. We also have texts on intangible cultural heritage using Islamic medicine as an example, and on material heritage – a description of the dervish shrines or the mosques of Samarkand.

The works included in this volume were prepared by researchers of the dynamically developing Urgench State University located in the Khorezm region, in addition to the staff of the Academy of Sciences of Uzbekistan (Tashkent) and various centres based in Samarkand: Samarkand State University, Samarkand International University of Tourism and Cultural Heritage 'Silk Road' and the Registan Ensemble museum centre.

We would like to express our sincere gratitude to all those who, despite their many other responsibilities, have contributed to this volume.

Aziz Mullaev (Academy of Sciences of Uzbekistan, Tashkent, Uzbekistan)

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Editors

The SilkRoad3D project as a scientific and practical testing ground in the protection of cultural heritage

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Abstract

The Lab3D laboratory of the Department of Computer Science at LUT has been carrying out work related to the digitisation of cultural heritage for 10 years: scanning, printing, visualisation in Virtual Reality and Augmented Reality technologies. Some of this work was carried out during the Scientific Expeditions of Lublin University of Technology to Central Asia.

The “3D Digital Silk Road” project financed by the Polish agency NAWA provided the opportunity to continue work in Uzbekistan in cooperation with four Uzbek universities. The chapter presents the background of acquiring the project, its tasks and the results obtained. The significant impact of the project on improving practical skills in the area of 3D scanning of cultural heritage objects and their modelling is indicated. Examples of monument protection problems solved during the implementation of the project for museums in Samarkand, Uzbekistan are also presented. Additionally, the chapter presents the results of the dissemination and promotion of the digitisation of the Silk Road cultural heritage, as well as the scientific cooperation of Lab3D with Uzbek universities.

Keywords: Silk Road, digitalisation 3D, cultural heritage, monument protection, 3D models, 3D panoramas

1. Introduction

The Laboratory of Programming Intelligent Systems and Computer 3D Technologies (Lab3D) of the Department of Computer Science has been carrying out work related to the digitisation of cultural heritage for over 10 years: scanning, printing, visualisation of various objects in Virtual Reality (VR) and

Augmented Reality (AR) technologies. The organisational structure of Lab3D includes three laboratories: Laboratory of scanning and 3D printing, Laboratory of virtual and augmented reality, Laboratory of intelligent systems. The main equipment of the laboratories are 3D scanners (Faro Focus X330, Artec Eva, Artec Spider, Rangevision Neo,...), 3D printers, an interactive 3D monitor Quazar 3D, helmets, VR glasses. Research work in the field of digitisation of cultural heritage is carried out under the supervision of prof. dr hab. inż. Jerzy Montusiewicz and concern 3D scanning of museum objects and the processing of received data, 3D prints of objects and exhibits, computer visualisations of 3D objects in VR and AR technologies.

The most important objects scanned in the period until 2019 included (Fig. 1):

- Interiors and exhibits of the Zamoyski Museum in Kozłówka (a)
- The former Parish Church square, courtyard of Lublin Castle in the Old Town of Lublin, manor house on the campus of the Lublin University of Technology (b), interior of the Academic Church of the John Paul II Catholic University of Lublin
- Museum exhibits, including robes of the Emir of Bukhara (c) Museum of the History of Uzbekistan, Afrasiab Museum and SamSU Museum in Samarkand (Uzbekistan) – 2015
- Archeological Museum of Khoja Akhmet Yassawi, International Kazakh-Turkish University (d), State Historical and Cultural Museum-Reserve “Azret Sultan” Turkestan, Kazakhstan (2018)



Figure 1. Selected objects scanned by Lab3D employees of the Department of Computer Science in 2015–2019

(source: <https://cs.pollub.pl>)

In the years 2019–2022, the Department of Computer Science of LUT carried out the “3D Digital Silk Road” project, which, in the interdisciplinary environment of historians and computer scientists, allowed to gain further experience in the protection of the cultural heritage of Silk Road monuments in modern Uzbekistan.

The aim of the article is to present the scientific and practical results of the 3D Digital Silk Road project and its role in protecting the cultural heritage

of the Silk Road. The study also shows an important aspect of international cooperation between computer scientists and historians.

2. Materials and methods

2.1. The 3D Digital Silk Road project as an interdisciplinary international undertaking of historians and computer scientists

The “3D Digital Silk Road” (Silkroad3D) project was financed in 2019 by the National Agency for Academic Exchange (NAWA) as part of the International Academic Partnerships programme, project number: PPI/APM/2019/0004. The project took place from October 1, 2019 to September 30, 2022. The allocated budget was PLN 1,043,900.

The applicant of the project was Lublin University of Technology (LUT), project manager Elżbieta Miłośz, and the partners were four universities from Uzbekistan: National University of Uzbekistan (NUU), coordinator Dilbar Mukhamedova, Samarkand State University (SamSU), coordinator Rahim Kayumov, Chirchik State University (ChSU), coordinator Bakhodir Eschanov, and Urgench State University (UrSU), coordinator Utkir Abdullaev.

The main goal of the project was to carry out scientific and research work in the field of digitisation of monuments of the Silk Road in Uzbekistan during scientific expeditions by Polish specialists in cooperation with partners from Uzbekistan and to disseminate research results through international scientific conferences, practical training, monographs and the website silkroad3d.com.

The project covered the period of the COVID-19 pandemic in 2020 and required the modernisation of project tasks and schedule to the force majeure or higher factors than obtaining in the world. Despite the difficult conditions, adaptation measures were taken and the project was completed successfully.

2.2. The 3D Digital Silk Road project as an interdisciplinary international undertaking of historians and computer scientists

The project was implemented by an international Polish-Uzbek team taking action in two areas: historical (selection and access to objects and exhibits of the Silk Road) and IT (3D scanning, data processing, modeling, visualisation).

Data acquisition by Polish IT specialists took place in historical buildings and museums in Uzbekistan. The selection of objects was suggested by specialists from Uzbekistan: historians, employees of Uzbek universities and museologists, employees of Uzbek museums. Consultations with historians took place as part of conferences and seminars traditionally conducted in Poland, Uzbekistan or online during the COVID-19 pandemic. Scanning experiments during the pandemic were carried out online: physical scanning of objects in Uzbekistan under the supervision and consultations of IT specialists from Poland. Historians and museologists ensured not only the selection of objects for scanning, but also access, security and supervision. On the other hand, Polish IT specialists shared their knowledge and experience in the field of 3D scanning, 3D modelling, and the use of specialised equipment and software. Theoretical and practical training of teams – employees of Uzbek universities – was carried out as part of planned training sessions in Poland and during scientific and research expeditions in Uzbekistan. Polish IT specialists undertook practical tasks in the area of saving monuments in the Registan Complex in Samarkand at the request of museum directors. The dissemination of the project results to the international community was carried out jointly by the Polish–Uzbek team on the four-language project website silkroad3d.com and in the Polish and Uzbek media: press, radio and television.

The following research methods were used during the project implementation:

- document analysis and research method, historical inquiry method (selection of historical objects);
- experimental method (process of scanning historical macro- and micro-objects);
- observation method (selection of scanner operating parameters in various climatic conditions);
- computer modelling method (3D modelling of objects based on point clouds);
- individual case method (investigating the degree of tilt of a mosque dome, estimating the number of tiles of a given colour during the renovation of monuments).

In the scientific articles resulting from the project, the authors used various research methods specific to the topics discussed.

The project also used the remote learning method (online conferences, online scanning experiments) and remote group work (changes in the project due to the pandemic, running an online portal in four languages).

3. Description of the project tasks

The project schedule included 9 specific tasks to be performed over the planned two-year period of the project, from October 1, 2019 to September 30, 2021. The first year of the project implementation coincided with the global COVID-19 pandemic, during which the main project tasks related to trips to Uzbekistan had to be suspended. Actions were taken to adapt the project to the existing objective conditions: the project was extended by one year until September 30, 2022, the schedule was rebuilt, introducing new tasks that could be performed remotely – a total of 12 tasks were planned (Table 1).

Table 1. Planned tasks in the SilkRoad3D project

Task number	Task name	Comments on changes to the project
1.	Organisation of a meeting initiating the project	Kick-off-meeting
2.	Organisation of scientific and practical expeditions to digitise architectural objects and museum exhibits of the Silk Road	A virtual expedition carried out during the pandemic has been added
3.	Processing digital data obtained during expeditions and developing 3D models and 3D panoramas of scanned objects	–
4.	Organisation of the first international scientific conference in Poland	–
5.	Organisation of two multimedia exhibitions presenting the course of scientific and practical expeditions	–
6.	Preparation and implementation of specialised training for Partners	A third training was added
7.	Preparation and development of a scientific monograph	–
8.	Dissemination of the project results on the website	–
9.	Organisation of the second international conference in Uzbekistan	–
10.	Web training for partners “3D scanning of small artefacts using low-cost scanners”	A new task carried out during the pandemic
11.	Web conference “The Silk Road – the Cultural Heritage of Asia and Europe” with the release of conference materials	A new task carried out during the pandemic
12.	Dissemination of project results in the international environment	A new task

As part of task number 2, 5 expeditions were planned: the first a virtual one, possible to be carried out remotely during the COVID-19 pandemic, and

four trips to the vicinity of five cities of the Silk Road in modern Uzbekistan (Samarkand, Tashkent, Urgench and Khiva, Chirchik, Bukhara), during which architectural buildings and museum monuments were scanned.

In order to provide partners with experience in the use of IT technologies in the protection of cultural heritage, training in the field of scanning small museum objects and large architectural objects using appropriate technologies and specialised equipment was planned as part of task number 6.

To make the virtual expedition possible, a new remote training was planned for partners from Uzbekistan in the basic skill of using a low-cost 3D scanner. A 3D scanner was sent to SamSU in Uzbekistan and experimental remote scanning of small museum exhibits was carried out. During the pandemic, a remote historical conference devoted to the presentation of Silk Road objects and the culture associated with it was also planned.

The developed models and 3D panoramas of the scanned Silk Road objects, as well as all design activities, are planned to be posted on the silkroad3d.com website in four languages: Polish, English, Russian and Uzbek. The project results are planned to be popularised at multimedia exhibitions, international conferences and in scientific publications.

The international project executive team had clearly defined tasks and related responsibilities.

Tasks and responsibilities of contractors from Lublin University of Technology:

- organisation of five scientific and research expeditions, securing appropriate equipment for 3D scanning, data processing, preparation of 3D models and panoramas;
- organisation of the first scientific conference in Poland, preparation of materials and publication of post-conference materials;
- conducting two practical training sessions on the use of 3D technology in museums;
- preparation of scientific publications and presentations at conferences;
- publishing a scientific monograph;
- administration of the online portal;
- project management – reports for NAWA.

Tasks and responsibilities of partners – four universities from Uzbekistan:

- proposal of historical Silk Road facilities, securing access to facilities and logistics;
- organisation of the second scientific conference summarising the project in Uzbekistan;

- participating in 3D scanning training;
- preparation of scientific publications and presentations at conferences;
- translation of the website into Russian and Uzbek.

4. Project results

4.1. Measurable results of the project

The main result of the project was the wide popularisation of the cultural heritage of Silk Road sites at the international level: through an internet portal in four languages, international conferences and multimedia exhibitions. Other practical results of the project for the academic community of Polish and Uzbek universities include: gaining experience in the field of 3D scanning and digital data processing of interesting monuments of the Silk Road in Uzbekistan, exchange of experience between partners in the field of computerisation of museums in Uzbekistan and Poland, and establishing scientific cooperation between LUT and universities in Uzbekistan [1].

For the funds saved, the fifth research expedition and the third training for Partners [2, 3] were added. The activities undertaken in the project, implemented in international cooperation of research workers from 5 universities and museologists, are aimed at the protection of the cultural heritage of the Silk Road [4]. All project related events are documented on the 4-language website silkroad3d.com in English, Russian, Uzbek and Polish [5]. The effects of scientific research and popularisation of the project were presented in monographs [6–10], scientific publications [3, 11–16], conference materials and local media (newspapers, television) and in the Internet.

As part of the project, several additional scientific and practical tasks were carried out to solve the problems of the museum management of the Registan Team in Samarkand [17, 18]. The soft results of the project include the strengthening of social, cultural and scientific ties between the project participants from Poland and Uzbekistan, which is in line with the objectives of the NAWA International Partnership Programme.

The project implemented all planned activities with significantly exceeded planned results:

1. As part of task number 1, a kick-off meeting was organised at Lublin University of Technology (February 3–5, 2020), during which the project tasks and principles of cooperation with four coordinators from four Uzbek universities – project partners were discussed (Fig. 2).



Figure 2. Kick-off meeting (photo at the top, from left: prof. M. Miłosz, prof. D. Mukhamedova, prof. H. Stryczewska, Mr R. Kayumov, prof. B. Eshchanov, prof. U. Abdullaev, photo at the bottom, from left: prof. B. Eshchanov, dr. E. Miłosz, Mr R. Kayumov, prof. D. Mukhamedova, prof. U. Abdullaev, dr. E. Miłosz)

(source: <https://cs.pollub.pl/spotkanie-inaugurujace-projekt-politechniki-lubelskiej-3d-digital-silk-road>)

2. As part of task No. 2, five scientific and research expeditions were carried out:
 - a) The 1st virtual one (May 2021, period of the COVID-19 pandemic), ceramic objects by the artist Baturov and Uzbek headgear were scanned by employees of Samarkand State University under the remote guidance of specialists from Lublin University of Technology using internet technologies (Fig. 3).

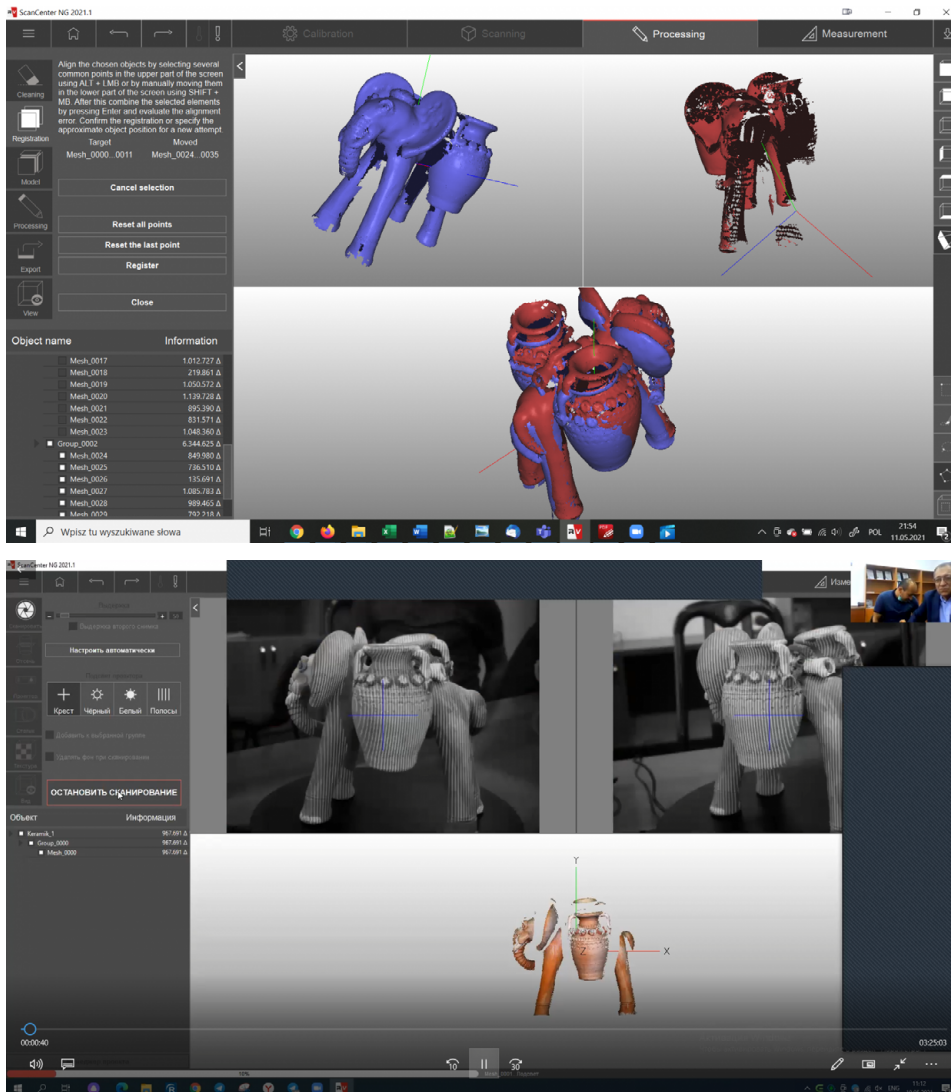


Figure 3. First virtual expedition
(source: https://silkroad3d.com/?page_id=2012)

- b) The 2nd one to Tashkent, Chirchik and Samarkand (16–28/08/2021)
– nearly 60 museum artefacts and three large architectural objects were scanned, two scientific seminars were conducted at 2 partner universities, 130 GB of data was acquired (Fig. 4).



Figure 4. Second scientific and research expedition
(source: https://silkroad3d.com/?page_id=2094)

- c) The 3rd one to Urgench and Khiva (10–23/10/2021) – several dozen small museum objects in Urgench and Khiva and several large objects in the inner city of Khiva – Itchan Kala were scanned, a scientific seminar was conducted at Urgench State University (Fig. 5).



Figure 5. Third scientific and research expedition
(source: https://silkroad3d.com/?page_id=2242)

- d) The 4th one to Samarkand (5–18/05/2022) – 6 large architectural complexes of Samarkand and Shahrissabz and over 20 small museum objects were scanned (Fig. 6).



Figure 6. Fourth scientific and research expedition
(source: https://silkroad3d.com/?page_id=3011)

- e) The 5th one to Bukhara (5–12/06/2022) – five large architectural objects and several dozen small artefacts from the Bukhara Fortress museum were scanned (Fig.7).



Figure 7. Fifth scientific and research expedition
(source: https://silkroad3d.com/?page_id=3103)

3. As part of task number 3:
- a) Data processing from the 1st virtual expedition was carried out, resulting in the creation of two mini exhibitions of 3D models: 12 works by the ceramic artist H. Baturov and 12 Uzbek headgear. https://silkroad3d.com/?page_id=2638

- b) Data processing from the second expedition was carried out, obtaining a total of: 24 3D models of museum objects, 5 3D panoramas of large objects and 5 VR panoramas for 3D glasses:
https://silkroad3d.com/?page_id=2707
https://silkroad3d.com/?page_id=2717
https://silkroad3d.com/?page_id=2730
https://silkroad3d.com/?page_id=2732
https://silkroad3d.com/?page_id=2734
- c) Data processing from the 3rd expedition was carried out, obtaining a total of: 20 3D models of museum objects, 8 3D panoramas of large objects and 7 VR panoramas for 3D glasses:
https://silkroad3d.com/?page_id=2894
https://silkroad3d.com/?page_id=2915
https://silkroad3d.com/?page_id=3166
https://silkroad3d.com/?page_id=3173
https://silkroad3d.com/?page_id=3176
https://silkroad3d.com/?page_id=3179
https://silkroad3d.com/?page_id=3182
- d) Data processing from the 4th expedition was carried out, obtaining a total of: 26 3D models of museum objects, 15 3D panoramas of large objects and 11 VR panoramas for 3D glasses:
https://silkroad3d.com/?page_id=3389
https://silkroad3d.com/?page_id=3235
https://silkroad3d.com/?page_id=3233
https://silkroad3d.com/?page_id=3231
https://silkroad3d.com/?page_id=3229
https://silkroad3d.com/?page_id=3225
- e) Data processing from the 5th expedition was carried out, obtaining a total of: 22 3D models of museum objects, 12 3D panoramas of large objects and 10 VR panoramas for 3D glasses:
https://silkroad3d.com/?page_id=3378
https://silkroad3d.com/?page_id=3262
https://silkroad3d.com/?page_id=3260
https://silkroad3d.com/?page_id=3258
https://silkroad3d.com/?page_id=3256
https://silkroad3d.com/?page_id=3254

4. As part of task No. 4, the first international conference was organized at Lublin University of Technology (13–15/12/2021) “IT in Cultural Heritage of the Silk Road” (IT-CHSR’2021) (Fig. 8), which was attended by over 50 people, employees of Lublin University of Technology, partner universities and museum employees from Uzbekistan, 37 papers were delivered and two post-conference monographs were prepared:
- “Cultural Heritage of Uzbekistan: From Petroglyphs to the Present Days” (27/05/2022).
<https://hdl.handle.net/20.500.14629/602>
 - “Computer technologies in sharing the cultural heritage and education of the Silk Road from Uzbekistan” (11/07/2022).
<https://hdl.handle.net/20.500.14629/609>



Figure 8. International conference “IT in Cultural Heritage of the Silk Road”
(source: https://silkroad3d.com/?page_id=2420, <https://hdl.handle.net/20.500.14629/602>,
<https://hdl.handle.net/20.500.14629/609>)

5. As part of task number 5, two multimedia exhibitions were organised in the hall of the Lublin University of Technology Library:
- a) The first multimedia exhibition: “Uzbekiscanning: LUT’s Scientific Expeditions 2021”, presenting the course of two scientific expeditions from 2021 in Uzbekistan (December 2–31, 2021). 50 large-format photos, posters, a multimedia presentation were prepared and an album about the exhibition was published (Fig. 9).
 - b) The second multimedia exhibition: “Uzbekiscanning: LUT’s Scientific Expeditions 2022”, presenting the course of the last two scientific expeditions in Uzbekistan (25/08/2022 – 8/09/2022). 53 large-format photos, posters, a multimedia presentation were prepared, and an album about the exhibition was published. Small format photos were also prepared for exhibition in Uzbekistan as part of the second international conference (Fig. 10).



Figure 9. Multimedia exhibition “Uzbekiscanning: LUT’s Scientific Expeditions 2021”
(source: https://silkroad3d.com/?page_id=2449)

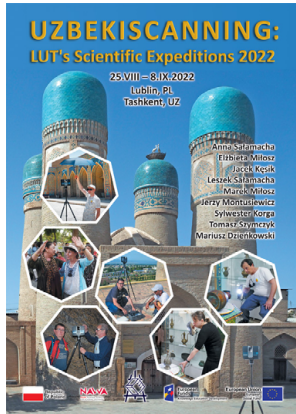


Figure 10. Multimedia exhibition “Uzbekiscanning: LUT’s Scientific Expeditions 2022”
(source: https://silkroad3d.com/?page_id=3397)

6. As part of task number 6, three training courses were organised at Lublin University of Technology for Partners from Uzbekistan:
 - a) Training No. 1: “3D scanning of small objects”, attended by 12 partners from four Uzbek universities (November 15–19, 2021) (Fig. 11).



Figure 11. Training “3D scanning of small objects”
(source: https://silkroad3d.com/?page_id=2391)

- b) Training No. 2: “3D scanning of large objects”, attended by 12 partners from four Uzbek universities (23–27/05/2022 (Fig. 12).

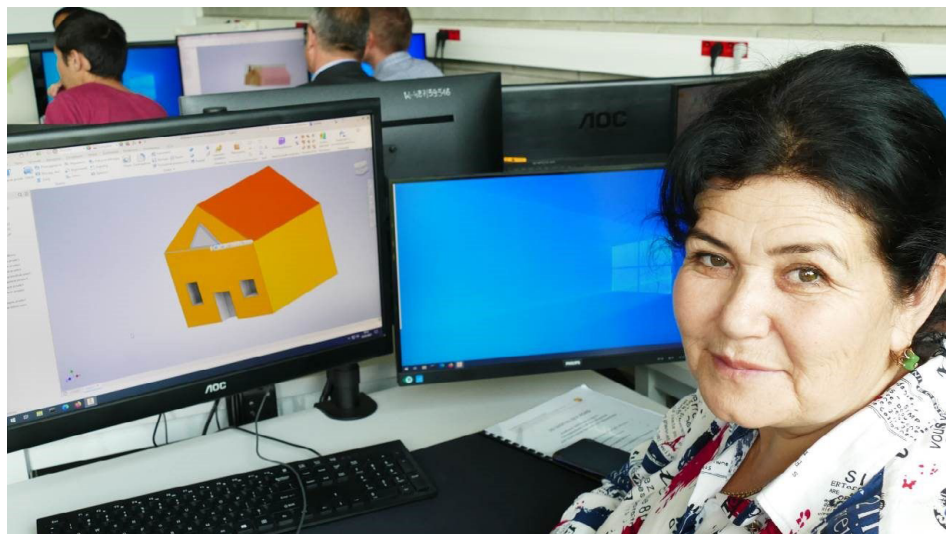


Figure 12. Training “3D scanning of large objects”
(source: https://silkroad3d.com/?page_id=3058)

- c) Training No. 3 for Partners from Uzbekistan “Methods of ensuring the durability of the results of the 3D Digital Silk Road project after its completion”, in which four coordinators from four Uzbek universities participated (September 19–24, 2022) (Fig. 13).



Figure 13. Training “Methods of ensuring the durability of the results of the 3D Digital Silk Road project after its completion”
(source: https://silkroad3d.com/?page_id=3679)

7. As part of task No. 7, a scientific monograph was prepared and published: “3D Information Technology in the Protection and Popularization of the Cultural Heritage of the Silk Road” (Fig. 14).

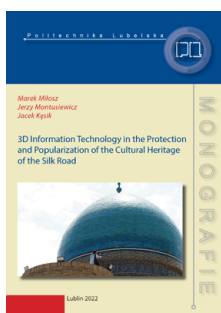


Figure 14. Monograph “3D Information Technology in the Protection and Popularisation of the Cultural Heritage of the Silk Road”
(source: <https://hdl.handle.net/20.500.14629/614>)

Information about all five monographs published as part of the project is available on the website at: https://silkroad3d.com/?page_id=3665.

8. As part of task No. 8, all work related to the implementation of the project was documented on the silkroad3d.com website in four languages: English, Polish, Russian and Uzbek, and appropriate translations of the content into Russian and Uzbek were made (Fig. 15). The portal includes 3D models, panoramas and VR panoramas for 3D glasses from five expeditions. A new interface for placing 3D models and panoramas on the portal was developed using new information technologies – the interface was used to present the results of the last 5th expedition to Bukhara. The news on the portal also includes links to Uzbek articles and websites describing the above-mentioned activities under the silkroad3d.com project.

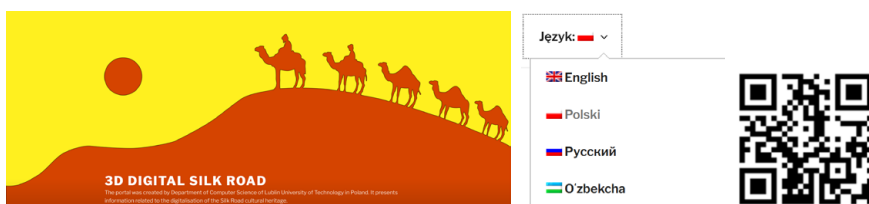


Figure 15. 3D Digital Silk Road portal

(source: <https://silkroad3d.com>)

9. As part of task No. 9, the second international conference in Uzbekistan “3D Digital Silk Road Project” (3DSR’2022) was prepared and held, summarising the project results (Fig. 16). The conference was held in 3 cities of Uzbekistan: in Tashkent (at the National University of Uzbekistan), in Chirchik (at Chirchik State Pedagogical University) and in Samarkand (at Samarkand State University and the Registan Ensemble). As part of the conference, which was attended by over 50 participants, 31 papers were prepared and presented. The conference program and theses of all speeches have been published on the website https://silkroad3d.com/?page_id=3410. During the conference, a multimedia exhibition “Uzbekiscanning: LUT’s Scientific Expeditions 2022” was presented (small format photos), presenting the course of scientific and practical expeditions carried out in 2022 as part of the NAWA “3D Digital Silk Road” project.



Figure 16. International conference “3D Digital Silk Road Project”
(source: https://silkroad3d.com/?page_id=3410)

10. As part of task No. 10, a web training “3D scanning of small artefacts using low-cost scanners” (Fig. 17) was conducted in April 2021 during the COVID-19 pandemic, organised remotely by Lublin University of Technology for employees of partner universities from Uzbekistan, preparing employees of Samarkand State University to independently scan small items.

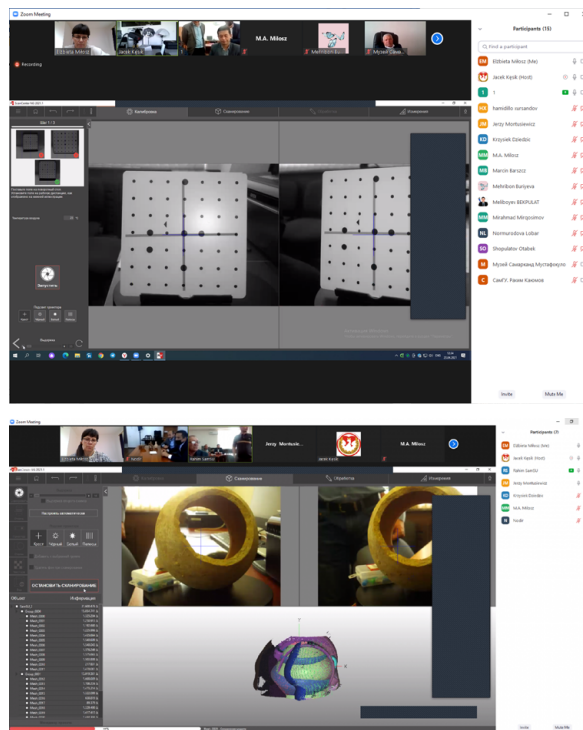


Figure 17. Web training for partners “3D scanning of small artefacts using low-cost scanners”
(source: https://silkroad3d.com/?page_id=1998)

11. As part of task No. 11, a web conference “The Silk Road – the Cultural Heritage of Asia and Europe” was organised during the COVID-19 pandemic (8–9/01/2021), in which over 40 employees of universities and museums from Uzbekistan and Poland took part (Fig. 18).

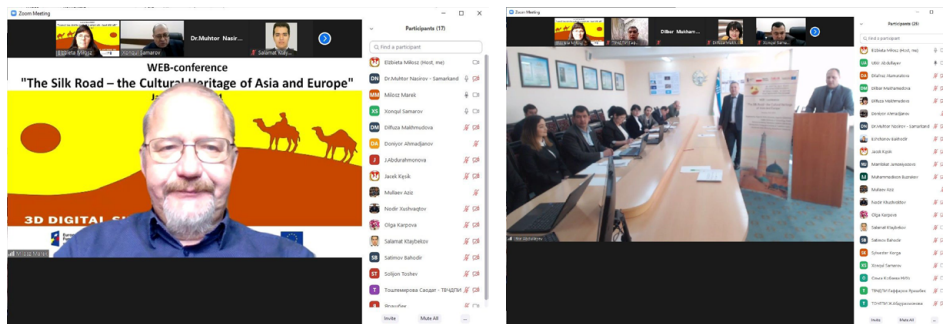


Figure 18. Web conference “The Silk Road - the Cultural Heritage of Asia and Europe”
(source: https://silkroad3d.com/?page_id=1747)

Two post-conference monographs were published (Fig. 19):

- a) “Tangible Cultural Heritage of the Silk Road from the Area of Modern Uzbekistan”: <https://hdl.handle.net/20.500.14629/560>
- b) “Intangible Cultural Heritage of the Silk Road from the Area of Modern Uzbekistan” <https://hdl.handle.net/20.500.14629/561>



Figure 19. Conference results

(source: <https://hdl.handle.net/20.500.14629/560>, <https://hdl.handle.net/20.500.14629/561>)

12. As part of task No. 12:

- a) Five scientific articles have been published in indexed journals:
 - o Comparative Analysis of Digital Models of Objects of Cultural Heritage Obtained by the “3D SLS” and “SfM” Methods

- (M. Barszcz, J. Montusiewicz, M. Pańnikowska-Łukaszuk and A. Sałamacha) [11]
- Methodology of 3D Scanning of Intangible Cultural Heritage – The Example of Lazgi Dance (M. Skublewska-Paszkowska, P. Powroźnik, J. Smółka, M. Miłosz, E. Łukasik, D. Mukhamedova and E. Miłosz) [12]
 - Structured-light 3D scanning of exhibited historical clothing—a first-ever methodical trial and its results (J. Montusiewicz, M. Miłosz, J. Kęsik and K. Żyła) [13]
 - Preliminary Application of the Algorithm Highlighting Petroglyph Patterns (P. Wójcicki, S. Korga, M. Miłosz) [14]
 - Virtual scientific expedition for 3D scanning of museum artifacts in the COVID-19 period – The methodology and case study (M. Miłosz, J. Montusiewicz, J. Kęsik, K. Żyła, E. Miłosz, R. Kayumov, N. Anvarov) [3]
- b) Four papers and presentations were prepared for the INTED 2021 virtual conference (8–9/03/2021) https://silkroad3d.com/?page_id=1886:
- 3D Modelling of Silk Road Artefacts as a Topic for Remote Professional Student Vocational Internships During the COVID-19 Pandemic (M. Barszcz, J. Montusiewicz, T. Nowicki, R. Kayumow)
 - Distance Teaching Of 3d Model Post-Processing on the Example of Artefacts from the Silk Road Area (K. Dziedzic, S. Korga, S. Skulimowski)
 - Extending Computer Graphics Curriculum by Cultural Heritage-Related Aspects – Silk Road Artifacts Case Study (J. Kęsik, K. Żyła)
 - Forced Virtualisation of International Projects – Methods, Tools, Problems (E. Miłosz, M. Charytanowicz)
- c) Two papers were presented at the ICL2022 conference held in Vienna, Austria (September 29–30, 2022):
- Creating Mobile VR Visualisations of 3D Objects from Area of the Silk Road (J. Montusiewicz, S. Skulimowski, M. Barszcz, R. Kayumov)
 - Practical Aspects of Using 3D technology to Disseminate Cultural Heritage Among Visually Impaired People (J. Montusiewicz, M. Barszcz, S. Korga)
- d) Three papers were presented at the international conference “Modern problems of applied mathematics and information technology”, which took place at the Bukhara State University in Bukhara,

Uzbekistan (June 7, 2022). [http://conf.buxdu.uz/uploads/2022/Dastur_\(Xalqaro%20konferensiya%20-2022%20-%20BuxDU\).pdf](http://conf.buxdu.uz/uploads/2022/Dastur_(Xalqaro%20konferensiya%20-2022%20-%20BuxDU).pdf):

- Modern problems of 3D scanning of cultural heritage objects – “3D Digital Silk Road” project (E. Miłosz, J. Montusiewicz, M. Miłosz, R. Kayumov)
- Digital documentation of monuments – modern information technologies and methodologies (T. Szymczyk, J. Kęsik, J. Montusiewicz, K. Samarov, U. Abdullayev)
- Virtual museum for education and popularization of cultural heritage (S. Skulimowski, M. Miłosz, D. Mukhamedova, S. Mustafokulov)

The measurable indicators of project evaluation are its hard results. The project results (planned and achieved) are presented in Table 2.

Table 2. Planned and implemented results of the project

No.	Result name	Plan	Realization	Date of achievement	Comments, % of exceedance
1.	Data from digitisation of objects obtained during expeditions	320 GB	496 GB	12.06.2022	155%
2.	Digital form of objects: – 3D models – 3D panoramas – VR images for 3D glasses	80 20 12	116 38 32	31.07.2022	145% 190% 267%
3.	Scientific papers presented at 2 conferences	40	94	9.09.2022	235%
4.	Scientific monograph in English	1	5	30.09.2022	500%
5.	Multimedia exhibitions: – Printed photos – Multimedia presentations	90 2	90+45 2	30.09.2022	109% 100%
6.	Internet portal: – Disk space used – Number of users – Multilingual interface	2GB 500 3 languages	20,65 GB 5339 4 languages	30.09.2022	1033% 1068% 133%
5.	Increase in knowledge and skills of training participants in the field of 3D scanning	50%	60%	31.05.2022	120%
8.	Publication of articles in indexed journals	4	5	30.09.2022	125%
9.	Participation in international conferences with publication of articles	6	8	30.09.2022	150%

4.2. Scientific cooperation of Polish and Uzbek specialists in the field of monument protection

The success of the project was largely determined by the very good cooperation of Polish and Uzbek specialists. Without the support of Uzbek colleagues, it would not be possible to obtain data for scanning. The idea of the project was to share the knowledge and experience of LUT employees with Uzbek colleagues. Scientific and research work was undertaken jointly aimed at protecting the monuments of the Silk Road.

The main activities carried out in cooperation between Polish and Uzbek specialists during the project implementation include:

- joint implementation of the object scanning process during expeditions to Uzbekistan
- joint editing/review of a scientific monograph and joint editing/review of four post-conference monographs (for each of two editors and reviewers: one from Poland, one from Uzbekistan)
- joint development of scientific articles and their publication
- joint maintenance of the portal content in four language versions (translation of the content by partners into Russian and Uzbek and content updating by the administrator from Lublin University of Technology)

As part of the project, several additional scientific and practical tasks were carried out to solve the problems of the museum management of the Registan Team in Samarkand [17, 18]. Studies of the deviation from the vertical of the Golden Mosque were carried out in the Registan Architectural Complex, and precise measurements and calculations were made for the renovation of the mosaic of the Sher Dor Madrasa in Samarkand at the request of the director of Registan. Three scientific seminars were held at partner universities in Uzbekistan: NUU, CSPI, UrSU. The soft results of the project include the strengthening of social, cultural and scientific ties between the project participants from Poland and Uzbekistan, which is in line with the objectives of the NAWA International Partnership Programme.

The effects of joint activities were published on the silkroad3d.com website, on the websites of Poland and the Partners' universities, in the Polish and Uzbek press and in publications.

5. Summary

The 3D Digital Silk Road project is an example of many years of international scientific cooperation between Lublin University of Technology and universities from Uzbekistan. Its implementation not only deepened this cooperation, but also brought tangible benefits to universities (signed and active cooperation agreements between universities from Uzbekistan and Poland, trained staff in the field of scanning, plans to organise 3D scanning laboratories in Uzbek universities). The built Internet portal allows the international community to interactively and three-dimensionally admire the Silk Road objects in the virtual world in the attractive form of panoramas and 3D models.

The planned results of the project were mostly implemented, and the quantitative indicators were significantly exceeded, which was possible thanks to the great involvement of university employees: LUT, NUU, SamSU, UrSU, CSPI and museum employees from Uzbekistan. LUT employees built a 3D scanning school, 15 LUT employees participated in expeditions to Uzbekistan. 17 employees of Uzbekistan partner universities acquired knowledge and skills in 3D scanning. Cooperation in the project resulted in the signing of 3 cooperation agreements between PL and universities from Uzbekistan. A large publication output (14 articles in journals, 7 articles in conference materials and 5 monographs) created during the implementation of the project's tasks disseminated its results in the international environment.

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The Great Silk Road – the longest trade route in the world

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Abstract

This article presents the Great Silk Road, which played a significant role in the development of human civilisation and has unique cultural value. Thanks to the presence of an intercontinental route, one of the fastest in world history, interpenetration of cultures of different peoples and an expansion of the space of international communication took place. There was an exchange of knowledge, technology, artistic techniques, philosophy and beliefs. The influence that the Great Silk Road had on the convergence of various civilisational streams is still felt today.

Keywords: Central Asia, Great Silk Road, Uzbekistan, UNESCO

1. Introduction

The Great Silk Road¹ has played an important role in the development of regional and international relations in Central Asia. At the end of the 20th and in early 21st century, the revival of the Silk Road in modern international relations and, based on this, the co-ordination of economic, political, cultural as

¹ A term coined by the 19th century German geographer Ferdinand von Richthofen.

well as transport and communication relations between countries and continents have been developed within the framework of the Silk Road Concept.

International communication between East and West initially developed based on political interests and trade. However, carrying with them the elements of everyday life, traditions and culture of their countries, merchants, perhaps without knowing it themselves, became ambassadors of goodwill and missionaries of spirituality in various states of the world. Together with them, the ancient travellers, thirsty for new knowledge and sensations, along with pilgrims and adherents of various religions, advanced.

The Great Silk Road can be called a vivid symbol of the ties between East and West, going back centuries. The emergence of this transcontinental road was a logical continuation of trade, as well as cultural and spiritual contacts that existed millennia earlier.

The Great Silk Road was an extensive international trade route that united a whole system of trade communications, which was actively functioning from the second half of the 2nd century BC to the end of the 15th century AD. It had a huge impact on the formation of the political, economic and cultural structure of many countries through which he passed.

The term Silk Road is tied to images of traders from long ago selling their goods on the backs of camels through enchanted cities separated by inhospitable deserts. While the romanticism of the Silk Road has been replaced by the hard realities that many of its current inhabitants face, the Silk Road is gradually being reconstructed to offer a number of potential business opportunities. The Silk Roads was an interconnected web of routes linking the ancient societies of Asia, the Subcontinent, Central Asia, Western Asia and the Near East, stretching for about 7,500 km east to west, but covering over 35,000 km along all the many branch routes (Fig. 1). The political, social and cultural impacts of these movements had far-reaching consequences for all the societies touched by them. The Silk Roads encompass some of the most complex and fascinating systems in the history of world civilisations [1]. A shifting network of roads and pathways for trade that evolved over centuries, it enabled the exchange of cargo such as silk, spices, gems or furs, but also shared art, religion and technology. It is also one of the first cultural corridors 'to be inscribed on the World Heritage List, embodying the principles of cultural diversity, heritage and peaceful cooperation that are fostered by both UNESCO and the World Heritage Convention [2].

The emergence of the Great Silk Road dates back to the 2nd century BC. Moreover, the term "The Great Silk Road" itself was introduced into historical science by scientists of the 19th century, after the German traveller and

historian F. Richthofen wrote his work *China* in 1877, in which he first identified this trade route along the eastern countries and called the “Silk Road”.

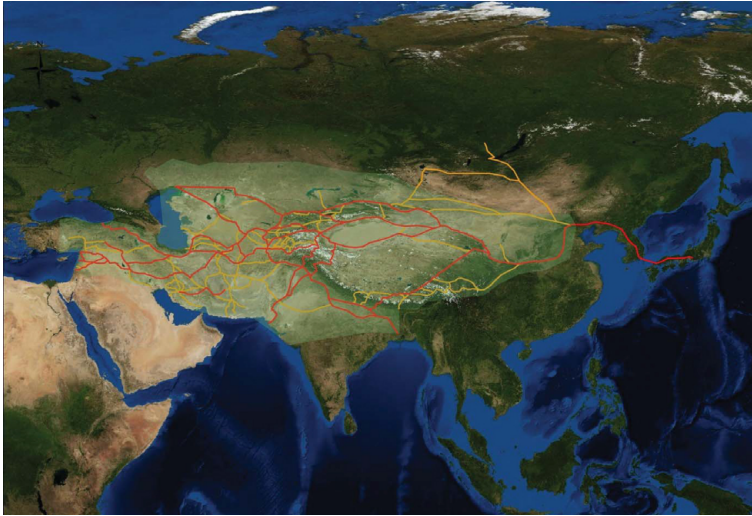


Figure 1. The vast geographical extent of the terrestrial Silk Roads, showing major routes (in red) and other significant routes (orange)

(source: https://openarchive.icomos.org/id/eprint/1487/1/ICOMOS_WHThematicStudy_SilkRoads_final_lv_201406.pdf)

It should be noted that long before the formation of the Great Silk Road on the territory of Central Asia and the Ancient East there were paths that served the purposes of war and peace. Large armies and small detachments advanced along them, bloody battles flared up, the cities located along them were attacked; in peacetime, these paths served as the connecting threads of political, commercial and cultural life. It is this function of theirs that the peoples have always appreciated [3].

One of the most ancient paths – “lapis lazuli” – formed as early as 3rd–2nd millennia BC. It began in the Pamir Mountains, passed through Iran to Western Asia and Egypt. The semi-precious stone lapis lazuli (‘blue stone’), mined in the area of the upper Amu Darya in the Pamirs (in Badakhshan), and was highly valued by jewelers of ancient Eastern states such as Sumer (Dvurechye) and Egypt. During the excavation of numerous tombs, items from the Badakhshan lapis lazuli were found.

Another route – the famous “royal road” of the Achaemenids – connected in the 6th–4th centuries BC the Asia Minor cities of Ephesus and Sardis on the shores of the Mid-Earth Sea with one of the capitals of Iran and the city

of Susa. Another route led from Iran through Bactria, Sogdiana, the Tashkent oasis and the territory of Kazakhstan to the Altai [4].

In the 4th century BC Alexander the Great defeated the army of the last Achaemenid king Darius and in the spring of 329 BC appeared on the border of Central Asia. Despite strong resistance, he established his dominance there. He founded a large number of Alexandria-named settlements, the farthest of which was on the banks of the Syr Darya, where the city of Khojent is now located. The enormous historical significance of the campaigns of Alexander the Great and the Seleucids lies mainly in the active penetration of Western culture into Central Asia. If the political subordination of the Greek conquerors of Margiana, Bactria and Sogd turned out to be short-lived, then the process of Hellenisation, that is, the fusion of Greek and Central Asian cultures, contributed to an intensive rise in spiritual and material culture. During this period, ties were maintained between Central Asia and the cultures of India and the eastern Mediterranean. Around the 3rd century BC, contacts with China began to be established, and during this period, the links between Central Asia and the cultures of India and the eastern Mediterranean developed. Around the 3rd century BC links began to be established with China.

2. The history of the formation of the Silk Road in Central Asia

Central Asia served as a unique link between the Mediterranean, Western Asia, India and China, which contributed to an intensive exchange of information and advanced achievements – both technical and economic, as well as cultural and spiritual [5].

The Central Asian region played an important role in the accumulation, transformation and transfer of various cultural achievements between East and West due to its location at the crossroads of major trade routes. Actually, in many ways, this is why it was a hotbed where the great civilisations of antiquity were born and died, and in their place new ones appeared, adopting the experience and knowledge of previous generations. The ancient culture of the peoples of the region constantly experienced external influences and, at the same time, influenced not only neighbouring, but also more distant countries. Already in the 3rd–2nd millennia BC the local sedentary agricultural population had a variety of contacts, including cultural ones, with the regions of Iran and India.

It is known that the Chinese emperor Wu Di in 138 BC sent his ambassador Zhang Qian in search of allies in the fight against the warlike nomadic

tribes of the Huns, who devastated the northern outskirts of China. While travelling, the ambassador was captured by the Huns and kept for ten whole years. He managed to escape and through the high passes of the Central Tien Shan to reach Issyk-Kul. Moving along the banks of the Naryn River, he entered the Fergana Valley. It came as a surprise to him that in the valley there were many cities united into one state. He tried to negotiate with the ruler of the Fergana Valley, but he only agreed to establish trade relations, and went further south. Returning from his journey, he was again captured by the Huns, but this time escaped two years later. Zhang Qian presented to the emperor a detailed report on his stay in Central Asia, indicated convenient ways for trade, which later became the basis of the Great Silk Road. The Emperor gave him the title of “Great Traveller” [6].

Information about the exchange between China and Central Asia is contained mainly in Chinese chronicles starting from the 1st century BC to the 7th–8th centuries AD.

Early testimonies tell of donations sent from the countries of the Central Asian region to the imperial palace. From here, gifts were also sent if China wanted to attract to its side any of the Central Asian rulers. Of the gifts from Central Asia, the famous horses of Davan, swift-footed horses, which the Chinese called heavenly or winged, were especially appreciated. Moreover, they were valued because in China there was a legend: in order to assert his divinity and achieve immortality, the emperor had to ascend to heaven with the help of a team of unearthly horses. Zhang Qian brought the heavenly horses to China. This enterprising traveller brought not only horses from Central Asia, but also food for them – alfalfa seeds. Soon, alfalfa crops spread throughout China [7].

Even the first civilisations and early state associations, which arose in the Eneolithic and Bronze Age, strove to expand the space they occupied. They include the Kritomikene, Egyptian, Mesopotamian, Luristan territories, the cultures of the Transcaucasus and the North Caucasus, Namazgin – in the south of Central Asia, the Harappan Indus valleys, and the Yin civilisation of China. Trading operations at that time were carried out in territories with a length of several thousand kilometers. This is evidence by numerous studies of scientists.

Since ancient times, the threads of commodity exchange have been stretching from East Asia to the regions of Central and Southeast Asia. Already in the middle of the 2nd millennium BC silk penetrates through East Turkestan into the territory of Central Asia, and at the end of this millennium appears in North India (Fig. 2). In addition, indirect trade links between East and West facilitated

the spread of glass products, the production centre of which was at that time in the Eastern Mediterranean.

Thus, already in the 3rd–2nd millennia BC systems of land roads and sea routes were formed, which connected the most distant cultures and civilisations in the vast region of the Middle East, stretching from the plains of Mesopotamia to the Indus Valley and from the deserts of Central Asia to the Arabian Sea. They later became one of the main routes of the Great Silk Road [8].

In the 3rd–4th centuries AD the Silk Road route system is undergoing significant changes. Therefore, during the sixteen dynasties in China the role of Xining was strengthened as an important trade and transit centre, lying at the intersection of the Tandukou and Tuyuyhun roads. The trade obviously carried on a large scale. For example, in 553 a local official captured a caravan returning along the Tuyuyhun road, in which, according to sources, 240 Western merchants on 600 camels and donkeys were carrying 10,000 pieces of various patterned and smooth silk fabrics. It should be noted that archaeologists have discovered a large number of Sassanian and Byzantine coins in Xining [9–14].



Figure 2. The study area (green) with major (red) and other significant (orange) routes (source: https://openarchive.icomos.org/id/eprint/1487/1/ICOMOS_WHThematicStudy_SilkRoads_final_lv_201406.pdf)

Gradually, trade relations between Central Asia and China were strengthening. Each year, the imperial court sent at least five missions westward, accompanied by several hundred guards. They brought silk and metal products

with them, which they exchanged for horses, jade, coral and other goods from Central Asia.

Chinese products were intended not only for Central Asia. A significant need for unique silk fabrics was in Persia and in the states to the west of it.

In addition, the so-called “diplomatic trade” was a feature of the trade on the Great Silk Road, when, under the guise of gifts or donations, during the exchange of diplomatic missions, virtual thinly-veiled trade was conducted. Therefore, during the reign of the Chinese emperor Cheng Di, an embassy arrived at his court with gifts from the state of Jibin (modern Kashmir). The emperor intended to send a reciprocal embassy, but his dignitary, Du Qin, informed the emperor in a letter “among those who brought gifts, there are no members of the royal family or nobility. These are all merchants or people of low birth. Their intention is to exchange goods and trade under the guise of sending gifts.”

In Europe, it was believed that silk grows on trees and that only the Chinese knew the secret of this culture. During the reign of Augustus, Rome paid for Chinese silk with woolen goods, spices and glass products.

The Chinese did not have the slightest intention to refute legends of this kind, by which they secured a monopoly and export of this expensive fabric. The Parthians, through whose territory trade was carried out, likewise did not see a reason to spread anything about the technical aspects of silk making, but they received significant profits from trade in it, like many subsequent dynasties through whose lands the silk routes passed.

The first meeting of the Romans with this fabric was not crowned with much glory. Marcus Licinius Crassus, a member of the 1st triumvirate, consul and Roman governor in Syria, dreamed of following in the footsteps of Alexander the Great and repeating his victories in the East. In 53 BC he led seven legions across the Euphrates into battle against the Parthians, but succumbed to the enemy’s horseback archery skills. However, it was not the news about the defeat that made a splash in Rome, but a completely random event, namely the discovery of silk. It was associated with the loss of the legions [15].

During the battle, the Parthians fled for visibility in order to then turn around at lightning speed in the saddle and shower the pursuing legionnaires with a rain of arrows – this was the famous Parthian shot. In addition, they unexpectedly unfurled huge banners that glowed and shimmered in the sun, frightening the soldiers so much that they surrendered. This was one of the most difficult defeats for Rome. Moreover, the banners embroidered in gold became the first silks that the Romans ever saw.

Once seen, this fabric in the following centuries plunged Rome into a real “silk fever”. This cool fabric, “light as a cloud” and “transparent as ice”, the Romans called “Chinese veil”.

Caravans leaving China headed to the northern Tien-Shan mountains, crossed the territory of Central Asia, and then through Khorasan (west of the Amu Darya) reached Mesopotamia and the Mediterranean. The length of the Great Silk Road was 12 thousand kilometers, so few traders walked the entire Silk Road completely. They tried to travel in shifts and exchange goods somewhere halfway. Along the Great Silk Road in the cities and villages through which the caravans passed, there were caravanserais (inns). They had hujras (“rest rooms”) for merchants and personnel serving the caravan, premises for camels, horses, mules and donkeys, necessary fodder and provisions. Caravanserais were a place where it was possible to sell and buy wholesale goods of interest for a merchant, and most importantly, find out the latest commercial news and, above all, the prices of goods [16].

Khorezm, Sogdiana and Fergana became prosperous trade centres. The Silk Road stimulated the need for Central Asian goods such as horses and forage crops, as well as grapes and cotton. In the cities, artisans have mastered new types of craft: the production of metal goods, taken over from the East, and glassware from the West.

As a conventional name, the Great Silk Road was a network of roads along which, in antiquity and the Middle Ages, trade and economic relations between the countries of the East and the West, located between the ancient world civilisations – the Roman (Byzantine) and the Han (Chinese) empires, were carried out. Covering almost the entire Eurasian continent, including the present-day territory of Russia, the Caucasus and Central Asia, the widespread network of the Great Silk Road carried the world’s religions, writing and culture around the world. This path, which has been operating for one and a half thousand years, played a huge role in the rapprochement of the two continents, in the mutual cultural enrichment of many European and Asian peoples. On the verge of ancient and modern, trade caravans from China began their journey from Chanyani and went to Dukhua, a city on the border of the Great Wall. From here, the route diverged into two paths: north and south. The “Northern Road” ran along the southern slopes of the Tien Shan and the Tarim River through Turfan and led to Kashgar, Alai, and from there to the Fergana Valley (Davan), the Central Asian Mesopotamia (Samarkand, Mera), then turned to the lower Volga and the Northern Black Sea coast (according to Chinese sources – Lixian). It ended in the local Greek colonies. This road, however, was not an established

trade route. This route was the “South Road”, which began to function in 115 BC. Thanks to the opening of the state postal road along the southern and northern outskirts of the Taklamakan Desert. As the “Descriptions of the Western Territory” of the Han dynastic chronicles narrate, the “South Road” led to Daqin (the eastern provinces of the Roman Empire) through the Pamir, Khotan, Yarkand, Balkh, Merv, Hekatompil and Ekbatana (present-day Hamadan). Then it was divided into two branches [15].

One of the branches, at that time the main highway, led to Seleucia-Ctesiphon on the Tigris and further along the ancient Achaemenid road (the royal road of Darius) to Mesopotamia and Syria. Its terminal was the capital of Syria – Antioch. Another branch went to Armenia, its capital Artashat. It ran through Gandzak-Shahastan (Gazaka), the centre of the Atropa-tena of the Midi (Small Media, present-day Iranian Azerbaijan). Further, the road passed along the eastern coast of Lake Urmia and crossed the Arake River at Dzhuga (Julfa). Then, through Nakhichevan, along the left bank of the Arak River, it went into the Ararat plain. The length of this first world transcontinental trade route was over 7000 km. The main direction of the Great Silk Road has never changed, but local changes in the plains happened quite often. Mountain roads that ran along gorges, passes and high-mountain trails were practically unchanged [5].

Since ancient times, the Tien Shan and the territory of modern Central Asia have been crossed by three branches of the Great Silk Road:

The Pamir–Altai way: from the Mediterranean Sea, crossing Iran, caravans came to the big city of Merv, here the path bifurcated. Some caravans went to the city of Termez, crossed the Amu Darya, and then along the bank of its right tributary Kyzyl-Su climbed to the Altai Highlands. Here their path lay to the convenient passage of Irkeshtam, and along the course of the Kuk-Su River travellers were directed to the limits of Eastern Turkestan.

The Fergana route: other caravans from Merv went through Bukhara and Samarkand to Khujand and came to the Fergana Valley. Further to the East, the path led along the foothills with vast rich pastures. Caravans entered the cities of Osh and Uzgend. Then, up the Yassy River, there was a difficult journey to the Central Tien Shan to the city of Atbashi. From here, some moved south to the borders of Eastern Turkestan, while others to Lake Issyk-Kul to the city of Barskhan.

The Chuysky way: in the early middle Ages, it was the busiest. Caravans from Samarkand went to Tashkent. Then along the foothills of the Kyrgyz ridge, they came to the Chuy valley. Here, a chain of cities stretched from west to east, through which caravans passed. The largest of them were Nevaket and

Suyab. From Suyab through the Boom gorge, traders got to the Issyk-Kul Lake. Along its southern coast, bypassing the cities of Yar, Hod and Ton, caravans passed to the city of Barskhan (Kaisary region). There were two ways from Barskhan. One led north through the San-Tash pass in the Mongolian steppe and to the Kyrgyz in southern Siberia. The other went through the Dzhuuk pass to the Central Tien Shan and through the Bedel pass to East Turkestan. All routes from East Turkestan led to China.

In the middle of the 2nd century AD, Claudius Ptolemy gave a description of the ancient variant of the Great Silk Road. Along it the road led through Mesopotamia, Assyria (Adiabena) and Media to Ecbatana, from there it turned to the Castian gate (a mountain pass east of Rhea), then passed through Parthia to Hecatompil, Aria (Herat), Bactria (Balkh) and Margian Antioch (Merv). The path described by Ptolemy was divided into three sections: from the crossing of the Euphrates River to Balkh, from Balkh to the Stone Tower and from it to Sera (Chanyan). The establishment of contacts and ties between countries located throughout the entire space from Rome to China led to the revitalisation of ancient world trade [17].

From the 3rd to the 1st half of the 4th century the position of the countries of Southwest Asia on the routes of world trade has undergone significant changes. With the emergence of the Byzantine Empire, these routes began to focus on Constantinople, which was turning into the largest trade and cultural centre at the junction of Europe and Asia. Then, along with the Syrian section of the “South Road”, a new continental highway was formed, heading through Ecbatana and Artashat to Constantinople.

Soon, the need to further reduce and straighten the path to Constantinople led to the preference for the roads passing through Rei (near Tehran) and from Mesopotamia (Nizibin) to Asia Minor (through Samosata). The road from Rhea went through the places where Qazvin, Zanjan, Miane and Tabriz later arose.

In the 4th–6th centuries agreements were concluded between Byzantium and Iran, according to which the exchange of goods, and in particular Chinese silk, between Persian and Byzantine merchants was carried out in specially designated places: Nizibina (Tigris River), Kalinnikum (Euphrates River) and Artashat (Arak River), subsequently, their functions were transferred to Dvin.

The revival of world trade, outlined between the 5th and early 7th centuries, led to the opening of new ways. Chinese sources of that time describe three roads: “North”, “Middle” and “South”. The latter led to Northwest India. The “Northern road”, bypassing the headquarters of the Turkic kagan (near Lake Issyk-Kul), skirted the Caspian Sea and went out to the Black Sea coast.

As for the “Middle Road”, it went out through Tsun-ling (Pamir), passed through the countries of Cao, He, Samarkand, Bukhara, Merv, reached Boosa (Iran) and reached the Western Sea.

The “middle road”, which ran from the Dvin to Constantinople, led through Karin (Theodosiopolis, Erzurum), the Colony (Koili, Gisar), from there to Nikiya (Yeznik), Amasia, Gangra and Angria (Ankyura, Ankara). The road in the southern direction passed through Khlat, Khlimar, Urfa (Odessa) and Damascus to Jerusalem and from there to Alexandria. Another road led to Basra through Nakhi-chevan, Gandzak-Shahastan, Tizbon (Ktesi-fon), Akolia (Kufa). From Gandza-ka-Shahastan, the road departed to Nineveh (Mosul), Mtsbin (Nizibin) and Urfa (Odessa). To the north-east, the road passed through the cities of Eastern Transcaucasia with access to the Caspian Sea.

3. Conclusions

The Great Silk Road played a huge role in the development of human civilisation and had a unique cultural value. The existence of this intercontinental route led to one of the fastest in history interpenetration of cultures and expansion of international communication. There was an exchange of knowledge, technologies, artistic techniques, philosophies and beliefs. We learn about this not only from ancient chronicles and from archaeological finds. The influence that the Great Silk Road had on the convergence of various civilisational streams is felt today. Very often we come across the presence of related features in the cultures of peoples geographically distant from each other by thousands of kilometers, and this is no longer surprising. For centuries, there has been an intensive process of dialogue between far-off communities, and it has not ceased to this day.

The Silk Road opened up unique opportunities for the development of diplomacy, in which economic interests in most cases were linked with political ones. It is natural that the first ambassadors were merchants. They had a “pass card”, the status of inviolability on the territory of even belligerent states. Therefore, they were entrusted with the most difficult tasks; they not only passed information “from mouth to mouth”, but also carried out secret assignments. This was convenient for the rulers who sent merchants on an important mission, since the merchants acted as neutral members of communities who were engaged in their direct business – trade, not related to inter-state relations.

The history of diplomacy of the countries located on the Silk Road is an organic part of the world historical process of interaction of peoples and cultures; it concentrates a huge international legal experience. It is interesting not only from the point of view of study. Having its roots in the past, ancient diplomacy partially penetrates into our life, to one degree or another, it influences modern international processes.

The system of the Great Silk Road existed until the 15th century. However, since the 14th century, due to a number of social and political transformations, as well as qualitative changes in shipbuilding and navigation, the priority in the field of transportation is gradually shifting to sea routes. At the same time, Western countries – Portugal, Spain, Britain, the Netherlands – began to seize the initiative in trade and economic relations. In their desire to take advantage of the finally emerging opportunity to monopolise trade, they are taking consistent steps to neutralise their competitors. The result of such actions was the decomposition of the traditional structure of East-West economic relations and the reduction to the local level of roads, which until recently had a trans-continental significance.

Long-distance international relations more and more actively shifted from land to sea. The Indian Ocean and the adjacent seas turned into the most convenient communication network, and all the best and largest trade and craft centres of Asia were concentrated on their coasts. In India in the sixteenth century – even before the great geographical discoveries affected its foreign trade – the amount of cargo transported by sea was almost 60 times larger than that transported by land to Asian countries. The arrival of European ships and colonial expansion made the situation even worse.

In conclusion, the Great Silk Road and its tradition keeps its importance in unifying nations, both in the past and hopefully in the future, as a carrier of international socio-economic, political and cultural values. Especially in the modern world, Silk Road diplomacy remains one of the three main directions of cooperation between regions and countries.

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Central Asian regionalism and the Belt and Road Initiative²

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Abstract

Multilateral partnership in important aspects of contemporary international relations. In the last several decades the Central Asian Republics of Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan have cofounded and joined regional organisations and institutions. However, there are challenges, similarities and contradictions within the multilateral relationships in Central Asia. This paper is an attempt, from a multidisciplinary perspective, to analyse regional cooperation initiatives in Central Asia as well as the Belt and Road as a grant initiative of global and interregional partnership, including Central Eurasia. Elaboration of multilateral relations in Central Asia will contribute to the perspective on future regional cooperation and international connectivity. Current and future Central Asian transformation will be prompted by interlinked local, regional, trans-regional and global issues and challenges.

Keywords: Central Asia, regionalism, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan, Belt and Road, connectivity

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1. Introduction

In the last several decades, the Central Asian nations have cofounded and joined regional organizations and institutions, however, there are challenges, similarities, and contradictions within the multilateral relationships. Belt and Road initiative is the new format of global and interregional partnership and this paper is an attempt, from a multidisciplinary perspective, to analyze the new tendencies in regional cooperation initiatives and interconnectivity in Eurasia, including in the framework of the Belt and Road initiative.

2. Status and New Dynamic of Regional Initiatives within Central Asia

Since the early 1990s, the Central Asian Republics have formed a new model of interstate cooperation. They have a common historical development and culture of diversity, language and religion, and a secular form of government. In 1993, in Tashkent, the protocol between Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan on the establishment of the common market was signed and the term “Tsentralnaya Aziya” (Central Asia) instead “Srednyaya Azia I Kazakhstan” (Middle Asia and Kazakhstan) was adopted as joint designation.

In 2002, the Central Asian Cooperation Organisation (CACO) was created and included Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan, but excluded Turkmenistan. But, within the CACO framework, there were several problems in implementing policies [1–4]. Between 1994 and 2006, there were more than 200 documents signed, many of which were never realized. In October 2004, Russia became a member of CACO. In November 2005 at a summit in St. Petersburg, it was decided to incorporate CACO into the Eurasian Economic Community. But, the integration of the EEC was one-way, the concept, structure, and interests of CACO should have automatically been incorporated into the EEC, but this did not happen. Furthermore, the EEC and the CACO documents were not synchronized.

As results, it was a number of factors in multilateral relations within Central Asia. First, the Central Asian Republics have set as a priority the formation of a nation-state identity over a regional one. Second, the republics were on the path to economic reform and these processes were of varying degrees of intensity. Thirdly, the role of external powers.

In December 2016, the newly-elected President Mirziyoyev mentioned Central Asia as the priority of his foreign policy. His first international visit was to Turkmenistan on March 5–6, 2017 and during the visit to Ashgabad, Presidents Berdimuhamedov and Mirziyoyev adopted a joint statement and signed an agreement on strategic partnership. In October 2021 after reelection Mirziyoyev paid official visit to capital of Kazakhstan – Nursultan in December 5–6, 2021. Kassym-Jomart Tokayev and Shavkat Mirziyoyev agreed to establish the Interstate Supreme Council, the Interparliamentary Cooperation Council and the Council of Foreign Ministers of Uzbekistan and Kazakhstan to further strengthen the strategic partnership [5].

Uzbekistan considerably extended cooperation with Tajikistan as well and 25 years after their termination, the flights between Tashkent and Dushanbe were re-established during a visit in 2006. Trade relations increased considerably from \$197 million in 2016 to \$ 502 million in 2020.

In 2016–2023, the Central Asian Presidents had more than 20 official and working meetings with the Central Asian counterparts and a number of documents on economic, trade, transport, communication, and cultural cooperation were signed. Regional economic relations in Central Asia in 2022, the total trade turnover between the countries amounted to \$ 16.4 billion, and the total foreign trade turnover – \$ 190.5 billion.

On March 15–16, 2018, Astana hosted the first Consultative meeting of the heads of Uzbekistan, Kazakhstan, Kyrgyzstan, Tajikistan and the chairman of the Mejlis of Turkmenistan. It should be noted that the initiative to hold regular meetings of the heads of Central Asian countries came from the President of Uzbekistan Shavkat Mirziyoyev. A general statement was adopted at the meeting, and the parties agreed to hold the format annually. On November 29, 2019, the second Consultative meeting of the heads of state of Central Asia was held in Tashkent. During these meetings, topical issues of bilateral relations and prospects for their expansion were considered [6]. Following the summit, a Joint Statement was adopted and the Regulations for the preparation and conduct of consultative meetings were approved. Third Consultative Meeting held in Turkmenistan on August 2021 on the Caspian coast, in the national tourist zone “Avaza”. A forth consultative meeting was held in Issik Kyl, Kyrgyzstan Issyk-Kul in Kyrgyzstan on July 2022 and the Fifth one in the Tajikistan capital Dushanbe in September 2023.

3. Diversity of extra regionalism in Eurasia

It is well known major analytical frameworks regional integration include functionalism, neofunctionalism, liberal intergovernmentalism, and economic theories of integration, among others [7–11]. However, extra-regional initiative in Central Asia is clearly based on liberal intergovernmentalism. Let's discuss some cases.

China strongly supports multilateral cooperation within Shanghai Cooperation Organisation (SCO) and over the years the SCO passed through a number of interesting phases in its institutional and political evolution and represented an international instrument to coordinate areas of multilateral cooperation. At present, the SCO comprises eight member states – India, Kazakhstan, China, the Kyrgyz Republic, Pakistan, Russia, Tajikistan, and Uzbekistan; four observer states – Afghanistan, Belarus, Iran and Mongolia; six dialogue partners – Azerbaijan, Armenia, Cambodia, Nepal, Turkey, and Sri Lanka [12]. However, the existence of differences between the SCO member states on a number of political and economic aspects should be noted, in addition to the expansion of the organization, resulting in new challenges and problems for the SCO [13]. There is a lack of conflict management measures, and differences on economic and stability aspects exist and others.

In 2004, Japan and Central Asia established a multilateral framework, “Central Asia plus Japan” and its main concepts were coordination and cooperation. In 2007, the “Republic of Korea–Central Asia” forum was organized. Within frameworks, meetings were held in Korea and Japan as well as in Central Asian republics to discuss issues for strengthening and further development of cooperation in various spheres, including the IT sector, agriculture, medicine, and health, implementing a system of “E-government”.

During its EU presidency in 2007, Germany initiated increasing bilateral and multilateral partnerships with Central Asian states as a result the EU strategy toward Central Asia from 2007–2013 was implemented [14]. In 2014, the EU decided to extend the strategy for 2014–2018 with the volume of financing reaching 1 billion euros. In May 2019 the EU decided to extend strategy for the next five years. At present, along with Russia and China, the EU is the main trading partner of the Central Asian states, especially Kazakhstan. The EU has expressed an interest in the energy supplies of Central Asia.

For several decades Turkey has attempted to unite Central Asia and Azerbaijan in its own interests. In 2009 Council of Cooperation of Turkish-speaking countries was founded by Turkey, Azerbaijan, Kyrgyzstan and

Kazakhstan. Thus, Uzbekistan became the fifth member of the international organization in 2018.

Since 2015 Russia lead the Eurasian Economic Union (EAEU) was formed and organization provides for free movement of goods, services, capital and labor, pursues coordinated, harmonized and single policy in the sectors determined by the Treaty and international agreements within the Union [15]. The Member States of the EAEU are the Republic of Armenia, the Republic of Belarus, the Republic of Kazakhstan, the Kyrgyz Republic and the Russian Federation. In 2020 Uzbekistan received observer status with the EAEU and it was signed a Memorandum of Cooperation with the Eurasian Economic Commission and a three-year Action Plan for its implementation [16]. Since 2014 and after the Russian war in Ukraine in March 2022 USA, the EU, and many other countries implemented sanctions on Russia, which also affect the members of the EAEU.

For decades the USA was the only major external actor in Central Asia without a regular multilateral consultative mechanism. In November 2015, US Secretary of State John Kerry made a visit to the countries of Central Asia and in Samarkand, Uzbekistan Secretary Kerry and the foreign ministers of Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan had meeting within the new cooperation format “Central Asia + USA” (C5+1). The “C5+1” Joint Declaration of Partnership and Cooperation was accepted, which included regional trade, transport and communication, business climate in the region, environmental sustainability challenges, cooperation to prevent and counter transboundary threats and challenges, and others [17]. Following years it established C5+1 Secretariat and the Working Groups on Economy, Energy and the Environment, and Security.

In September 2023 the presidents of the United States, Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan – met on the occasion of the first-ever C5+1 Presidential Summit, held during the 78th session of the United Nations General Assembly in New York [18]. It was accepted C5+1 leaders Joint statement, which reaffirm commitment to strengthening security cooperation as a necessary cornerstone to addressing shared regional security challenges and maintaining the sovereignty and independence of the Central Asian states, conforming to continuing investment in and development of the Trans–Caspian Trade Route, or the so-called “Middle Corridor,” as well as energy infrastructure and extension of transportation networks connecting Central Asia to South Asia are also necessary to diversify transport routes [18]. Nevertheless, the success of C5+1 requires

concrete and long-term project and program implementation in the economy, trade, energy, communication, tourism, education, and other fields between the USA and Central Asian nations.

In January 2019 the first ministerial meeting of Foreign Ministers of India – Central Asia – dialogue was held in Samarkand, Uzbekistan and the Foreign Ministers of Afghanistan, India, Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan and Uzbekistan attended the meeting. The Parties reaffirmed the willingness for cooperation, mutual support, joint solution on relevant issues in order to ensure security, stability and sustainable development [19].

27 January 2022 Prime Minister Shri Narendra Modi hosted the first India – Central Asia Summit in virtual format, which was attended by Presidents of Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan and Uzbekistan. This first India–Central Asia coincided with the 30th anniversary of the establishment of diplomatic relations between India and Central Asian countries [20]. Leaders agreed to institutionalize the Summit mechanism by deciding to hold it every 2 years. They also agreed on regular meetings of Foreign Ministers, Trade Ministers, Culture Ministers and Secretaries of the Security Council to prepare the groundwork for the Summit meetings. An India–Central Asia Secretariat in New Delhi would be set up to support the new mechanism and finally, a comprehensive Joint Declaration was adopted by the leaders that enumerates their common vision for an enduring and comprehensive India–Central Asia partnership.

To sum up, instability in Eurasia and maintenance of the geopolitical balance are the main challenges for providing security and stability in Central Asia.

4. Belt and Road as New Format global partnership

In 2013, Chinese President Xi Jinping announced the creation of “The Silk Road Economic Belt” in Astana, Kazakhstan and “The 21st Century Maritime Silk Road” in Jakarta, Indonesia. In 2014 the Silk Road Fund (US\$50 billion) was established, and in 2016 the Asian Infrastructure Investment Bank (AIIB) (more than US\$100 billion) was founded, which aimed at providing investment and financial support toward cooperation in infrastructure, resources, industry, and the finance sector, as well as other transport communication projects. This involved various countries in the economic framework of “Belt and Road” initiative. The Central Asian countries and the current republics of the AIIB’s ninety-seven member states support China’s mega grant initiative.

In May 2017 and April 2019 together with more than a dozen state and government leaders, the Presidents of Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan took part in the first and second “Belt and Road” international forum in Beijing. In a forthcoming third forum in October 2023 also plan the participation of Central Asia leaders.

China’s trade with the five Central Asian countries – Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan – increased to US\$70.2 billion in 2022 from US\$0.46 billion in 1992, when China established diplomatic ties with the five Central Asian countries [21].

Moreover, China’s relations with the Central Asian States began to focus more and more on long-term and comprehensive goals. In recent years, they have been closely linked to “Belt and Road” initiative, which has the character of a transport and communication strategy (Fig. 1).

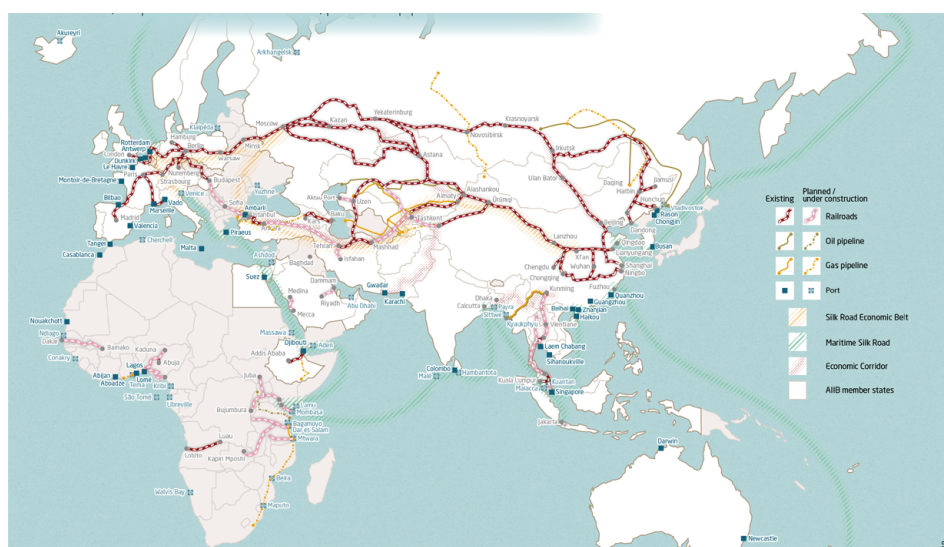


Figure 1. Transport infrastructure within the framework of the Belt and Road Initiative [22]
(source: <https://merics.org/en/analysis/mapping-belt-and-road-initiative-where-we-stand>)

Another factor contributing to intensification of interaction is the development of China and Central Asia is “PRC + CA” format. So far, however, it has only been implemented mainly at the level of multilateral contacts between ministries and departments (for example, ministries of foreign affairs) and expert think tanks.

China actively developed new communications links in Eurasia, in particular, communication with Europe. Its branches go in a to north-west and south-west direction, first passing through Russia, Ukraine, Belarus, Poland, and other

countries and the second passing through Kazakhstan, Uzbekistan, Turkmenistan, Iran, Turkey, and Europe. The construction of the Tashkent–Andizhan–Osh–Sarytash–Irkeshtam motor highway and the Kashgar–Osh–Andizhan railway project are regarded as part of an intensive economic exchange between China and Central Asia. In the last SCO summit in Samarkand in 2022 it was finalized the implementation of the China–Kyrgyzstan–Uzbekistan rail project, which faced difficulties in its realization in past. Also, transportation of hydrocarbons from Central Asia and the Caspian region to external markets should be noted. In 2005, an oil pipeline from Atasu (Kazakhstan) to Alashankou (China) was completed. In 2009, the first gas pipeline (A line) between Central Asia–China was signed. In the following years, B and C lines, which pass through the territories of Turkmenistan, Uzbekistan, and Kazakhstan, were completed.

5. Conclusions

Post-Soviet Central Asia has sought a new model of interstate relations, but Central Asian cooperation has had very weak institutional frameworks and has gone through several regional initiatives. Prospects for cooperation and integration in Central Asia will depend on the ability to work together to carry out the proper reforms and common projects. There are challenges, similarities and contradictions within diversity of the multilateral relationships in Central Asia. There are global and regional challenges today. To a large extent, the interests of external states in Eurasia are driven by their contradictory interests.

Today, the Belt and Road Initiative is a global initiative, which requires comprehensive bilateral and multilateral cooperation on economic, political, and security matters. In Central Asia, the realisation of the regional and international projects is needed. Increased connectivity and technological developments, as well as the essential active implementation of the diverse range of cooperation between “Belt and Road” participating countries, including high-tech innovations, education, public diplomacy, and tourism are required.

Strong international partnerships with Central Asian states is needed for democratic and economic reforms, new technology, innovation, and attracting foreign investment. Current and future transformation within Central Asia will depend on interlinks between regional and global issues and challenges.

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The role of the Great Silk Road in international relations

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Abstract

The Great Silk Road played a significant role in shaping international relations throughout history. Originating in China, this ancient network of trade routes connected the East with the West, facilitating the exchange of goods, cultures, ideas and technologies between different civilisations. The Silk Road contributed to the development of commercial networks, cultural diffusion and diplomatic interactions among nations along its route. It facilitated the exchange of silk, spices, precious metals and other commodities, fostering economic prosperity and cultural diversity.

However, its legacy continues to resonate in contemporary international relations, as nations seek to revive and harness its spirit of cooperation, connectivity and cultural exchange through initiatives like the Belt and Road promoted by China. Overall, the Great Silk Road remains a symbol of cross-cultural interaction, economic integration and diplomatic engagement in the history of international relations.

Keywords: Great Silk Road, international relations, China, Central Asia, Uzbekistan, New Silk Road

1. Introduction

In the political, socio-economic and ethnocultural life of the peoples and states of Central Asia, the Great Silk Road, which connected East and West, was of incomparable importance. It is noted that the formation of this road system

took place in three stages: first, local roads that operated within regions and tribes and peoples in a certain territory; second, roads of regional importance which connected all the peoples and states of Central Asia; and third, roads that acquired strategic importance and played an important role in the life of the regions. It is this system of trade routes that is of international importance. The beginning of these roads and the traffic along them date back to the 3rd–2nd millennium BC. In 138 BC, Zhang Jian discovered this for the Chinese authorities [1].

In the 19th century, the study of the formation and operation of the route called the “Great Silk Road” began. As it turned out, this track spanning Eurasian regions was considered the invention of peoples who did not have waterways. That is why several thousand kilometers of roads connected with each other and reached the sea coast. In particular, the core of this route, which began from the Altai and reached Turan, Iran, the Middle East and the coast of North Africa in the 4th–3rd centuries BC, was the “steppe road” from the steppes between the Volga (Volga region) and the Ural (Yayik) rivers in Eurasia to India [2]. All these roads passed through the Turan region, a historical part of Central Asia, more precisely, through the Sogd region, the centre of which is Samarkand, an important historical and cultural region. On this path, the Sogdians acted as intermediaries or go-betweens. They actively participated in all trade transactions between the Chinese dynasties in the East, the Byzantine Empire in the West, as well as Sasanian Iran, the Great Steppe and the North Caucasus. In particular, from the middle of the 1st millennium BC until the end, the language, writing and diplomacy of the Sogdians dominated the territory from the Amu Darya to the Hexi Gansu corridor [3].

The significance of the Great Silk Road in international relations is determined by the clash of political and economic interests of that time. In particular, in the ancient period of the 1st–4th centuries the freight route became the arena of political and economic struggle between the Roman, Parthian, Kushan and Han states. By the 3rd–4th centuries, the main powers of the region of the Kan state and the Kushan kingdom collapsed. From about 350, the economic activity of states and state associations increased, such as Sogd, Tokharistan, Khorezm, Fergana and Chocha, which were formed instead of large states. It should also be recognised that the leading role in this process was taken by Sogd and its people, the Sogdians. The “Sogdian era” began, which was considered important for the economy, social life and cultural development of the vast region [4].

In the early Middle Ages, the 5th–6th centuries, competition for the Silk Road intensified between the Chinese dynasties, Sasanian Iran, the Byzantine Empire and the Turkish Khanate. This struggle was determined not only by trade, but also by political, economic and cultural significance [5].

Representatives of the settled oases of Central Asia were not only traders, but also suppliers of products. Their products travelled by land and sea from Byzantium to Korea and Japan, from Tibet to Sri Lanka (Fig. 1). In particular, Chinese sources report that horticultural products from Sogd (peaches and cherries), viticulture (raisins) and thoroughbred horses and sheep were exported to China [6–9].

Complex international relations, which lasted from the 4th–3rd centuries BC to the 10th century AD, could not stop the trade and commercial activities that were part of them. In the area from Chocha to Gansu in the northeastern direction of the region, a system of new trading settlements and cities appeared. Thanks to them, representatives of different peoples, languages, cultures and religions were able to prove that mutual cooperation is more important than any political conflict. Residents of sedentary oases established economic and cultural ties with nomadic tribes and formed a new ethnocultural environment [10, 11].

Relations between Sogd and neighbouring regions, which occupy a central place in regional relations, acquired not only economic, but also political, social and cultural significance. Ustrushana, located on the northeastern border of Sogd, was a “space of contact” between sedentary and nomadic regions. It was influenced by both Sogd and Chocha. Trade routes passing through the country connected the desert region and the banks of the Syr Darya with the Zarafshan oasis, and in the south with Tokharistan. The people of Ustrushana were also active in international relations and, according to the Tang-shu chronicle, in 618–626, they sent ambassadors to China together with the young ruler of Ustrushana (Su-dui-sha-na) Samakand (Kan). In 627, Ustrushana sent its trade caravan to China with representatives of Bukhara, Samarkand and Ishtikhan [12, 13]. Although Ustrushana was not such a large historical and cultural region as Sogd and Chocha, it had its place in regional relations. In addition, a branch of the Great Silk Road passed through its territory.

In regional and international relations, in the active movement of the Great Silk Road, the Chocha–Tashkent oasis occupied an important strategic place. Caravans in the northeastern and southwestern directions from the Chirchik and Ohangaron basins moved through the Chocha regions. This region is considered a strategically important centre in the northeastern

direction of the Silk Road. The geographical position of the region was favourable for the residence of both sedentary, semi-nomadic and nomadic populations. From the last quarter of the 1st millennium BC to the last stage of the early Middle Ages, several dozen local (Saka) and Sogdian settlements appeared in the oasis. From the second half of the 6th century, when Chocha became part of the Turkic Khaganate, it became an important political centre of the Khaganate. From here, the Western Turkic Khans maintained political and economic ties with neighbouring countries [14, 15].

The strategic directions of the Great Silk Road passing through Chocha acquired greater importance, first under the state of Kan (2nd–4th centuries BC), and then under the Hephthalites (5th–6th centuries). The rulers of Chocha were actively involved in regional and international relations. The chronicles “Wei Shu” of the 6th century and “Bei Shu” of the 7th century mention the state of Chocha (Zheshe/Chiachiat), which sent envoys to China in 437. “Tongdian” mentions Chocha’s diplomatic relations with the Sui dynasty (581–618) [16, 17]. Strong control of the Silk Road during the Turkish Khanate increased the political status of Chocha and contributed to the further development of its economy.

As part of regional and international relations, the arrival of the Chachliks to Samarkand – the Sogdian Ikhshidi Varhuman (Avarhuman) (650/655–675) as part of the Chinese and Chaganian ambassadors was reflected in the wall paintings of Afrosiab [18]. This embassy proves that regional relations were active in the early Middle Ages.

Chocha products occupy an important place in international trade. Lashkarak silver, Tunket and Tokket metals and Karamozor blue turquoise were exported along the Great Silk Road. In Chocha itself, coins (срѣw γ’γ’n pny) of the Turkish Khagans Yabgu were minted for the domestic market. In the 5th–8th centuries, traders from Chocha, along with those from Chugdi, Fergana and Tokharistan, exported goods and lived as communities in foreign settlements [19–21]. This brought income to the treasury of the Khanate and made the Khanate responsible for the political and military protection of Central Asian merchants.

In addition, the strategic position of the Chocha oasis on the Great Silk Road has acquired important significance not only in the country, but also in international relations.

Within the framework of regional and international relations, internal and external relations of the Fergana Valley occupy a special place. Although the Fergana Valley was not located on the main route of the Great Silk Road, it served as an important branch of it. Trade routes passed through the valley of the region at the same time as Chocha from the 4th–3rd centuries BC, it played

an important role in the regional and external relations of Sogd, and gained importance in international relations with the Chinese dynasties. Sometimes the Chinese did not distinguish between Sugdians, Chochains or Ferghanas and considered them all “Hu” (Westerners) or Sugdians. This is probably why in Chinese sources of the early Middle Ages Fergana (Davan, Polona (5 thousand BC), Bokhan (6th–7th c.) or Ningyuan (7th–8th c.)) is mentioned as the property of Sogd. In particular, in the Bei Shu information from 435 Fergana is not mentioned as a separate possession. According to the Chinese scholar E. G. Pulleyblank, the language, anthropology, customs and beliefs of the inhabitants of Fergana in the Sogd region are included in Chinese sources [22–24]. In general, sources and scientific literature consider the inhabitants of Central Asia as a single ethnic group.

Fergana took its place in regional and international relations and trade. In particular, in 479, red Fergana horses were sent as a gift to the Chinese emperor, and in 675, a green bottle of Fergana wine was sent. Alfalfa seeds and nuts (“mu-su”) were supplied to Chinese markets. “Rich households store more than 10,000 cans of oil,” and such products, once marketed, developed domestic and foreign trade. In addition, Sasanian and Sogdian dirhams were in circulation in Fergana until the 7th–8th centuries. Ferghana products were first supplied to East Turkestan and China through the mediation of Sogdian merchants, but from the 4th–5th centuries, they themselves became more active in trade and began to compete for profit [22, 25]. Commercial labour became an economic need for Ferghana residents.

The valley has long been the cause of several Sino–Fergana wars with its famous heavenly horses. These horses are part of international diplomacy, and the ambassadors of Fergana achieved compromise and good neighbourliness in relations with China on account of these horses. Since the sale of paradise horses brought great profits on the international market, attention was paid to their breeding in Sogd and Chocha. On the Great Silk Road there was trade in Fergana fruits and grapes. In addition, the valley actively participated not only in agriculture, but also in international trade in its non-metallic products [26, 27]. There were mines of copper, lead, gold and iron, and metalworking crafts were developed. Such production and trade in it served the economic interests of the cooperating parties.

Documents A-14 and B-17 of the Mug archive, dating from the beginning of the 8th century, tell about the mutual political relations of the Sogdian, Fergana, Chocha and Turkic khanates. Document A-14 shows that Devashtich, the ruler of Pancha in the eastern region of Sogd, sent his representative

Fatufarn to the ruler of Chocha, the ruler of Ferghana and the Turkish ruler to communicate against the invasion of the Arab Caliphate. Document V-17 – a letter from Devashtich to Afarun, the Khoksar ruler, states that a military commander was sent from the king of Fergana to Goanak (Gorak–Sogdian ruler (king) from the king of Fergana [28]. These data show that the efforts of the countries of the region to act in concert in international relations have acquired important political significance.

One of the ancient states of Central Asia was Tokharistan – a state union that arose in the northern part of Bactria in the early Middle Ages, which was of great importance due to its strategic location. In the ancient times of Greco–Bactria, after the decline of the Kushans, this land, occupied by the Dagals, was called Tokharistan and was important in regional and international relations, especially in the southern direction of the Great Silk Road [29]. Tokharistan connected the region with India, Iran and the Middle East as an outlet to the south.



Figure 1. The Silk Road map

(source: <https://culture360.asef.org/opportunities/unesco-2021-silk-roads-youth-research-grant/>)

From the second half of the 6th century to the beginning of the 7th century, there were wars between the Hephthalites, the Turkic Khanate and the Sassanids to establish their power in Tokharistan. It is no coincidence that this region became the cause of the Turkish–Hephthalite and Turkish–Sasanian military conflicts. Negotiations were held on the issue of territory between Khosrow I and the Turkish Yabgu–Hogan Istami. During the reign of Khagan Bilgi Tardu (576–603), all of Tokharistan, including its main province of Chaghanian,

came under the control of the Khagan. The country was ruled by the descendants of Tardu, who had the title. From the second quarter of the 8th century, Karluk Yabgu (Arabic “jabgu al-harlukhi” or “jabguya at-Tukhari”; Chinese “Tukhalo shehu”, Sogd. tgw’r’k MLK’ – Malig (king) of Tokhara) came to authority [30]. The country began to achieve political stability and economic growth after the rule of the Kaganate, and then independently. Since Tokharistan is a confederal union, the foreign policy activities of its constituent entities are not limited. In Tokharistan, which was under the tutelage of the Turkish Khaganate, the Chaganyan class also had the opportunity to conduct a semi-independent policy. The center of Chaganyan was Badrakh, from where ambassadors were sent to different regions and countries. In particular, information about the embassy sent to Sogd has been preserved. In the second half of the 7th century, there is an image of a visit to the palace of Dapirpati, Mirzo Bukarzat, in the presence of the Sogdian ruler Varhuman (Avarhuman) on behalf of Turontash, the Turkish ruler Chaganyan [31–33]. It is shown that these ambassadors brought an ostrich to Sogd as a gift. Such regional relations served the interests of the tribes and peoples living in Central Asia and ensured political and religious stability.

Caravans leaving the region headed to Termez through Subah, Khuzar, Temu and Kapug (Buzgol). Having passed through the Amu Darya, they went to India, Iran and the Middle East [2].

Agriculture in Chaganyan was not as developed as in sedentary oases. But livestock farming and crafts were well developed. In particular, in 660, items made of red and emerald glass were sent from Chaganyan to China [34]. This information alone proves the development of crafts in the country.

Ettisuv, a historical and cultural land inhabited by Turkic peoples, has acquired special significance in regional and international relations. Mil. front. The Saka nomads, who lived here from the 2nd–1st millennia, created a unique high culture. The “Scythian way of depicting animals” in fine art is a unique example of the early Middle Ages [35].

From the 4th–3rd centuries BC to the early Middle Ages, the Ettisuv were in close contact with the settled oases of Central Asia. As part of the Kan state, relations between Sogd and Ettisuv rose to a new level. Ethnocultural ties strengthened when Sogdian trading factories appeared in Ettisuv [36].

The leading place in the breeding economy was occupied by livestock raising and partial farming. The settlement of the Turkish Khanate also created great opportunities for intercountry trade relations.

The urban culture of the settled oases of Central Asia, especially Sogd, had an effective influence on the formation and development of the cities

of Ettisuv. As a result of the kenta (kata) system, built from the 6th to the 8th centuries, dozens of cities such as Hamukat (Dzhamukent), Shaljikat, Juvikat, Navikat, Nuzkat and Sutkat were created. In the 6th–8th centuries, 18 cities and fortresses were built in the Chu valley, where Turks, Sugdians, Syrians and Persians were engaged in trade and crafts [37–39]. Such urbanisation is an important aspect of international relations and confirms the closeness of mutual interests of rich peoples and countries in political and economic matters.

Among the cities of Ettisuv, Suyob and Talas were the main economic, cultural and military centers. These cities were mainly ruled by Sugdians. In the 580–590s, the ruler of Hamukat (Dzhamukent) was Hamuk (Jamuk) from Poykent, in 710 the ruler of Navikat was Samarkand or Cher son Vakhzanak from Penjikent, in 732 the ruler of Semekna was Neksengun from Sogd, and the governor Taroz was Ogultarkhan from Bukhara. These cities and their mayors have positively influenced regional and international relations in political, economic and ethnocultural issues [40].

The international connections of Central Asia with the oases of East Turkestan and the regions adjacent to China were an ancient and complex process. On the Silk Road, the Chinese authorities were interested not only in Davan (Fergana), but also in the whole of Central Asia. The emperors sent their spies (Song Yong, Xuan Zang, Hui Chao, etc.) and tried to collect a lot of information about this country.

Central Asians, who passed through the oases of Eastern Turkestan along trade routes, founded trade and craft settlements on these lands. Collection of letters from 197 AD. e. “Old Letters” (letter 2) talks about the Sogdian colonies in the territory connecting the Chinese cities of Luoyang (s’ry – Sarag’) and Chang’an (’γwmtn – Akhumtan) with Jiuyuan (cwc’n – Chuchan) provides information [41, 42].

Trading settlements, which before 350 were established mainly for commercial purposes, began to acquire political, economic and cultural significance in 350–750 AD. This united Central Asia and East Turkestan into a single ethnocultural space [4, 43].

Relations between the Central Asian and Chinese dynasties intensified during the Tang dynasty (618–907), and in 627–647, 9 ambassadorial missions from the Sogdian Confederation were sent to China [44]. This, in turn, paved the way for the relationship between the Sogdians and the Turks in the region.

During Turkic rule, the Sogdians took over trade with the south, east and north through Gansuda. The Hami region near the city of Kumul was also

under their control. Like the Turkish Khagans, Tang administrators also used the services of the Sogdians. Kan Su-mi from Samarkand was appointed to the post of the governor (duhufusi) of the Bei-an district in the Ordos. In 630, the “great leader” An Tu-khan from Bukhara led 5 thousand Sugdians to Northern China and became the ruler of the Weizhou district. In the second half of the 7th century, the Kang Yantian group from Samarkand built three villages around Lake Lop Nor, east of the Tarim River. One of them was called Putaochen – Vineyard. Documents found in Dunhuang also confirm the increasing influence of the Sogdians from the 7th century [4, 45, 46].

Representatives of Central Asia were located in Luzhou, Lizhou, Hangzhou, Saizhou and Yizhou between the Ordos and Shanxi regions of the Great Silk Road. International trade in these cities had a positive impact on the economic life of both the Turkish Khanate and China. Chinese historians Wang Zhenya, Guan Lianji, Li Mingwei, Chen Aichu, Jin Yue: “... the Sogdians from the 5th century BC to the 10th century made an incomparable contribution to the development of connections through the Silk Road for about one and a half thousand years”. The capital of China at that time, Chang’an (Xi’an), passed through the Hexi corridor to Gansu. According to the Sui Shu chronicle, of the million-strong population of Chang’an, about 50,000 were immigrants, including Sogdians. They were called “Zhaou ju xing xu” – “Hu of the nine lands” [3, 47].

Being a convenient place for trade, the security of the Hexi region is ensured. Historian Li Mingwei described it as “a kind of independent or semi-independent stable region.” Areas here such as Guozhou (Anxi), Suzhou (Jiuyuan), Shazhou (Donghuan), Hangzhou (Zhang’e), Liangzhou (Wuwei) and Lanzhou (central Gansu) were mainly inhabited by Sugdians. In 439, the Northern Wei emperor Tai Wu-di captured Lanzhou and took most of the Sugdians captive. Only envoys sent from Sogd returned the Sugdians to Lanzhou in exchange for a large ransom [48, 49]. After this, ample trade opportunities were created in this war-free space.

About one of the large centres of residence of the Sogdians, “Donghuan–Druan”, Li Ming-wei wrote in “Suitsan sichou zhilu”: “One of the 13 villages in Donghuan province is called Songhua.” From the period of the Wei (220–265) and Jin (317–425) dynasties to 534, the number of Sogdians in the city of Wuwei increased several times thanks to the privileges created by the Wei dynasty. In addition, Dunhuang was an important part of the Silk Road [41].

The eastern branch of the Great Silk Road along the “Otter Road” at the beginning of the 5th century reached Primorye along the right tributaries of the Amur – the Sungari and Ussuri. The city of Ugochen–Besh Mulk

(Beshkent–Panchkent) was founded at the confluence of the Mudantsyan and Sungari rivers, and the Central Asians began active trade with neighbouring tribes [50].

In China, there was a great demand for the products of cattle breeding and Central Asian horses of the nomads. In 607, 3,000 (three thousand) horses were valued at 13,000 (thirteen thousand) rolls of silk by those who sold it for the price of wrapping silk. A roll of silk fabric cost 20 Sogdian dirhams and was sold in Samarkand for 28 dirhams. This required the production of silk fabrics in Sogd. In addition, the main buyers of products from Sogd, Chocha and Fergana were nomadic Turks. The Sugdeans sold their products to the Turks at a lower price than to China, based on economic and political interests [51, 52].

In general, the relations of the peoples and states of Central Asia with the Chinese dynasties were a colourful and complex process that reflected the centuries-old development of the region.

In the early Middle Ages, the Turkish khanates entered into trade, economic and political competition on the Great Silk Road with Byzantium, Sasanian Iran and China. The Sasanian ruler Khosrow I Anushervan (531–579) became the son-in-law of the Turkish ruler Istami Yabgu and formed an alliance. But the conflict of economic interests, especially competition in the silk trade, did not end there. Sugdian silk began to displace Chinese fabrics from the Western market. This product came to Byzantium through Iran. In the 6th century, Iran sent envoys to Luoyang, the capital of China, and signed an agreement to supply Chinese silk to the West. Sogdian businessmen sought to establish direct contacts with Byzantium. Iranian merchants artificially raised the price of silk. After Byzantium's attempts to raise silkworms failed in the 6th century, it was again associated with Sogdem [4, 53, 54]. This was in the interests of the Turkish Khanate.

The political issue between the Turkic Khanate and Byzantium was the issue of conflicts with the Avar Khanate and Iran, and Byzantium was ready to cooperate with the Turkish Khanate in this regard. In 563, Istami Yabgu sent Eskil, an elder of the Nushibi tribe, to Constantinople to find a solution to these problems and cooperate. In 568, in order to deliver silk fabrics to Byzantium, he sent envoys to Iran under the leadership of Maniax of Sogd. However, the policy of the Iranian king Khosrow I regarding Sogdian silk at the Iranian embassy failed. The silk fabrics brought by the ambassadors were burned before their eyes. Istami Yabgu's second mission, consisting of Turks, ended in tragedy. As a result, the economic interests of the Great Silk Road prevailed over the political ones,

and the Khakhanid–Sassanid alliance disintegrated. Iran's borders were closed to caravans, and diplomatic relations were severed [55–57].

Maniax attempted to reach Byzantium through the northern shore of the Caspian Sea. A group of ambassadors led by him arrived in Constantinople in 568. This was a political achievement of the Turkish Khanate before Iran and the opening of the “Caucasian Silk Road” to the Middle East and Egypt [55, 58].

The ambassadors of the Kaganate were received by the Byzantine basileus, Emperor Justinian II (565–578). According to Menander, the ambassadors read to the emperor a letter written in the “Scythian (Sogdian)” letter by Istami Yabgu. After negotiations, the merchants sold their silk fabrics and other goods and bought rum goods [55].

In honour of the Great Silk Road, both sides signed agreements on economic, diplomatic and military alliances. In the autumn of 568, the Byzantine ambassador Zemarkh was in the presence of Istami Yabgu in the army of the Kagan in Otukan. Istami received the ambassadors of Justinian II and established connections between the Turkic Khanate and Byzantium. These contacts continued again, and a group of ambassadors was sent to Constantinople, led by Maniah's assistant Tagma Tarkhan. With the permission of Istami Yabgu, the African ambassadors of the Khorezmshahs also joined this group. The exchange of ambassadors between the parties lasted eight years (until 576). A group of ambassadors led by Valentin Mechenosets (Sword–Bearer) also arrived in Etsisuv from Byzantium, Menander reports in his “Continuation of the History of Agafyev.” Byzantine–Central Asian relations continued until the end of the Byzantine Empire in the 13th century [55, 59, 60].

Political struggles and economic interests around the Great Silk Road complicated relations between Central Asia and Iran. In this regard, the Heptalo–Sassanian and Turkish–Sassanian wars took place several times. Even cross-fertilisation did not work. However, the Great Silk Road remained an important artery of life for Eurasian peoples and states until sea routes were opened.

2. The role of the New Silk Road in international relations

Throughout history, people and societies have established and developed mutual social, political, economic, and cultural relationships. The development of bilateral relations was based on legal documents, international and regional organisations, bilateral and multilateral agreements, and projects.

The historical and modern Silk Road served as an important factor in the economic, historical, and cultural integration of the countries of West and East, South and North. In this regard, efforts to restore the Silk Road on a global scale in modern integration processes are increasingly developing. In this regard, many projects were implemented by countries around the world, but later the implementation of several projects was not completed.

The Great Silk Road played an important role in the historical development of regional and international relations in Central Asia [3]. The Great Silk Road occupies a place in human history as a unique socio-political, economic, and cultural institution, which includes all the necessary infrastructure. The Great Silk Road not only economically, but also politically and culturally connected Central Asia, regional neighbours, Asia, Europe, and foreign countries and played an important role in coordinating mutual ties.

At the end of the 20th and the beginning of the 21st century, in modern international relations, the restoration of the Great Silk Road and the coordination of mutual economic-political, cultural, transport, and communication ties between states within the framework of the Silk Road concepts developed.

Scientific research into the historical, geographical, economic and cultural aspects of the Great Silk Road began in the second half of the 19th century by world scientists. At first, scientists from Europe, China, Russia, Korea and Japan made a great contribution to the scientific and practical study of this path. In particular, the *Encyclopedia of the Great Silk Road* [61] was published in Korea. The term “Silk Road” was first used by the German scholar Ferdinand von Richthofen³ in his classic work *China*, published in 1877. In his work, the term “Great Silk Road” was first used in German as “Seidenstraße”. After this, this term began to be scientifically studied on a wider scale by his students and followers. In his work, Richthofen also gives detailed information about Central Asia, which is of great importance on the Silk Road. In his book he “includes a map of Central Asia.” The term “Silk Road” is used in English and 丝绸之路 (Sichou zhilu) [62] in Chinese sources.

This can be seen in the example of the international programme “Silk Road – Road of Dialogue”, implemented by UNESCO, the United Nations Organisation for Education, Science and Culture.

³ Ferdinand von Richthofen (Ferdinand Paul Wilhelm Freiherr von Richthofen 1833–1905) was a German geographer, geologist, traveller, founder of geomorphology, president of the Berlin Geographical Society. He was a professor at the universities of Bonn, Berlin and Leipzig. He is the author of 5-volume *China, A Guide for the Travelling Researcher*, 4-volume *Geomorphological Etudes of East Asia*, 2-volume *Chinese Diary*.

Considering the unique place of the Great Silk Road in the history of civilisations, a comprehensive research program *Silk Road – Road of Dialogue* was adopted by UNESCO in 1987 as part of the UN World Decade for the Development of International Culture [63]. The main goal of this programme is a comprehensive study of the history, culture, ethnogenesis, socio-economic processes and international relations of the peoples of Central Asia, as well as the development of cultural ties between East and West. Based on this, in 1993 the UN General Assembly decided to restore Silk Road diplomacy in the areas of international relations, culture, science, trade and tourism [64].

The “Silk Road – Path of Dialogue” programme brought together influential historians of the region from Central Asian and Western countries, and several international conferences and congresses were organised as part of their mutual scientific cooperation. Also, programme participants organised several international scientific expeditions to the countries of the ancient Silk Road, made films about the history and culture of the region, published books, brochures and articles, as well as restored many archaeological and architectural monuments. In particular, participants in the project in June–August 1987 in the Istanbul–Beijing direction “In the footsteps of Marco Polo”, October 23, 1990 – February 1991, “Sea Expedition”, in Khiva in 1991, “Across the Republics in Central Asia” in June–August 1992. In total, 5 large expeditions to Mongolia were organized, such as “Along the Routes of Nomadic Culture”, 1995 Istanbul–Lyon, and “The Silk Road in Europe” [63]. 227 experts, scientists and about 100 international media workers [63] from 47 countries took part in the expeditions.

In addition, as part of the programme, 26 scientific conferences were organised on the history and traditions of the Great Silk Road. For example, “Formation and development of the Great Silk Road in Central Asia in antiquity and the Middle Ages” in Samarkand in October 1990, “Cities and caravanserais on the Great Silk Road” in Khiva on May 2–3, 1991 [65], “Nomadism and sedentary cultures on Silk Road” in June 1991 in Almaty, “Epics of the countries of the Great Silk Road” in Turku, Finland [66], July 1993, “Languages and writing on the Silk Road” in Cyprus in September–October 1994, “Development of tourism on the Great Silk Road” in October 1994, “Development of tourism on the Great Silk Road” in February 1996 in Bukhara. Scientific conferences such as “Reviving the Silk Road: Reviving Tourism and Heritage in Uzbekistan” were held. At these seminars and conferences, more than 700 scientific articles, books, and brochures were published in 27 countries. For example, at the Institute of History of the Academy of Sciences of the Republic of Uzbekistan the monograph “The Great Silk Road

in Central Asia. Essays on Culture and History” was also published [67]. Also during this event, such research projects as “Petroglyphs of Central Asia”, “Epic of the Silk Road”, “Language and Manuscripts of the Silk Road”, “Restoration of a Caravanserai”, “Spatial Archeology on the Silk Road” were implemented projects.

Within the framework of this project, “The Great Silk Road” (*Die Seidenstrasse*) in Germany, “Silk Trade in Caravans” (*Sur la piste des caravanes la soie*) in France, “China and the Great Silk Road” (*La Chine et les Routes de la soie*) at UNESCO”, a total of 400 hours of documentaries and videos, such as (*Les Potiers de Samarcande*), *Travelling the Silk Road*, “Central Asia and the Silk Road”, more than 400 special magazines and Republican newspapers [63].

Within the framework of the programme, the establishment of the Iko Hirayama research grant, a professor at Tokyo National University, and UNESCO Goodwill Ambassador, acquired great importance in the material and moral stimulation of researchers of the history and culture of Japan. The Silk Road and Central Asia. During 1990–1999, about 100 scientists and researchers received Hirayama’s grant, including 3 scientists and researchers from Uzbekistan.

3. Conclusions

In conclusion, the favourable geographical position of Central Asia ensured further activation of the Great Silk Road. It prepared the political, socio-economic and ethnocultural ground for regional and international relations. A single ethnocultural space was created in Sogd, Ustrushan, Chocha, Fergana, Chaganian, Ettisuv and East Turkestan. It was considered an important means of communication on various levels with the Chinese dynasties in the East and Iran and Byzantium in the West. Settlements of representatives of Central Asia on the Silk Road, built in different periods, created the basis for the resettlement of migrants, joining the processes of economic and cultural integration. The mediating function of the Sugdian language and writing has acquired regional and international significance, bringing together representatives of different cultures and religions. The Silk Road was the result of international relations, political stability, economic development and the cultural rise of the region in the early Middle Ages.

The Silk Road has historically played an important role in connecting different regions and countries politically, economically and culturally. At the same time, the Silk Road had global significance for its time, covering all continents.

However, with the passage of time and changes in political processes, the Silk Road has not lost its significance. In this regard, Silk Road diplomacy takes its place in the coordination of international relations in the modern world.

Also, the UNESCO “Silk Road Dialogue” programme has become one of the major international projects that have received significance in the development of mutual cultural ties between states and countries, and the strengthening of inter-civilisational ties and dialogue. Its successful implementation served not only to further develop relations within the Silk Road, but also to further strengthen bilateral and multilateral cooperation.

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Researching the Great Silk Road in Uzbekistan

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Abstract

The article discusses the role of the study of the history of the Great Silk Road in the territory of Uzbekistan. The theoretical basis of the methodological research of the article is the new ideas expressed in the works of historians of Uzbekistan – the comments and conclusions contained in lectures and speeches, as well as the scientific views of historians on this topic. There are also reflections on the comparative methodological basis of the study of the history of the Great Silk Road.

Keywords: The Great Silk Road, history, culture, great scientists, civilisation, science, education, renaissance

1. Introduction

Uzbekistan is a unique land at the crossroads of great roads and civilisations, and every time this phrase is repeated, one can feel that there is a certain harmony behind it. The gradual transition of a society from one stage of development to another in order to develop in all respects determines its level of evolutionary development. The great spiritual heritage created by our eminent ancestors ensures a worthy place in the world for our country. The Silk Road, merchants traded desirable wares from all over Asia and the Mediterranean. Gold, porcelain, spices, jewelry, textiles and just about any other commodity

that any civilisation within this vast network of trade routes could create. Along with material concerns, however, came the much more lasting and intriguing effects of cultural exchange: religious, philosophical, artistic, architectural and culinary ideas all moved with the merchant travellers from one place to the next. Some eventually spread from the Greco–Roman world all the way to China and Japan.

The Great Silk Road, with its enormous potential, has served as an important factor in the historical development of the eastern countries. The Great Silk Road is not only connected with trade in the history of mankind, but also has a unique history as a way of intercultural exchange between different peoples of the East and the West during its great history of several thousand years.

2. Material and methods

The study of the development of the Great Silk Road is one of the most important areas in the history of Uzbekistan, and to this day it is analysed as a topical area of research.

The ancient cities of Uzbekistan, such as Samarkand, Bukhara, Khiva or Tashkent, were famous on the route. One of the main branches of the Great Silk Road passing through the Samarkand region is called “King’s Road” and it stretches from Miyonkal Island between the two rivers Aqdarya and Karadarya to Samarkand and passes through the ancient cities of Kumushket, Ishtikhon, Rabinjon, Dabusiya and Karmana. According to Arab tourists who passed this road in the 9th–12th centuries, this road is located in the shade of age-old trees. What did such a road look like in ancient times? According to historians, “As a result of centuries of marching caravans, a wide and well-organised road was built, in which six, eight and twelve camels could walk in a row at the same time. The number of camels loaded in most caravans was more than three thousand. A large number of armed soldiers have been hired to protect valuable cargo.”

The relevance of the topic is that by studying the past of this historically significant route we can explore the interrelationships of the valuable information between Asian and European countries that has been preserved to this day. To do this, first of all, we can effectively use the methodology of comparative analysis of the scientific aspects of historiography.

To begin with, we present our views on the research work of historians who have been engaged in Uzbekistan to date on the topic of the history of the Great Silk Road.

Historian scholars in Uzbekistan have conducted research on the past of the Great Silk Road. As a result of our scientific research, we have divided the historiography of the study of the Great Silk Road by regions into the following:

- the history of the Great Silk Road in Western Europe. Research mainly by English and French historians;
- the history of the Great Silk Road in Asia. Investigations mainly by historians from China, India, South Korea and Japan;
- special attention is paid to the study of the history of the Great Silk Road in Central Asia, the area being one of the most important sections of the trade route.

The historiography and source studies of the Great Silk Road in Uzbekistan are divided into the following:

- Chinese manuscript sources;
- Chinese literature about the Great Silk Road translated into English and Russian;
- the literature of Asian, European and American historians;
- ancient manuscript sources in Turkish, Persian and Arabic languages;
- the Great Silk Road through the eyes of research historians in Uzbekistan.

3. Literature review

The term 'Great Silk Road' was not used in ancient times. The scientific study of the historical, geographical and cultural aspects of the route began practically in the second half of the 19th century by scholars in many countries. Scientists from Western Europe, Russia, China and Japan have made significant contributions to historical research of the of Silk Road. In particular, the Great Silk Road Encyclopedia was published in Japan. In 1877, the famous German scientist Karl Richthofen, in his major scientific work on China, called the system of roads connecting different parts of the vast Eurasian continent the Silk Road, and later adopted the term 'Great Silk Road'.

The study of the past of the trail dates back to ancient times. At the end of the 1st millennium BC, the Han Empire pursued a policy of expanding its territory to the east, sending an ambassador, Zhang Xiang, to gather information and espionage, and develop diplomacy. However, the first detailed route from the eastern Mediterranean city of Hierapolis to Serica, China, was built by the Macedonian merchant May Titian (100 AD). This information is contained in Claudius Ptolemy's *Geographical Handbook*. Ptolemy, in turn, obtained this information

from the works of the historian Marin, written between 107 and 114, which have not survived. According to these sources, the Great Silk Road was divided into two major sections: from Hierapolis to Tashminor (Tashkurgan) and from Tashminor to Serica [1]. The Central Asian part of the road started from Aria (an ancient region in the south of present-day Turkmenistan and northwestern Afghanistan). The route from Aria went north to Antioch in Margiyana (the ruins of the ancient city of Merv near Bayramali), then turned east to Bactria (Balkh in northern Afghanistan). From here the road turned north, crossed the Amudarya around Termez, and then went in two directions. The first, along the north, went through the Iron Gate to Marakand (Samarkand), and from there to Fergana. The second, south, led along the Surkhandarya valley to the mountainous region of Qorategin. Both routes led to Tashminor. Some scholars believe that it is located in the territory of Tashkent, others in the Alay valley [2]. After Tashminor, the road stretched beyond Central Asia, with a “merchant camp” around Ergashtom, and then through the Takla Makan Desert to Dunhuang, then to the ancient Chinese capital, Chanang. From here the road probably went to the northwest to Korea and Japan [2, 3].

In the process of conducting research on the history of Uzbekistan, the study of the history of the Great Silk Road is one of the new directions in teaching students the history of their country. Many of our scientists have conducted research on the formation of the Great Silk Road and its contribution to world development [4, 5].

The book *The Great Silk Road* by the famous archeologist and academician Edward Rtveladze contains a lot of information about the historical sites of the route through the territory of Uzbekistan [6]. The book contains information about the sites of the Great Silk Road, associated with the activities of Chinese merchants of ancient Uzbekistan. Ablat Khujayev's book *The Great Silk Road: Attitudes and Destinies* contains a wealth of scientific information on the history of the area [7]. We can also mention the studies of Abdukhalik Abdurasul oglu: *The Great Silk Road, Chin and Mochin*, and others [2]. Cooperation of Uzbekistan with Asian countries on the restoration of the Great Silk Road is analysed in depth in A. K. Kyrgyzbaev's monograph *International cooperation of the Republic of Uzbekistan with Asian countries* [1].

4. Conclusions

The Great Silk Road is not only a caravan route but also a process that has left an indelible mark on the history of Eurasian civilisation and served as a great

factor in its all-round development [8]. In short, the history of the Great Silk Road can be established through large-scale historical studies, in the direction of scientific research of the cultural and educational heritage of the route. This kind of investigations serves as a basis for us historians to study the past of the Great Silk Road in different aspects. In the history of Uzbekistan, there is every reason to study the subject, because the trail has contributed to significant advances of the science and culture of the country, the development of ancient cities, of economy, diplomacy and culture.

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Social aspects of digitising the history of Uzbekistan

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Abstract

This article is dedicated to the philosophical analysis of the problem of digitisation of the history of Uzbekistan. The relevance of the issue is also connected with the key aspects of national identity and pride. The digitisation of historical information can contribute to the construction and reinforcement of national identity. Making historical records accessible and engaging helps citizens connect with their roots, fostering a sense of pride and attachment to their cultural history.

Keywords: socio-philosophical aspects, digitisation, Uzbekistan, national identity, paradigm, digitisation of consciousness, values

1. Introduction

The study of socio-philosophical aspects of the digitisation of the history of Uzbekistan is very relevant in the conditions of the modern era, when integration of digital technologies is changing various aspects of social life. “In addition, the changes in civilisation that are taking place today affect people’s ideas and attitude to life values. The fact that the modern global problems of human civilisation are closely related to human values is considered one of the urgent issues of today. Therefore, it is important even today to renew socio-cultural relations for Uzbekistan and for all models of civilisations” [1].

Digital history, in addition to digitising the past, serves to develop scientific research in the field of history and present the results of scientific research to the public in new ways in an interactive way. This approach to studying and presenting historical information is known as digital history. With digitising historical documents, sources and other materials related to the history of Uzbekistan, there is a tendency for researchers to use their information and to communicate it openly to the public. First of all, it helps to preserve the cultural identity of the country. Second, digitisation helps make historical knowledge available to a wider audience. Through online platforms, educational institutions and digital archives, people can access historical information more easily. It should help raise awareness of Uzbekistan's rich history and help better understand the country's cultural evolution. In addition, digital tools allow historians, sociologists and other researchers to analyse historical data more effectively. A lot of data analysis results may not be immediately obvious through traditional research methods. Digital technologies can reveal trends and insights into the data's meaning and content. This leads to a deeper understanding of the socio-philosophical aspects of the history of Uzbekistan.

The urgency of the problem is also related to the main aspects of national identity and pride. Digitisation of historical data helps to form and strengthen national identity. Through the interactive visualisation of historical sources, the use of information from online platforms allows researchers to enrich their research. Therefore, in a number of scientific research institutes and universities of developed countries, issues of digitisation of history, problems of creating concepts and models of the future, and forecasting a new perspective of history are being researched.

The study of the socio-philosophical aspects of the digitisation of history is an interdisciplinary field, involving scientists from various scientific specialties. Researchers and scholars with expertise in history, philosophy, sociology, cultural studies, digital humanities, computer science and related disciplines can contribute to understanding the implications of digitising historical sources. Today, scholars in the digital humanities investigate how digital technologies affect the study of history, literature and culture. They use interactive sites to research, learn and discuss ways to digitise historical texts, sources and other materials. An example can be The Cold War International History Project (<https://www.wilsoncenter.org/program/cold-war-international-history-project>), containing a variety of materials on the origins, escalation and end of the Cold War. Founded in 1991, this digital project is overseen by the Wilson Centre's History and Public Policy Programme (<https://www.wilsoncentre.org/program/>

history-and-public-policy-programme). It contains declassified historical materials, including photographs, diplomatic documents, high-level correspondence and meeting minutes. Historical information is presented in essays, timelines, maps and video formats. In addition to the use of archival documents, oral history materials can also be found in abundance. Within the practical project of the Coordinating–Methodological Centre on the Latest History of Uzbekistan, functioning under the Academy of Sciences of the Republic of Uzbekistan, there are four books and albums on the contribution of Uzbekistan during the Second World War. In addition, historians, especially those specialising in modern or recent history, are investigating the impact of digital tools on historical research methods, the preservation of historical materials and the presentation of historical narratives. In Uzbekistan, cultural studies researchers prepare the intersection of culture, technology and society through digital materials. Analysing how digitisation affects cultural heritage, collective memory and the formation of national identity, critical thinking is one of the key skills for digital historians. Uzbek philosophers study the philosophical impact of technological progress. Philosophers consider the ethical, cultural and social aspects of digitisation, including its implications for understanding history.

It should also be recognised that specialists working in archives and libraries play a decisive role in the digital preservation of historical documents. They can learn best practices in digitisation, data creation and long-term preservation.

Scientists like Lev Manovich work in digital humanities system. Manovich has contributed to cultural analysis and the understanding of the impact of digital technologies on culture and history. In 2017, Lev Manovich's collection of articles *Theories of Soft Culture* was published in Russian. In his work, the author conceptualises new media in the context of the history of art, film, media and design, and raises the question of how “cultural software” and “information aesthetics” are changing our behavioural strategies and ways of perception. Manovich discusses how new technologies can reveal invisible layers of modern culture and how this changes our understanding of culture and ourselves.

Another scholar was Roy Rosenzweig, a noted historian and key figure in the field of digital history. His works, including *Digital History: A Guide to Collecting, Preserving, and Presenting the Past on the Web*, have influenced the study of history in the digital age. Dan Cohen, former executive director of the Digital Public Library of America, participated in a discussion about the intersection of technology and history, including issues related to digital archives and their accessibility [2]. Historian and digital humanist Tim Hitchcock has participated in various digital history projects exploring how technology can change

historical research and representation [3]. The main difference between a digital historian and an ordinary historian is that he conducts research integrated with computer technology when working on historical projects.

The issues of digitisation and its consequences are also relevant in the Republic of Uzbekistan and are being studied by leading scientists of our country. In particular, this problem is being developed within the framework of the international project of the National University of Uzbekistan and the State University of Belarus “Socio-cultural and axiological foundations of the formation of the consciousness of the youth of Uzbekistan and Belarus in the conditions of modern challenges and threats”. The historical features of the formation of digitisation were addressed by T. Toylokov [4], or by Q. Mominov and M. Komolov, while some legal aspects [5] were studied by A. Akromov [6] and a number of other scientists.

When accessing specific scientists, it is also useful to look at academic institutions and research centres that are leaders in digital humanities and historical studies. Institutions such as the Roy Rosenzweig Center for History and New Media (Virginia), the Digital Humanities Summer Institute (British Columbia) or the Center of Digital Humanities Research (Texas) often host scholars and projects related to the digitisation of history.

A multidisciplinary approach that includes history, philosophy, sociology, cultural studies, digital humanities and related fields is a key skill to explore the socio-philosophical aspects of digitising history.

2. Research methodology

The article addresses approaches such as comparative research methods analysis, synthesis, literature review, case studies, critical discourse analysis, philosophical research, theoretical foundations or critical evaluation of technology. By combining these methods, we can have a holistic understanding of the socio-philosophical aspects of history digitisation in Uzbekistan or any other context. A digital historian examines the authenticity of a variety of written sources, archival documents and historical materials and integrates them with computer technologies, while the socio-philosophical aspects of digitisation enable detailed examination of the cultural, ethical and social aspects of the data.

As an example, let us analyse the problem of the techno-media sphere of the society as factors of socialisation and upbringing of the young generation. Studying the problem of the techno-media sphere of society with the help

of socio-philosophical analysis as factors of socialisation and upbringing of the young generation is very relevant for several reasons. First, modern society is experiencing rapid and continuous development of information and communication technologies. This has a strong influence on the socialisation and education of the younger generation. Mobile devices, the internet, social networks and other media platforms are changing the way we interact, learn and share information, which requires in-depth analysis. Second, technology and mass media have a strong influence on the formation of values, worldviews and cultural imaginations of young people. This may include issues of personality, morality and attitudes toward various aspects of life. Third, technology is changing how young people socialise and learn. Studying this topic helps to understand how young people adapt to modern problems and how society supports their development and social inclusion. Also, with the development of technology comes ethical issues related to the use of mass media and digital platforms. Studying these aspects helps to develop guidelines and standards for ethical and responsible behaviour in the digital world. In addition, globalisation and access to world information create new opportunities and challenges for the interaction of different cultures and worldviews. This is important for understanding how the media sphere shapes intercultural relations and worldviews. Studying these issues through socio-philosophical analysis allows for a deeper understanding of the fundamental aspects of the impact of technology and mass media on society and the young generation, and also offers theoretical and philosophical tools for analysing and interpreting these phenomena.

There are many scientists who have made a great contribution in the field of researching the problems of digital literacy and socialisation of young people, analysing the impact of modern technologies on the formation of values and skills. In particular, Henry Jenkins is one of the leading researchers in the field of media and cultural studies. He studies the impact of media and technology on youth and society, as well as digital literacy [7, 8]. Danah Boyd is a well-known technology and social media researcher. Her research focuses on how young people use and interact with digital platforms. In her PhD dissertation *Taken out of Context: American Teen Sociality in Networked Publics* she investigated social networking sites. Sonia Livingstone is a professor of media and communications. Her work *Digital Technologies in the Lives of Young People* includes an analysis of the impact of digital literacy and media on the development of skills and values among young people. Another scholar, renowned psychologist and sociologist Sherry Turkle, studies the impact of technology on interpersonal interaction and socialisation. Her work, in particular the book *Living Voice. Why talk and*

listen in the digital age, is about the use of modern technology by young people. Julian Sefton-Green studies the impact of digital media and media education on young people's socialisation and learning. Annette Markham is an anthropologist and social media researcher who analyses the cultural and social aspects of digital technology use. These and other researchers are studying the impact of modern technologies on the socialisation of young people and the formation of their values and skills, which makes this topic relevant and allows a better understanding of the changes taking place in modern society [9].

Digital literacy and youth socialisation are closely related, and modern technologies have a significant impact on the formation of values and skills in the younger generation. The social status of the family also has a significant effect on the attitude and behaviour of the individual, because it predetermines the type of social environment. The higher the status of the family, the richer the value proposition. As the individual matures, along with the strength of family ties, the importance of external reference groups also increases. These include peer communities, the school community, and early informal and formal organisations. An important point here is that the relations of reference groups correspond to family relations, thereby strengthening the primary socialisation of the individual [10]. In particular, it is related to issues of access to information. After all, with the advent of the Internet and smartphones, young people have unlimited access to information. This allows them to quickly learn new facts, addressing topics of interest quickly and easily. However, it is important to teach young people to analyse and think critically so that they can distinguish true from false information. Access to the Internet and various educational resources allows one to acquire knowledge and skills in various fields. Young people will be able to learn new subjects, engage in interesting research and improve their professional skills. It helps build digital literacy and develop critical thinking. Modern technology is also changing education itself. Young people can learn online, learn new languages, programming and other skills. This opens up new opportunities for career growth. However, it shows how important it is to ensure everyone has access to education and technological resources to prevent the digital divide.

In addition, social networks and messengers allow young people to get information about friends, events and news. It encourages socialisation, supports connections and communication with people, even if they are located at great distances. However, it is important to teach young people to critically evaluate information and separate facts from opinions. Young people access information and media resources through the Internet. This enables them to be aware

of current events and various socio-cultural aspects. In addition to the above, the Internet gives young people the opportunity to explore their interests and hobbies, find like-minded communities and share knowledge. It helps in the development of skills and competencies in various fields and helps in socialisation.

Young people can use smartphones and online services to solve everyday problems such as searching for information, ordering goods and services, planning routes, etc. It develops digital literacy and helps them adapt to modern life. It should be noted that despite all the benefits, access to information also brings risks such as digital addiction and misinformation. Therefore, educational programmes and parents should teach young people to analyse, evaluate and use information responsibly.

Social networks and mass media influence the formation of social values of young people. They may be inspired by different behaviours, active or consumer lifestyles. We can list the ways in which social networks influence the value orientations of young people as follows:

- *Influencing forms of behaviour*

Young people, especially teenagers, often imitate the behaviour they see on social media and in the media. Posts by celebrities, bloggers and other influential people can create standards of appearance, behaviour and what is considered successful or desirable. It can form values related to appearance, lifestyle and material wealth.

- *Affecting the mind*

Mass media and social media can shape public opinion on a variety of issues, including politics, social justice, the environment, and more. Young people can develop their beliefs and values by learning and discussing these topics online. However, it is important to remember that the media and social media can be biased or show one side of the issue.

- *Developing cyber immunity*

Social networks and media algorithms can create cyber immunity by providing users with content tailored to their preferences and opinions. This is to further increase the effectiveness of existing beliefs, to increase the cyber potential and worldview of young people, to strengthen their ideological immunity, and to preserve the historical heritage, customs and traditions of national education of our people, and interreligious tolerance among broad segments of the population, especially among young people, provides an atmosphere of international harmony and mutual kindness.

- *Engaging in social activity*

The trend of digitisation of history in modern society, relying on national characteristics in the study of the history of different peoples and nations, taking into account the objective laws of historical development, attempts to manipulate the minds of young people by falsifying history, etc. Such positive effects as creativity can be considered in the context of the changes of the period, reflecting the digitisation of history.

- *Getting to know different cultures and views*

Social media and mass media also provide opportunities for young people to learn about different cultures, religions and beliefs. It helps to understand tolerance and diversity. It should be noted that the influence of social networks and mass media on the social values of young people can be both positive and negative. Educators and parents can help young people develop critical thinking, analyse information and understand how they are affected in the online environment. In particular, it is important to discuss digital ethics, emotional well-being and online relationships with young people.

Smartphone and social media addiction can have a negative impact on the mental and physical health of young people. It is important to teach them moderation, to use technology to achieve personal and professional goals, and not to become isolated and dependent on it. Young people must learn to use digital technologies wisely and responsibly. This includes understanding digital threats, online safety, time management, protecting personal data and tackling digital addiction. These skills and knowledge help maintain mental and physical health. In addition, modern technologies, including the use of computers and mobile devices, can lead to a sedentary lifestyle and physical inactivity. It is important to incorporate digital literacy into the context of physical health, such as teaching young people to take breaks and active pauses during prolonged use of devices. In addition to physical health, the mental health of young people is also important. It is well known that the Internet can be a source of stress, anxiety, depression and even cyberbullying. However, when used correctly, it can be a source of support, mental health information, and a way to connect with psychologists and counsellors. Young people can use technology to support emotional well-being, such as meditation apps, sleep trackers and apps to communicate with loved ones. They can learn to manage stress and emotions through digital resources.

3. Conclusions

A holistic approach to digital literacy and youth socialisation should focus on the relationship between technology, health and well-being. It helps young people develop the skills they need to live successfully and safely in the digital age. In general, modern technologies have a great influence on young people and shape their values and skills. It is important to balance the benefits and risks when teaching young people about digital literacy and responsible use of technology. The study of the socio-philosophical aspects of the digitisation of history in Uzbekistan includes the study of how the introduction of digital technologies affects and shapes the understanding of the nation's history, culture and identity. In conclusion, it should be noted that the study of the socio-philosophical aspects of the digitisation of history in Uzbekistan is a complex and multifaceted task that includes the study of the intersections of technology, culture and identity. The digitisation of historical resources and information creates opportunities and challenges that affect how a nation's history is perceived, preserved and communicated. As scholars, politicians and stakeholders explore the socio-philosophical aspects of digital history in Uzbekistan, it is important to maintain a scholarly and interdisciplinary approach. Collaboration between historians, philosophers, technologists and the public helps develop ethical frameworks, educational strategies and cultural policies that align with national values and aspirations. Ultimately, a thorough study of the socio-philosophical aspects of digital history is essential to shaping a dynamic and inclusive narrative about Uzbekistan's past in the digital age.

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Cultural heritage features for digital tourism development in Central Asia (the case of Uzbekistan)

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Abstract

The subject of this article is the rise of the tourism industry in Uzbekistan, focusing on the digital transformation of the tourism sector. Measures in the law documents regarding the digitisation of tourism in the country are discussed. The support provided for startup businesses and new business ideas in the tourism industry is highlighted. Analysis of the online booking of hotels, plane, train and bus tickets, and automobiles for hire, as well as the organisation of virtual tours, was a necessary step in the process of digitising the infrastructure of the industry. The conclusions offer some recommendations for improving the digitisation system in order to increase the tourism potential of Uzbekistan.

Keywords: Central Asia, digital tourism, Uzbekistan, cultural heritage Introduction

1. Introduction

Cultural heritage features play a significant role in promoting tourism development in Central Asia, particularly in countries like Uzbekistan, which boasts a rich historical and cultural legacy. *Historic Cities and Architecture*: Uzbekistan is renowned for its ancient cities such as Samarkand, Bukhara or Khiva, which feature stunning Islamic architecture, including mosques, madrasahs and

mausoleums. Digital platforms can offer virtual tours, interactive maps and detailed information about each architectural marvel, allowing tourists to explore these sites remotely before visiting in person. *Silk Road Heritage*: As a prominent stop along the historic Silk Road, Uzbekistan holds immense cultural significance. Digital tourism initiatives can highlight the Silk Road routes, archaeological sites and trading posts scattered across the country, offering insights into the vibrant exchange of goods, ideas and cultures that occurred along this ancient trade network [1].

Digital tourism development in Central Asia holds significant potential for promoting the region's diverse cultural, historical, and natural attractions while enhancing visitor experiences and stimulating economic growth.

Digital Platforms and Infrastructure: Invest in robust digital platforms and infrastructure to support tourism initiatives, including user-friendly websites, mobile applications and online booking systems. These platforms should offer comprehensive information about tourist destinations, accommodations, transportation options and local attractions.

Virtual Tours and Experiences: Develop virtual tours and immersive experiences that allow travellers to explore Central Asia's cultural heritage sites, historic landmarks and natural wonders from anywhere in the world. Utilise technologies such as virtual reality (VR), augmented reality (AR), and 360-degree videos to provide interactive and engaging experiences.

Multilingual Content and Localisation: Ensure that digital tourism platforms offer multilingual content and localisation features to cater for diverse audiences and facilitate seamless communication with international travellers. Translate website content, navigation menus, and essential information into major languages spoken by tourists worldwide.

2. Digital tourism development in Uzbekistan

During this time of globalisation, our country is going through considerable reforms, the primary focus of which is on digitising a variety of different industries. In particular, the tourism industry is not an exception to this rule. The researchers O. Kononova et al. highlight the significance of digital transformation models in the tourism industry. These models combine contemporary digital technologies such as databases, artificial intelligence, virtual reality and information technology [1]. Uzbekistan is considered in a number of legal texts that address issues related to tourism development. On July 18, 2019, [2]

the law titled *On Tourism* was approved by the Republic of Uzbekistan. During the course of the global spread of the coronavirus pandemic, there was a discernible increase in the propensity toward programming, digitisation and activities that take place in virtual environments across a number of different industry sectors. A directive was issued by the President of the Republic in order to provide assistance to the tourism industry during the pandemic. This directive also lays the legislative groundwork for the digitisation of the tourism sector. Extra subsidies amounting to 1.5 billion soums, [3] will be provided to tour operators in order to encourage the development of new projects and innovative business ideas within the tourism industry. These subsidies will be allocated exclusively for information programmes and services that are intended to improve the convenience of tourists. In accordance with the process of establishing a technology park for software products and information technologies, this is in keeping with the trend. The foundations for support have been laid. Another important legal document concerning the digitisation of the tourism industry in Uzbekistan is the decree prepared by the President on April 26, 2023 [4]. It was titled “On additional measures to rapidly develop the tourism potential of the Republic and further increase the number of domestic and foreign tourists.” Within the realm of the implementation of contemporary information technologies and the digitisation of the sector, the following rules and regulations have been established in accordance with this decision:

- Creating a fully digital system for visitor evaluation using QR codes to establish a unified electronic registry for certifying tourist services and classifying tourism industry facilities and accommodation options.
- Displaying the precise locations of tourist attractions in the Republic, together with their accurately spelled names in Uzbek, Russian and English, as well as providing concise information about them on extensive interactive maps and web apps.
- Non-governmental non-profit organisations and local initiators in the tourism sector can receive up to 5 billion soums annually for projects that involve creating interactive electronic platforms (mobile applications) for trip planning, forming tourist packages and exploring new travel opportunities through a grant allocation system [4].

According to the legal documents that were quoted, the tourism industry is currently undergoing electronic development as part of start-up and innovative projects. Using such technological facilities on their own, without the assistance of specialised travel firms or trip providers, is a very convenient option for travellers. In order to assist the pre-booking of aircraft tickets,

transportation vehicles, hotels and restaurants in Uzbekistan, we have investigated an assortment of electronic platforms and mobile applications that have been specifically built for the country.

Online booking of hotels

Uzbek, Russian and English are the three languages that are supported by the Mybooking.uz website (<https://mybooking.uz/uz>), which provides accessibility to relevant information. The website has information about 725 hotels and gives customers the ability to search for specific accommodations in Uzbekistan based on location, length of stay and room capacity. The online booking system offered by Booking.com supports 45 different languages; however, Uzbek is not one of them. It was determined that there were 395 results for hotels in Samarkand, and these results were classed as such. Through the use of the Mybooking.uz website, 115 hotels were encountered. It is of the utmost importance to improve the effectiveness of the national search system and to include new information into the database.

Reservation of transport vehicles

Multiple smartphone applications have been developed for taxi services in Uzbekistan. Commonly used programs include YandexGo, MyTaxi, Uklon, Milliy Taxi Driver, Taxi Millenium and others. There are limited simple apps available for pre-booking vehicles tailored for cross-country travel. The TravelCars application is one of these electronic advancements. TravelCars is a smartphone application designed for booking transportation services such as cars with drivers, minibuses and buses for travel throughout Uzbekistan. The application contains information in Uzbek, Russian and English, with a total of 32 vehicles available for booking, including 12 cars, 6 minibuses, 3 vans, 3 buses and 8 VIP cars. Another benefit of this electronic advancement is that the program displays information like weather, exchange rates and the most popular destinations by region.

Participate in a virtual tour

United Arab Emirates-based information technology professionals are responsible for the development of the Izi.Travel Guide smartphone application. There are 18 audio-recorded excursion itineraries that cover tourist sites in four cities in Uzbekistan: Tashkent, Bukhara, Samarkand and Nukus. These itineraries contain information about travelling to Uzbekistan. The material consists of audio recordings in both Russian and English. The Uzbek language and other foreign languages that are not identical, but have similarities are being incorporated into practical undertakings in our country. Due to the fact that the projects are still in an incomplete state, it is difficult to obtain information on them.

Airline, train and bus ticket booking

Mobile applications such as EASYBOOKING.UZ, UzBUS, Uzrailway tickets, and Uzbekistan Airways are examples of mobile applications. These platforms are the most popular ones for making reservations for tickets in Uzbekistan.

3. Conclusions

Sustainable Tourism Practices: Promote sustainable tourism practices and responsible travel behaviours through digital platforms and educational campaigns. Raise awareness about environmental conservation, cultural sensitivity and community empowerment to ensure a long-term viability of tourism development in Central Asia. By embracing digital tourism development strategies, Central Asian countries can unlock new opportunities for economic diversification, cultural exchange and sustainable growth while showcasing the region's rich heritage and natural beauty to the world. Collaboration among governments, tourism stakeholders, and technology partners is essential to realising the full potential of digital tourism in Central Asia.

Firstly, for the development of the tourism sector within the framework of the Digital Silk Road, it is advisable to accelerate the joint projects “Silk Road visa”, “One trip – the whole region” carried out by the countries of the region, as well as to create a portal that will combine the history and cultural heritage of Central Asia. In order to further develop economic and cultural ties, implement the concepts of “sustainable tourism” and “smart tourism” in Uzbekistan.

Secondly, *Develop User-Friendly Websites and Apps:* Create user-friendly websites and mobile applications that offer comprehensive information about tourist destinations, accommodations, transportation options, and cultural attractions in multiple languages. Ensure that these platforms are accessible to a wide range of users, including those with disabilities.

Thirdly, *Promote Virtual Tours and Experiences:* Collaborate with tourism stakeholders, cultural institutions and technology partners to develop high-quality virtual tours, 360-degree videos, and immersive experiences that allow travellers to explore Uzbekistan's cultural heritage sites and landmarks remotely. *Offer Multilingual Content and Localisation:* Translate digital tourism content, navigation menus and essential information into major languages spoken by tourists worldwide to cater for international visitors and facilitate seamless communication. *Promote Sustainable Tourism Practices:* Raise awareness about such practices as environmental conservation and cultural

preservation through digital platforms and educational campaigns. Encourage responsible travel behaviour, support eco-friendly initiatives and highlight destinations that prioritise sustainability and community empowerment.

By implementing and improving these proposals, Uzbekistan will be able to strengthen its digital tourism infrastructure, expand its online presence and attract a wide range of travellers interested in exploring the country's rich cultural heritage, historical sites and natural landscapes.

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The dynasty that built Registan Square

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Abstract

This article highlights Imam Quli Khan, a representative of the dynasty, which formed the Registan square, which is considered the heart of the city of Samarkand, and the sheikhs and emirs of Samarkand who played an important role in his accession to the throne. In addition, information is provided about the weapons used during the dynasty.

Keywords: Samarkand, Registan square, Imam Quli Khan, Abulqasim Sheikh, Polish scientists

1. Introduction

Registan Square, which is considered the heart of Samarkand city, located at an intersection of the Great Silk Road, has been adding to the city's beauty since its creation. The complex, with its bright colours and magnificence, has attracted the attention not only of tourists, but also foreign researchers.

The use of IT technologies in the preservation and study of historical monuments in the complex has been carried out in cooperation with Polish scientists [1–4]. It was already addressed by this author in a previous article [5]. Below, we will talk about the activities of the representatives of the Ashtarkhanid dynasty, who ruled in Samarkand during the period when this area was formed.

2. Materials and method

The events of the period when Registan square was built, the years of Ashtarkhanid ruler Imam Quli Khan's rule, are covered in such manuscripts as *Bahr al-asrar fi manakib al-akhbar*, *Silsilat as salatin*, *Tarihi Sayyid Raqim*, *Imamqulinoma*. But these works have not been translated into Uzbek. Copies of their manuscripts were used to write the article. Also, in the analysis of these data, the principles of historical comparison, chronological consistency, cause, process and result dependence, objectivity, historicity and systematicity of historical knowledge are used.

The formation of the Registan complex corresponds to the initial stage of the rule of the Ashtarkhanid dynasty. The question naturally arises: how did the Ashtarkhanids come to power? It can be answered as follows.

3. The origin of the Ashtarkhanid dynasty

In the 13th–14th centuries, the Tokai Timurids (the Ashtarkhanids or Janians) lived in the western part of their relatives, the Shaybanites. They rarely lived as nomads and lived on the northeastern shores of the Caspian Sea. As the Altin Horde (Zhoji ulus) weakened, it was divided into a number of small governorates [6, 7]. As a result of this division, the Ashtarkhan khanate was formed in Volgaboyi lands in the 1430s. "Astrakhan" is the Russian form of Ashtarkhan. "Ashtarkhan" is derived from the word "Haji Tarkhan". Tarkhan is considered one of the privileged titles in the life of Turkic-speaking peoples and existed since the time of the famous Khazar Khaganate [8].

In the middle of the 15th century, Abai's brother Uz Temur bin Tokai Temur, a descendant of Joji, established the khanate power in Kazan and Crimea [9, 10], while the descendants of Abai's relative Muhammad established their power in Astrakhan on the north-western coast of the Kasbi Sea [11]. Yor Muhammad Khans grandfather Javak and father Mangishlag lived in Astrakhan, but they did not become the khans of Astrakhan. Their relatives, two brothers of Javak – Ahmed and Mahmud ruled Astrakhan [12, 13]. In the work *Bahr al-asror* Tokai are called Timurites, in the work *Tarihi Muqimkhani* they are called Ashtarkhanis, and in some works they are also called Janis [14]. We found it permissible to call them Ashtarkhanis.

The exact time of the arrival of the Ashtarkhanids in Movorounahr is still a matter of controversy. According to the work *Bahrul Asrar*, Yor Muhammad's father Mangishloq, in *Imamkulinoma* Baghishlov [9], came to Movorounahr with

his family in 1528 [10]. However, according to other sources, Yor Muhammad Khan and his family visited Movorounahr in 1556 [13], because the Russians conquered Astrakhan. Yor Muhammad Khan's children – Joni Muhammad, Abbas Sultan, Tursun Muhammad Sultan, Pir Muhammad Sultan and his wife came to Movorounahr [14].

4. Management of the Samarkand region by the Ashtarkhans

Iskandar Sultan Yor Muhammad, the father of Abdullah Khan II, the ruler of Bukhara at that time, welcomed Yor Muhammad and his family members and married his daughter Zuhrobegim to Joni Muhammad, the son of Yor Muhammad. Jonibek and Zuhrobegim had 3 sons. They were Din Muhammad, Baqi Muhammad and Wali Muhammad [13]. In turn, Abdulla Khan II entrusted Joni Muhammad with the authority to manage the territory of Samarkand. But after his death, his son Abdulmomin sent Muhammad to the Balkh region [14].

5. Description of research

Imamquli's struggle to occupy the throne of Bukhara

What factors caused the transfer of power from Wali Muhammad Khan to Imam Quli Khan? It is mentioned in "Imamqulinama" that the emirs and the population turned away from him due to some bad actions of Wali Muhammad [15]. As a result, the emirs of Bukhara put the governor of Samarkand, Imam Qulikhan, on the throne of Bukhara in 1611. Enraged by this, Wali Muhammad captured the fortress of Samarkand.

Wali Muhammad used different tactics while capturing the Samarkand fortress. As in the Timurid dynasty, during the Ashtarkhanid dynasty, tabl (drums) and flutes were played and the flag was raised before the battle. It is said that among the weapons of war there were manjaniq⁴, arroda⁵, dig⁶, tavar⁷,

⁴ A weapon used to throw stones and fire in battle.

⁵ A catapult-like weapon used for throwing stones.

⁶ Kazan.

⁷ That is an ax.

zamburak⁸, ladder and various weapons: tir, tofang⁹ and 200 carts, and they were used in this war. The leader of the soldiers was called a solor and had a helmet on their head. Wali Muhammad Khan divided his soldiers into groups while occupying the fort. One group struck a gate with a hammer¹⁰, another shot bows, and another group of armoured warriors are shown fighting on horseback with their blades unsheathed. But the occupation of the central part of the main fort was carried out by Wali Muhammad himself, and the city was occupied [16].

After Wali Muhammad occupied the fortress, Bukhara emirs and army chiefs came to Imamquli and asked him to become the king, and they consulted Wali Muhammad to capture the Samarkand fortress. Among the commanders, Nazarbi, Qulbondey, Shahmurad, Boyim Muhammad, Khojamberdi from the Katagan tribe, and Tangriberdi from the emirs came with 200 soldiers, supported him in the fight against Wali Muhammad, and expressed their obedience to Imam Qulikhan [17].

Moral support

Baqi Muhammad and Wali Muhammad cooperated with Abdurahim Khoja during their reign. In the battles with his nephews, Wali Muhammad received help from his Bukhara intercessors, while Imamquli relied on a number of famous Samarkand sheikhs. The most famous among them was Hashim Khoja Dahbidi [15]. Khoja Hashim Dahbidi, son of Muhammad Amin and grandson of Ahmed Kosani, was from Samarkand. When the relationship between Wali Muhammad and Imamquli and Nadr Muhammad worsened, Hashim Khoja joined Imamquli Khan [18, 19]. In order to join forces with his brother Nadr Muhammad, Imamquli fled south, i.e. to Balkh. Hashim Khoja stayed in Samarkand. Here he opposed Baqi Biy Kalmaq, who was appointed as the governor of Samarkand, and did everything he could to help Imam Qulikhan take power. Later, Baqi Bey Kalmaq [20] faced so much resistance from the people of Samarkand that he himself had to go to the side of Imam Quli Khan [21]. In a situation where a fight was inevitable, Imamquli said that he was worried about it. Khoja Hashim told him not to worry and inspired him to victory [22]. So, in the battle between them, Imam Quli Khan got the upper hand and was able to sit on the throne.

⁸ Cannon.

⁹ Rifle.

¹⁰ Heavy stone weapon.

Imam Quli Khan's consultation with government officials

When Imamkuli was the governor of Samarkand, he reopened the entrance to Gori Amir, which increased the loyalty of the population to him [22]. In addition, he was supported by religious scholars in Samarkand. He remembered their help during the 1611 coronation ceremony. This is the work of Imamkulinama: *هعلق ختف باب د ناگرا ب مال غ نودرگ هاشن هش و ماقتنا رهپس نامرق ندومن تروش* (in Persian: 'to consult the hero of Sepehr Neftam and the emperor Gerdon Gholam Bargan about the conquest of the Samarkand castle'; content: detailed information is given in the chapter on the consultation of the ruler (Imamquli) with the Ayans to conquer the Samarkand fortress [21]. Among those who participated in this ceremony were Khoja Hashim Dahbedi, Hashim's brother Salih Khoja Dahbidi, Kubravi sheikh Yusuf Karaboghii [23], and Olim sheikhs, a student of Kasim sheikh from the Yasawiya sect. According to the work, Abul Qasim from the Khojagan sect sat on the right side of Imam Quli Khan, and the famous amir Hasan Khoja took a place on the left side. In addition, it was mentioned that the ruler appointed some persons for certain tasks in this meeting. For example, Hasan Khoja is appointed to the position of Naqib [24]. During the meeting, among the dignitaries, Abul Qasim from the Khojagan sect spoke and said that they recognised Imam Qulikhan as the ruler and were ready to serve him. He suggested to the ruler that before marching against Wali Muhammad, he should send three men to settle this battle peacefully, and give him whatever he wants to hand over the fortress of Samarkand to Wali Muhammad Khan. Then Imamquli decided to send Sheikh Abulqasim to make peace with Wali Muhammad Khan [23]. So, as a result of the battle between the two, Wali Muhammad Khan was defeated and Imam Quli Khan took the throne. Bahadir Yalangtosh was the governor of Samarkand at the time of his accession to the throne.

6. Results

By researching the information about the studied period presented in the primary sources, new information was revealed about the origin of the Ashtarkhanid dynasty, which ruled during the formation of the Registan complex, the events of the accession to the throne of the representative of this dynasty, Imam Qulikhan, and the methods and weapons used by Wali Muhammad Khan in his battle to capture the Samarkand fortress.

7. Conclusions

In conclusion, it can be said that the Registan Square, located in the centre of Samarkand city, was formed in the first half of the 17th century, during the reign of Imam Quli Khan, a representative of the Ashtarkhanid dynasty, and got its present appearance.

Despite the fact that the events of Imamquli Khan's accession to the throne have been studied by several researchers, an adequately detailed account has not yet been provided. An attempt was made to solve this problem by researching the work of Imamqulinama, which was considered the primary source of that time.

Based on the results achieved, the contribution of sheikhs and a number of emirs from the Khojagon sect to the conquest of the throne of Bukhara by Imam Qulikhan was incomparable. The work "Imamkulinoma" describes the fighting methods and weapons used during this dynasty. According to it, weapons such as rifles and cannons were used during battles in the Bukhara Khanate even in the 17th century. A comparison of these weapons with those used in European countries, especially in Poland, at the same time leads to interesting results.

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The role of information technology in the development of the cultural and architectural heritage of Uzbekistan

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Abstract

Modern information technologies have changed communication, providing the opportunity to choose its form. Modern media are becoming dynamic as a new means of sociocultural communication and cultural exchange. Multimedia technologies have transformed the function of creating and promoting cultural heritage.

The preservation of historical data through software for the use and management of cultural heritage is the main objective of our research. The creation of applications for the preservation of cultural heritage data is not a technical problem but a cultural one, since the methodology and technology for their creation and development must be developed. Creating images of historical and architectural objects in 3D with the help of Google Street View will be the basis of the future application for Android.

The purpose of the research is to collect high-quality camera images of the objects under study, gather data based on each cultural heritage site, and disseminate them by translating into three languages, placing object data in the Google map navigator on a social network. The mobile application shows the location of historical and architectural objects using a Google map. A video image and a 3D image of the object are also displayed. Through this application, one can view videos and photos about the location and its attractiveness as a culturally historical object. The use of this application for historical preservation and tourism purposes should be reproduced in future systems.

The goal of such projects is to establish a regional segment of cultural heritage networks through the creation and development of collections of information resources. Creating a collection allows to: expand access to information resources; ensure the development of sufficient and protected resources to support the vital activity and viability of the region, its sustainable functioning and development; and protect regional cultural values.

1. Introduction

Cultural and spiritual heritage is an invaluable treasure of the people, which is necessary for the education and development of the younger generation, and the formation of a new statehood. The cultural and spiritual heritage must be treated very carefully, preserved and used fruitfully for the development of the national spirituality of Uzbekistan.

The term “cultural heritage” is relatively new. Its appearance is associated with the UNESCO Convention for the Protection of the World Cultural and Natural Heritage of November 16, 1972, where the composition of cultural heritage was first presented: “Cultural heritage includes objects of material culture, monuments, groups of buildings and territories with various significance, including symbolic, historical, artistic, aesthetic, ethnographic or archaeological, having scientific and social significance” [1].

Cultural and spiritual heritage, being a powerful means in the formation of national self-awareness and national pride, is ultimately universal: morality, law, customs, traditions, literature, art and history lessons – everything that constitutes unshakable values of modern man. Unfortunately, to date, a significant part of the monuments of national history and culture have been destroyed, are under threat of destruction, or have sharply decreased their value as a result of the direct or indirect impact of economic activity, as well as due to insufficient protection from the destructive effects of natural processes.

Uzbekistan is a country of ancient civilisation and deep culture. No republic of Central Asia has as many historical monuments of ancient culture as Uzbekistan. The land of our Republic is a kind of precious archive, storing unique historical and archaeological monuments of different eras from the time of human formation to the creation of large ancient states. It is no coincidence that extensive archaeological research in Uzbekistan has advanced archeology as an independent branch of historical science, the development of which is also marked by several outstanding discoveries of world significance.

Today, 4,308 archaeological, 2,079 architectural monuments, 694 works of art, 395 landmarks, and a total of 7,476 objects of material and cultural heritage are under state protection [2].

Multimedia resources have made it possible to change the quality of communications in networks and systems. In modern conditions, multimedia overcomes geographical boundaries and contributes to the intensification of information exchange. This leads to the blurring of boundaries between the centre

and the periphery (province), which means that a person has the opportunity to integrate into world cultural processes. If earlier national cultures developed in parallel, and interaction was insignificant, today network interaction assumes that communities want to share their cultural heritage.

2. Results

The territory of Uzbekistan, the oldest agricultural part of ancient Turan, located in the centre of the Central Asian region, played a large role in the formation and spread of religion. The main connecting link between the ancient states of the world was the Great Silk Road and its spurs. There was increased trade along this road, but also an exchange of cultural and spiritual values.

Along the route of the Great Silk Road and its branches, representatives of different religions carried their beliefs and teachings. According to historians, one of the oldest religions in the world, Zoroastrianism originated on the territory of present-day Uzbekistan in ancient Khorezm. According to the Zoroastrian religion in its Sogdian version, it gave rise to the custom of burying the dead in special ossuaries called “ostadons”. They are very often found in the vicinity of the city of Samarkand and are unique spiritual and tourist sites of antiquity. From the territory of ancient Uzbekistan, Zoroastrianism spread through the Silk Road to other parts of the world.

According to other researchers, the penetration of Buddhism from India to China went through the current territory of Uzbekistan. The process began in the middle of the 1st century BC. In the spread of this religion in East Turkestan and China, an important role belonged to Central Asian theologians and missionaries, in particular the Sogdian–Parthians and Kangjūs.

A special branch of Christianity, Nestorianism, which originated in the 5th century in the eastern Roman Empire (present-day Syria), also spread along the Silk Road. Nestorianism first migrated to Iran and from there along the Silk Road to the east, including present-day Uzbekistan. Traces of its presence were discovered by archaeologists near the villages of Sufien and Vazkert, located near the city of Urgut.

The missionaries of the Manichaean religion also “took advantage” of the Great Silk Road. This religious and philosophical teaching arose in Iran at the end of the first half of the 3rd century. The Sogdians played a leading role in the spread of this religion. At the beginning of the 8th century the supreme head of the Manichaeans had a residence in Samarkand.

Islam reached the current territory of Uzbekistan a little earlier than 670 in the person of Arab warriors and their commander al-Hasam ibn Amr al-Gifari, who first crossed the Amu Darya. The Muslim religion began to penetrate especially actively into the depths of Maverannahr under the governors of Khorasan Ubaidullah ibn Ziyad and his successors Said ibn Usman and Selma ibn Ziyad. This process acquired a natural character under Qutayb ibn Muslim. In the 9th century, Islam became the dominant religion in the current territory of Uzbekistan, and from that time its flourishing in the region began.

Centuries have passed, and scientific daring, the works of great thinkers, and the military successes of famous commanders have become part of history. Over time, the names and deeds of outstanding personalities became legendary and the subject of cult and worship; the people elevated them to the category of saints, into objects of religious veneration.

With the advent of Islam, to preserve the memory of the dead, tombstones were installed over their graves. The first tombstones were built from river kairaks.

Under the Timurids, a new type of grave monument appeared – magnificently carved marble tombstones. Over such tombstones of outstanding people, Muslim architectural religious structures were erected: madrasahs, khanqahs, mosques, minarets, and most often mausoleums and mazars. These buildings are turning into spiritual monuments. People go there to pray and worship, and they become objects of religious pilgrimage [4].

The task that the authors set for themselves was to combine the extensive material found in various literary sources about the religious monuments of Uzbekistan, to find and collect new religious and spiritual monuments as a result of field expeditions, to compile their maps and give pilgrims and spiritual tourists general information about them.

As a result of studying and preserving historical data, as well as editing videos and photos of Uzbek religious monuments, the application “Religious and spiritual monuments of Uzbekistan” will be compiled, including Google maps.

The first map on the topic will be compiled based on the study of historical, bibliographic, stock and field data of the country. The map legend describes the location of religious and spiritual monuments, their appearance, condition and preservation. If a monument has not been preserved, then, based on the study of historical materials, its name and the intended geographical location (city, village, aul, kishlak) of this spiritual object are indicated.

The second map will be called “Religious and Spiritual Monuments of Samarkand”. In this map, all monuments will be divided into three groups:

1. Preserved spiritual monuments.
2. Disappeared and newly restored Mazars of Samarkand.
3. Ancient cemeteries on the territory of Samarkand.

Based on the research and these maps, new spiritual tourist routes will be compiled along the monuments of ancient religion and Islamic spiritual monuments, which will facilitate the passage of pilgrims and spiritual tourists to the territory of Uzbekistan.

3. Conclusions

The rich history, unique scientific and spiritual heritage of our great ancestors, who made an invaluable contribution to the development of world civilisation, and the world-famous historical cities of our country, attract tourists from all over the world. Spiritual revival is also connected with a person's relationship to the earth, and to its wealth. Respect for land and freedom is no less important a moral imperative than for the objects of civilisation. In the context of worsening environmental problems, both global and regional, this requirement is of particular relevance. Cultural and spiritual heritage is the main way of existence of culture. What is not part of such heritage ceases to be culture and ultimately ceases to exist. During a person's lifetime it is possible to master and transfer into one's inner world only a small fraction of the relevant cultural and spiritual heritage. Nevertheless it remains for future generations, serving as the common property of all people, of all humanity. However, this can only be so if it is preserved. Therefore, the preservation of cultural and spiritual heritage is tantamount to the preservation of culture in general.

Modern technologies are being introduced into all areas of human activity, which allows us to talk about virtualisation also in the cultural sphere itself. Thanks to applications, new possibilities for visualising objects and creating virtual images appear. In the cultural and philosophical context, the digitisation of cultural heritage is one of the determining factors in the development of the region, along with such factors as science, technology, social management, values, etc. Thus, the preservation of cultural heritage may be impossible without the effective use of modern information technologies. In this regard, it is necessary to bring cultural and information policies closer together both in the region and the country and develop common methodological, technological and organisational procedures.

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Problems, achievements and prospects of the development of 3D digitisation of Samarkand's cultural heritage

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Abstract

The development of information and communication technologies (ICTs) opens new opportunities for the protection and promotion of cultural heritage. As a result, a huge market of information recipients with equipment and the ability to access broadband data networks has emerged. On the other hand, technology provides increasingly sophisticated tools for digitising artefacts and sharing their results. This article presents the story of a collaboration between computer scientists from Lublin University of Technology and museologists from Samarkand State University. The process focuses on the three-dimensional digitisation of cultural heritage artefacts from Central Asia, with a particular emphasis on the remains of the mediaeval Timurid dynasty. The results of the co-operation and plans to tighten it are also presented. ICT now makes it possible to transmit of mediaeval achievements through the Internet and thus make them accessible to all.

Keywords: 3D digitisation, information and communication technologies, cultural heritage, architectural monuments, conservation, LUT, SSU

1. Introduction

Samarkand is a city of rich history, positioned in the centre of the Great Silk Road, where there are many cultural heritage sites. These are monumental archaeological and architectural locations, as well as many museum objects stored in the funds of museums in Samarkand. To date, according to official data

the Samarkand region has 1607 objects of cultural heritage, including 992 archaeological, 537 architectural and 78 monumental items. In addition, the collections of more than 40 museums hold about 500,000 objects of archaeological, ethnographic, photo-documentary, history-of-art and other types of museum interest.

The study, preservation and promotion of these cultural heritage artefacts is one of the most important tasks of the institution of culture and the protection of cultural heritage objects. To this end, a great deal of work is carried out by international, national and local organisations.

A great deal of attention is being paid in this direction by the State of Uzbekistan. A number of documents on the preservation and promotion of cultural heritage in Uzbekistan have been adopted in recent years.

With the emergence and development of information and communication technologies, many cultural institutions have begun to use these new technologies in their work on the preservation and use of cultural heritage objects.

The development of information and communication technologies has opened up new opportunities on the ground for the protection and utilisation of cultural heritage. As a result, a huge market of information recipients with equipment and access to broadband data networks has emerged.

In recent years, technological developments in ICTs have led to the emergence of digitisation systems on the one hand and the possibility of widespread reception of digital information by virtually all of society on the other. The technological development of digitisation systems provides an increasing number of new hardware and software tools, expanding the possibilities of their use and reducing the costs of the digitisation process.

2. Challenges

In Uzbekistan, institutions involved in the preservation and use of cultural heritage objects do not use ICTs sufficiently in their work. Therefore, the main task of these organisations is to use all possibilities and new technologies for this purpose. One of the methods of using ICTs in this field is 3D digitisation of cultural heritage objects [1, 2].

Digitisation of cultural heritage objects is a method of preserving their appearance in binary form that can be automatically processed using computer technology. Like any digital product, the binary information of cultural heritage objects can be easily and cheaply duplicated, stored, transferred, processed and transmitted. Because of its cheap duplication and storage in many locations

around the world, it is virtually indestructible. It is an important element in the protection of cultural heritage. In addition to the archival properties of digital information on cultural heritage sites, an important element is the ability to transmit and share it easily and cheaply, including via the Internet [3].

Taking into account this problem of studying, preserving and using cultural heritage objects, the staff of Samarkand State University together with specialists of Lublin University of Technology (LUT) started cooperation in this direction in 2015.

In the course of our joint project, we found out that the full implementation of digitisation of cultural heritage objects in Uzbekistan faces the following problems and challenges [4, 5]:

- Lack of a programme for 3D digitisation and processing of cultural heritage objects in Uzbekistan.
- Lack of specialists who could perform work on 3D digitisation and processing of the obtained data.
- Lack of technology programmes for processing 3D digitised cultural heritage objects in the form of architectural monuments and museum objects.
- Lack of equipment (laser scanners, high-tech computers, high-speed internet connections and others).
- Lack of targeted funding for the 3D digitisation and processing of cultural heritage objects.

Based on such conditions in Uzbekistan, together with our partners from Lublin University of Technology we have developed an action plan for our joint work.

3. Achievements

The co-operation was interdisciplinary in nature, meaning that both parties brought unique knowledge and skills to it. This situation created mutual respect between the partners and, through the resulting synergy, allowed for exceptional results [6]. The partners from Uzbekistan represented specialised knowledge of history and art history. They also provided access to a variety of material cultural objects on which they could work with the skills of the Polish specialists. Scientists representing the Lab3D from Lublin University of Technology were engaged in 3D digitisation of cultural heritage objects using both laser scanners and structured light technology [1–3]. In Lublin, they processed the data by generating 3D digital models of different quality and properties.

These models were suitable for archiving as well as sharing on websites, creating virtual reality worlds and interactive panoramas of omnidirectional or 3D printouts [6, 7].

The joint co-operation between the Universities of Lublin and Samarkand can be divided into 3 periods:

The first period – 2015–2016, was a distance relation, during which both the first publications and documents on official co-operation between our universities were created [1, 2].

The second period – 2017–2019, were the years of the first three scientific Expeditions to Central Asia of the staff of the Department of Computer Science at Lublin University of Technology (Prof. Jerzy Montusiewicz, Prof. Marek Miłosz and Dr Jacek Kęsik). The scope of their activities covered Uzbekistan, Kazakhstan and Kyrgyzstan. Representatives from Central Asian countries also visited Poland. Two scientific conferences were organised: international conferences on information technology in cultural heritage management (2018 in Lublin, Poland and in 2019 in Samarkand, Uzbekistan). Collaborative research and publications were also established, as well as the portal “3D Digital Silk Road, silkroad3d.com” [6, 7].

The third period – 2020–2022 – saw the implementation of the 3D Digital Silk Road project funded by the National Agency for Academic Exchange (PPI/APM/2019/1/00004). Existing co-operation was extended to three more new universities in Uzbekistan. These were the National University of Uzbekistan, Chirchik State Pedagogical University and Urgench State University. The initial duration of the project coincided with the coronavirus pandemic, which significantly limited activities, but despite this, a virtual conference was organised, which resulted in the publication of two monographs (*The Material Cultural Heritage of the Silk Road in Modern Uzbekistan* and *The Intangible Cultural Heritage of the Silk Road in Modern Uzbekistan*) [8].

In addition, a virtual scientific expedition of Lublin University of Technology to Central Asia was organised, which resulted in two collections of digital 3D models and two virtual exhibitions [8].

In 2021–2022, 4 consecutive scientific expeditions to Central Asia (15–28 August, 2021 – Tashkent, 10–22 October, 2021 – Urgench, 5–18 May, 2022 – Samarkand, 5–12 June, 2022 – Bukhara) were organised by Lublin University of Technology to digitise cultural heritage sites in Tashkent, Chirchik, Urgench, Khiva, Samarkand, Shakhrisabz and Bukhara. A total of 13 different members of staff from the LUT Computer Science Department participated in these expeditions [8].

Documenting the condition (geometry and appearance) of the monuments that make up the tangible cultural heritage of the Silk Road, given their number, dispersion and diversity, is a complex process. Fieldwork in local conditions is difficult and requires participants to be in good health, perseverance in action and creativity in solving problems. Scanning outdoors for many hours in temperatures of up to +42° C in the shade, when specialised equipment, after being heated to 60° C, refuses to work, when an overheated tablet slows down the download of data sent by the scanner, demonstrates that your equipment was not designed for such conditions. A competent team, however, was able to overcome all these adversities and imperfections. During these expeditions, 110 small and large cultural heritage sites were scanned, yielding around 400 GB of raw data in the form of point clouds, photos and videos [8].

During this time, a total of 5 monographs, more than 100 scientific articles, 3 album catalogues, 5 International Scientific Conferences, 5 photo exhibitions, 2 virtual exhibitions, 6 scientific seminars, 4 master classes and other events have been published or organised as a result of the joint work [8].

As a result of the collaborative work, the research field developed since 2015 has finally led to the establishment of an informal academic and research school with an international reach in the field of 3D digitisation of cultural heritage objects, their archiving, reconstruction and sharing [8, 9]. Over the years, the authors have conducted a comprehensive research in the use of three-dimensional computer graphics technologies in the protection of cultural heritage objects, leading to the permanent archiving of the appearance and geometric dimensions of these objects and their wide accessibility [10].

The results of these activities include: many effective techniques for carrying out 3D scanning in local conditions, methods of processing the obtained data in the organised Lab3D, methods of digital reconstruction of damaged objects, methods of preparing digital models for 3D printing, methods of implementing digital models in the world of virtual reality (VR), methods of distributing interactive digital 3D models with descriptions freely available in the Internet, and methods of preserving the geometry and appearance of cultural heritage objects in digital form [8].

4. Perspective

As a result of joint work of Uzbek universities and Lublin University of Technology, there is an opportunity to develop such ICT in Uzbekistan and

other neighbouring countries of Central Asia. For this purpose it is necessary to continue joint co-operation with foreign specialists and partners, as well as proceed with the following works:

1. In each educational institution of Uzbekistan participating in the above project with the involvement of specialists from cultural heritage institutions to create a 3D technology centre for digitisation of cultural heritage objects.
2. To train specialists from among students, masters, postgraduates and doctoral students with the involvement of various specialists (archaeologists, historians, ethnographers, art historians, architects, museologists, programmers and others).
3. To develop a prospective work plan for 3D digitisation of archaeological and architectural monuments and museum objects of the cultural heritage of Uzbekistan and its regions.
4. To solve the issue of financing the implementation of these works.
5. To acquire the necessary equipment and devices to carry out these works.
6. To organise various experience exchange events, scientific conferences, training seminars, master classes and others.
7. To publish the results of the work in the form of monographs, textbooks, scientific articles, reports at scientific conferences, lectures for students and popular science articles in the mass media.

5. Summary

One of the forms of study, preservation and use of objects of cultural heritage of Uzbekistan and Central Asia is 3D digitisation of these objects, which was proved by the joint project of Uzbek and Polish specialists “3D Digital Silk Road”. This technology will provide great opportunities in archiving the state of these objects, for studying and conducting scientific research, using the obtained data in the design of restoration and conservation of structures, restoration, architectural and archaeological objects, as well as museum objects. In addition, 3D digitisation technology of cultural heritage objects will enable the creation of new expositions and exhibitions, virtual exhibitions, preparation of thematic lectures and reports, development of monographs, textbooks, catalogues, albums, booklets, guidebooks and other publishing products.

The main objective of this 3D digitisation of cultural heritage objects is to promote and make known to a wide audience of history and art lovers the history of these objects, through the World Wide Web in different languages of the world.

For the successful work in the field of preservation and use of cultural heritage objects, the application of the programme and new technology of 3D digitisation of cultural heritage objects, it is necessary to address the issues mentioned above in the list of 7 points to be and solved.

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Architecture of the district mosques of Samarkand and the prospect of their 3D digitisation

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Abstract

The article analyses the architecture of the mosques of Samarkand, their condition, and the issues of their preservation. Samarkand is famous for its architectural monuments, among which neighbourhood mosques occupy a worthy place. More of them have been preserved than other architectural structures, such as palaces, shopping arcades and covered markets, bathhouses, artisans' workshops, bridges and others. Today, one of the pressing issues is the study, preservation and use of the city's architectural monuments, especially its neighbourhood mosques. To study, preserve and use local monuments, it is necessary to use 3D digitisation technology, which promises great results. Thanks to the joint work of LUT and SamSU, and the cooperation agreement between LUT and the directorate of the Registan ensemble, the instances responsible for historic heritage now have experience in 3D digitisation of architectural monuments of Samarkand.

Keywords: district mosque, architectural monument, *guzar*, *mahalla*, Samarkand, city district

1. Introduction

The development of cities and urban life is one of the important aspects of the history of society, its productive forces and production relations, its material and spiritual culture.

Central Asian cities were divided into residential areas – *guzars* or *mahallas*, which represented the main structural unit of the city. The residential area was not only a territorial unit. Its residents united into a kind of community, within which the lives of the families inhabiting the quarter took place, connected by kinship or personal acquaintance, mutual assistance and participation in each other's family events [1].

Without studying residential areas, it is very difficult to imagine the composition and life of the population of Central Asian cities in the pre-revolutionary period. Everyone knew their quarter and its inhabitants well and could really only provide sufficiently detailed and reliable information about it. Messages from old residents of individual neighbourhoods provide, in their totality, quite broad and detailed material, based on which one can judge the entire city as a whole. The types of housing, adapted to climatic conditions, the environment and social and living traditions, corresponded to the historical experience of the urban planning culture of the peoples of Central Asia. A full-flowing irrigation ditch flowed through the streets and alleys, and in the *mahallas* there were houses – the main source of drinking water. There was a public centre, which served as a *guzar* or *mahalla* mosque [2].

At the beginning of the twentieth century, there were about 100 different mosques in the city of Samarkand. After the establishment of Soviet power and the transition to communist ideology, many mosques were closed, and their premises were used for other purposes. Thanks to the regaining of independence of our country, several historical neighbourhood mosques were restored and began to function as mosques again [2].

Today there are about 20 mosques in Samarkand, many of which are located in historical architectural monuments. In most of the architectural structures where the mosques are located, restoration and construction work was carried out as a result of which they lost their original appearance. Therefore, today in Samarkand, in order to preserve and use architectural monuments, most of which are neighbourhood mosques, it is necessary to digitise these objects using 3D technology. Luckily, in Samarkand there is experience in 3D digitisation of cultural heritage objects.

2. District mosques of Samarkand

The city of Samarkand, as a living organism, developed and changed, new *mahallas* – neighbourhoods – emerged and expanded in it. In the historical topography of the cities of Central Asia, the terms *mahalla*, *guzar*, *kucha* (street) denoted different, but closely related concepts – city blocks that had administrative and social significance. In Samarkand, neighbourhoods were populated on the basis of production and craft, which is reflected in their names (*kulolon* – potters, *sharbatdor* – confectioners, *harroton* – wood turners, *zingaron* – saddle makers, *suzangaron* – needle makers, *zargaron* – jewelers, *charmgaron* – tanners, etc.) [3]. The quarters also bore the names of those cities and villages from which the artisans were resettled (Toshkenti, Khojandi, Urguti, Bukhori, Kokandi, Shakhrisabzi, Dakhbedi, Gijduvoni, Khavosi, Zaamini, Yamini, etc.); names of hydronyms (Obi-Mashhad, Kosh-Khauz, Khauzi-Sangin, Khauzi-Baland, Chashma, etc.); parks and green spaces (Bogi-Maidon, Bogi-Baland, Bogi-Shamol, Koshchinor, Kavarzor, Lolazor, Almazor, etc.); geographical features of urban places (Labi-Gor, Tagiregak, Chakar, Gilburch, etc.); architectural monuments (Ak-Saray, Gur-Amir, Madrasai-Safed, Rukhobod, Hopako, Kuk-Machit, etc.); ethnonyms (Arab-Khona, Dzhugi-Khona, Turkman-Kishlok, Eroni-Kishlok, Yahudiyon, Kashgari-Dungan. The names of famous scientists of Samarkand (Fakih Abullaysi, Makhtumi Khorzami, Motrudi, etc.) also became the names of mahallas [4].

Thus, even the nomenclature of the mahallas of Samarkand is valuable material for historians, ethnographers, archaeologists, topographers, indicating the urbanisation and development of the city. The mahalla was led by an elder (*aksakal*), elected by a general meeting of residents. On its territory, as a rule, there was a mosque and a teahouse – a kind of community centre. Sometimes several mahallas, usually on main streets or at their intersections, had one centre, where there were also numerous trade and craft enterprises, shops and a small market.

Administratively, mahallas were part of the *kita* (parts) of the city (Kalandarkhan, Khairabad, Suzangaran, Khoja-Ahrar), governed by *hakims*. In the Middle Ages, the city developed mainly from north to south, and after annexation to Russia (1868) – to the west and north-west. According to written sources and archaeological research, the formation of the first mahallas dates back to the era of the Samanids (9th–10th centuries) and Karakhanids (11th century). In the 14th–15th centuries the neighbourhoods of Dari-Zanzhir, Mirzo Pulodi, Kozi-Kalon, Kuk-Machit, Kosh-Khauz, Khoja Zulmurod,

Makhtumi Khorazmi, Madrasi-Safid, Khoja-Nisbatdor, Khouzi-Sangin, Gur-Emir, Ak-Saray, Ziigaron and others appear, and in the 16th–17th centuries – Motrudi, Zarduzon, Bul-Bulak, Kulolon, Yalangbek, Bogi-Maidon, Zargaron and others. By the end of the 18th – first half of the 19th century there were more than 60 of them (only at the end of the 18th century – 24). The layout of the central streets of the city remained unchanged in the late Middle Ages [4].

In the middle 19th century Samarkand was surrounded by high adobe walls with loopholes, towers and six gates (Khoja-Ahrar, Kalandarkhan, Khazreti Shakhi-Zinda, Khairabad, Bukhara, Suzangaran), which were demolished in the 1870s due to the reconstruction of the city [1]. The street between the Bibikhanum mosque and Chorsu (now Islam Karimov Street) was considered the busiest during this period. At the end of the 19th century there were 96 guzars in the city, in which about 55 thousand people lived. As a rule, from 450 to 800 people lived in each medium-sized quarter, and in the large (Toshkenti and Charmgaron, which in turn consisted of four parts) quarters of Yahudien – from 2300 to 2500 people, Lola-Zor – 2000, Kozi Gafure – 1000. Many Samarkand residents who had gardens outside the city, where they spent the entire agricultural year, were at the same time residents of the corresponding villages (Havas, Dakhbed, Urgut, Yamin, Zaamin, Motrud, etc.) [4]. The topographic map of Samarkand reflects economic life, development and distribution of productive forces from a historical perspective (Fig. 1).



Figure 1. Plan of the restoration of the Timurid city of Samarkand (Samarkand guide, Tashkent, 2007)

A mosque (Arabic for “place of worship”) is a Muslim architectural structure for prayer (liturgical) purposes. The mosque serves as a gathering place for Muslims to perform collective prayers. In addition, mosques can be places for people to gather, teach the basics of the Islamic religion, etc. The first mosque was the Kaaba [2].

According to the tradition that gradually developed, the mosque is a separate building with a dome (*gumbaz*); sometimes it has a courtyard. Attached to the mosque are tower-minarets. The prayer hall is devoid of images, but verses from the Koran in Arabic may be inscribed on the walls. The wall facing Mecca is marked by a *mihrab*, an empty niche in which the imam prays. To the right of the mihrab there is a *minbar* (pulpit) from which the preacher imam reads his sermons to believers during Friday and holiday prayers. As a rule, *madrasa* schools operate at mosques.

Already at the end of the 7th century, a distinction was established depending on the purpose and functions between [1]:

- *mahalla* (neighbourhood) mosque – a mosque of daily five-fold prayer;
- cathedral *juma* mosque – a mosque for collective Friday prayers performed by the entire community;
- Kabira – (Arabic *kabir* ‘great’) the capital’s central mosque;
- *musalla* (from Persian *namazgoh* ‘prayer room’) – a citywide mosque in the form of an open square (for worship on the holidays of Kurban Bayram or Eid al-Adha).
- mosques at *madrasas* (Ulugbek, Tillo-Kori, Nodir Devon-Begi).
- mosques at holy places and cemeteries (Shahi-Zinda, Khoja Abdu Darun, Khoja Abdu Berun, Khaja Ahrar, Makhdumi Azam Dakhbedi, etc.).

The neighbourhood mosques of Samarkand, like the mosques of other cities of Central Asia, played a significant role in the life of the population in the past. First of all, the mosque was a place of religious worship, and in it, in accordance with the requirements of Islam, believers of a given parish gathered five times a day to perform prayers together. The staff of the mosque usually consisted of two or three persons – an imam, a *mutawalli* and a Sufi, who were invited by the parish (Muslim clergy, and the duties of an imam could be performed by any literate person who knew the necessary prayers and had no physical disabilities) [2]. The imam took part in the prayers performed in mosques, reading the prescribed prayers aloud, performed the wedding ceremony of *nikoh* (for this they always invited the imam of the quarter mosque, whose parishioners were the girl’s family), took part in the reading of the Koran during circumcision, read the *janoz* prayer over the deceased (who, taken out of the house,

was brought into the courtyard of the mosque), and then accompanied him to the cemetery, where he read the appropriate prayers. For each ritual performed, the imam received a special reward in money and food. When celebrating family events such as circumcision or wedding, among other rewards he was also given a robe, which he wore during the festive feast, at which he and the Sufi were always present [3].

The duties of the *mutawalli* included the main economic work and financial affairs of the mosque. In the absence of the imam, he replaced him and performed his functions [3].

The main duty of a Sufi was to call for prayer from the *azon* (the minaret of the mosque) before each prayer. In addition, he had to keep the premises of the mosque and the courtyard clean. Typically, the Sufi taught children attending the *maktab* primary school (in other cities, this responsibility more often fell on the imam of the mosque).

Financial support for the maintenance of the mosque usually came from the *waqf* of the mosque; often the mosque had its own *waqf*, i.e. income-generating property (in the East, before the construction of mosques and madrasas, the source of financial income for the maintenance of the building itself and their servants was determined and secured on a *waqf* document. This could be the life of land, retail outlets, caravanserais, bathhouses, bridges and others). They dispersed at the discretion of the mosque servants, the imam, the *mutawalli* and the Sufi. In addition, money was collected from all residents of the *guzar* – *imomona*, most of which was given to the imam, *mutawalli*, and the smaller part to the Sufi [1].

Sometimes one of the parishioners, dying without heirs, bequeathed his property to the mosque for this purpose.

Usually, at the mosque, in the courtyard, several small service rooms were built – a *hujra* for the mosque servants. In some mosques, in addition to this, additional *hujras* were built in which poor madrasa students lived.

If more than two students lived and studied at the mosque, then the mosque was called a *madrasa*.

Typically, neighborhood mosques consisted of a winter room and an *iwan* (a terrace next to it). Often in the courtyard of the mosque or next to it there was a pond – *havz*, around which trees were planted [2].

In terms of layout, the quarterly mosques of Samarkand are quite diverse [3].

1. A winter room (square or rectangular in plan) with a single-row or double-row *iwan*, serving as a summer mosque and located on one side of the room. Most often in this case, the *iwan* is located on the eastern

side, i.e. in front of the room. This is the most common plan for a small neighbourhood mosque both in Samarkand and in many other places.

2. Winter room and iwan located at an angle on both sides of the room. More often in this case, iwans are located in the east and north, but often also in the east and south.
3. Winter room and iwan covering it on three sides. This plan scheme, sometimes with a large development of iwans, especially the side ones, supported by many rows of columns, is characteristic of the Friday mosques of the cities of Fergana.

In Samarkand, as in the Fergana–Tashkent regions, the winter room of the mosque is called *khonako*. For the most part it is square in plan, with one or four columns supporting the ceiling, but sometimes it has an elongated rectangular shape. In the latter case, the ceiling is supported by two columns, less often one [2].

In Samarkand, there was also a dome covering a rectangular room with a *khonako*. In it, on both sides of a very deep niche of the *mihrab*, there were two small rooms with doors opening into the mosque, called *hujra* (cell), or *chillakhona* – room for performing *chilla*. If *chilla* is not performed in them, then sometimes poor madrasa students live in them, or even just store all the equipment of the mosque [2].

If we talk about the neighbourhood mosques of Samarkand at the end of the 19th and early 20th centuries, we can see that some of them, after the independence of the Republic of Uzbekistan, were converted into Friday (*juma maschit*) cathedral mosques [2]. For example, the Khoja Zudmurod mosque, located at 81 Charrakha St., Samarkand, originally served as a district mosque, but today this mosque is a cathedral mosque, i.e. a Friday service one (Fig. 2). To look at the history of the creation of this mosque, one can note that the current structure was built on the foundation of the late 9th – early 10th centuries. During the restoration, bricks from the reign of Sultan Ahmad Sanjar (1086–1157) of the Seljuk Empire, were discovered in the foundation of the mosque. Tradition says that Amir Temur brought the relics of Hazrat Jirjis (St. George) here and buried them near the mosque. In Soviet times the supposed burial place of the saint was demolished. According to legend, prayer in a mosque leads to the rapid fulfilment of good desires. Hence its name, which means quick fulfilment of desires. In ancient times, the mosque was covered with a dome, after the destruction of which the building was covered with wooden beams. At the end of the 19th century, an iwan was erected around the mosque, and a minaret rises next to the temple. During Soviet times, the mosque remained operational. Its last restoration was carried out in 1992.



Figure 2. Khoja Zudmurod Mosque
(source: <http://dkm.gov.uz/uz/mecet-hodza-ziemurod-samarkand>)

The Khoja Nisbatdor Mosque is one of the mosques in Samarkand, the construction of which was completed in 1901 (Fig. 3). The mosque was built on the site of an ancient structure. The builders of the mosque were masters (*usto*) brothers Zainiddin and Shamsiddin Gafurov, *usto* Sadulla and *usto* Mahmud, as well as others. The construction was headed by Abdukadyr Bakiev. Named after the Islamic theologian Khoja Nisbatdor, who lived in the 15th century. Located in the centre of the historical part of the city of Samarkand, in the Suzangaron mahalla, a few hundred meters to the south of the Registan square and ensemble [2]. The mosque is built of baked brick, surrounded by an iwan and has a minaret and khanqah, a place for (typically Sufi) spiritual practice and religious education. In the 19th century it was restored; among the restorers was the architect Abdukadyr Bakoev. During Soviet times, the mosque building was used for various purposes, such as a post office, libraries, museums, industrial premises and others. After the collapse of the USSR and Uzbekistan gaining independence in 1998, the mosque was returned to believers and thoroughly restored. Today, it functions as a cathedral Friday mosque.



Figure 3. Khoja Nisbatdor Mosque

(source: https://pagetour.org/samarkand/samarkand/Mosque_Khoja_Nisbatdor.htm)

Such examples can be cited many times; in the future, modern 3D technologies will greatly help in preserving the traditional architecture of mosques for restoration work.

The term 3D technology has become closely integrated into our modern life. We constantly see 3D graphics in advertising, movies and video games. It is used in industry, architecture, and medicine. By using 3D scanners, virtual analogues of objects from the real world are created. In particular, recently, scientific achievements in the field of 3D technologies have been widely used in the preservation of cultural heritage sites. 3D scanners, a three-dimensional measurement device used to collect data about physical objects for subsequent modelling or analysis in a digital environment, are widely used in this area. The latest generation 3D scanners do not require physical contact with the object being scanned [5].

Why is it necessary to scan cultural heritage objects with a 3D scanner? A 3D scanner is one of the latest inventions of technology, which allows to create exact copies of real objects in digital form. These three-dimensional models are highly detailed and informative (with their help, the user can find out data about an object in mathematical, digital or computer form). A 3D scanner is very useful for solving problems of reverse engineering, issues of cultural heritage preservation, museum work, and in any case where it is necessary to preserve the exact shape of an object in a short period of time. These devices simplify and improve human work, and sometimes even perform “impossible” tasks. 3D scanning greatly simplifies the process of creating 3D models, making them as close as possible to the original [5].

3. Summary

As is known, the safety of cultural heritage objects is influenced by many factors. Often these objects are located in the open and are exposed to adverse weather conditions, which eventually leads to their destruction. Restorers have been fighting for the safety of these objects for a long time, constantly carrying out restoration and conservation work. The achievements of science come to their aid in the form of 3D scanners, with the help of which it is possible to accurately observe changes in the building, for example, the foundation, walls, cladding and others.

District or neighbourhood mosques are also objects of cultural heritage and are of great historical and cultural value, allowing one to learn about the architecture, ethnography, traditions and way of life of past time.

The use of modern technologies, in particular 3D scanners, in the preservation of neighbourhood mosques, contributes to their further study and preservation of the rich architecture of the past, and as those responsible for such objects our most important task is the preservation and transmission of our rich cultural heritage to the future generation.

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From the history of mediaeval educational institutions in Samarkand (madrasas and maktab), and their 3D digitisation

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Abstract

The article describes the role of mediaeval madrasas in the development of science and culture in Samarkand. As is known, after the conquest of the Central Asian region by the Arabs, the ideology and culture completely changed here, and the religion of Islam was established. The first *madrasas* and *maktab*s in Samarkand appeared in the 1st century and this continued until the beginning of the 20th century. Therefore, studying the history of the madrasa and its activities in training educated personnel is of great significance. The emergence of madrasas in Samarkand is widely shown, and a comparison of their activities with educational institutions in other regions of the Islamic world and others is drawn. The role and importance of madrasas in personnel training, the development of science, culture, art and literature is also raised. A proposal is made for preservation and 3D digitisation of the Samarkand madrasa.

Keywords: *madrasa*, *maktab*, Samarkand, Central Asia, Samarkand State University, Lublin University of Technology, preservation, 3D digitisation

1. Introduction

Samarkand is one of the oldest cities in the world, with a rich history that has not yet been fully studied. What has been bequeathed to us has been preserved thanks to Samarkand scientists and enthusiasts. The topic of the history of

mediaeval educational institutions or the history of education of Samarkand is well covered in the exhibition of the museum and the Mirzo Ulugbek madrasa of the Registan ensemble. It was officially opened at the end of August 2020, on the 600th anniversary of the madrasa. In the course of preparing and collecting materials for the future exhibition of the museum, we had to study a lot of literature. Until the beginning of the twentieth century, education in Samarkand was carried out mainly in maktab and madrasas. This mediaeval system of education existed in Samarkand for more than a thousand years, some of the buildings of these educational institutions have survived to this day.

2. From the history of mediaeval educational institutions

After the Arab conquest of Central Asia, the people of this region accepted Islam and its ideology. After that a lot of changes occurred in the socio-cultural direction. One of these was the direction of educational institutions. According to historical information, the first maktab and madrasas appeared in Bukhara at the end of the 8th and the beginning of the 9th century. A maktab is a primary school where children received basic knowledge. They were usually divided into 3 groups, primary, secondary and adult. After completing the maktab, many continued their studies at madrasas. Maktab were organised at mosques, at home, in special premises and other places. Children went to primary school from the age of 5 or 7 years. They learned letters, words and reading short texts from a book. After primary school, they continued their studies in secondary and adult groups. Not all children continued their studies to the end. Many completed their studies after primary and secondary education. Complete schooling was extended over 10 years. Rich and wealthy people homeschooled their children by inviting teachers to their homes. Unfortunately, the building of such maktab or mediaeval schools have not survived to this day.

In Samarkand, the first maktab and madrasas also appeared in the 9th century. Scientists have proven that in Samarkand during the period of the 9th to the 20th centuries there were more than 70 madrasas. They were different in form and content, state, public, private and others. They were built by rulers, viziers, officials, the rich, society and others. For example, the madrasa of Ibrahim Tamgachkhan was built in 1066 by order of the eponymous Karakhanid ruler, while the madrasa of Mirzo Ulugbek in 1420 by the ruler of Maverinahr. The Sher-Dor and Tilla-Kori madrasas were built in the 17th century by order of the Samarkand ruler Yalangtush Bakhodir.

Today in Samarkand the following madrasa structures have been preserved: Mirzo Ulugbek, Sher-Dor, Tillo-Kori in the Registan ensemble, Nodir Devon-Begi in the Haja Ahrar complex, Kushbegi on the Shah-i Zinda site, Punjab Madrasa, Usmat Madrasa and others.

What are madrasas and how did they appear in Central Asia, in particular in Samarkand?

In the 1960s, during archaeological research in the Shah-i Zinda ensemble in Samarkand, a precisely dated madrasa, one of the earliest in Central Asia, known from written sources, was discovered. This was the Hanafi government madrasa of Kusamiyya from the 11th century, built at the main shrine of the city, Mashada Kusama, by the first Turkic ruler of the Western Kaganate from the Karakhanid dynasty, Ibrahim Tamgach – Bugra Khan in 1066. Tamgach Bugra Khan (ruled 1040–1068) from the very beginning of the formation of the Western Kaganate made Samarkand its capital. At the end of his reign, he built a house for the sick (*dar li-l marda*) in the capital city and “ordered to found a madrasa near the shrine (*al-mashhad*), which would become a meeting place for people of science and religion [1, 2].” Almost simultaneously, a *waqf* for this madrasa dated 1066 was discovered in Alexandria, Egypt, translated first into French and then into Russian.

In the same years, several lists of the same *waqf* of 1066, stored in Tashkent (funds of the Institute of Oriental Studies of the Academy of Sciences of the Republic of Uzbekistan), were translated and compared with materials from archaeological work in Shah-i Zinda (O. D. Chekhovich, N. B. Nemtseva).

This complex of written and archaeological data made it possible for the first time, on a documentary basis, to examine one of the earliest madrasas in Central Asia, to study questions of their origin, early architectural forms, internal structure, training programmes, etc.

The Kusamiyya madrasa was built on the western side of the road-street (Shah-i Zinda corridor), opposite the Kusama Mashad in the “kosh” ensemble. The main façade of the madrasa was facing east, towards the “mashad”, the northern one – towards the canal (*farkin* along the *waqf*), flowing from the main distributor of Jui–Arzis at the southern Kesh gate towards Shah-i Zinda. The building had a four-iwan courtyard layout composition and occupied an area of about 55 × 45 m. The main eastern façade had a frontal composition characteristic of such structures (45 m long). On the central axis of the façade there was an entrance portal, on its sides there were wings of the walls, completed with corner *guldasta* towers. This is a typical frontal composition for the 11th century. Finally formed, as shown by a number of

architectural monuments of Central Asia (Rabat-i Malik, Daya-Khatyn, etc.), in the Kusamiyya madrasa of the 11th century, it is presented in a completed, established form. The façade, preserved to a height of 0.7–2.80 m (part of the facade is embedded in the Bezymyanny-2 mausoleum of the late 14th century), was lined with paired polished bricks with transverse figured inserts or “bows” – a typical decorative cladding technique for the 11th–12th centuries. The upper parts of the façade and the entrance portal, judging by the finds, were decorated with carved unglazed terracotta with richly saturated floral, geometric and epigraphic ornaments. The internal plan of the building consisted of a spacious (about 20 × 30 m) courtyard paved with square slabs, with iwans on the axes, lined on the sides with hujras for student accommodation and classrooms. In the corners, judging by what was opened, there were apparently large square halls – a *dars-khana*, a mosque, a library – named in the waqf. The interior of the exposed south-eastern hall was covered with polychrome painting on the *ganch* and paved with square polished slabs [2].

In the Kusamiyya madrasa, as follows from the waqf of 1066, students professing the teachings of Abu Hanifa studied theology (Koran, Sunnah, Sharia) and secular disciplines (called *adab* – literature, ethics), and there was a library. The outer walls of the madrasa were built on solid foundations made of prefabricated materials (burnt brick, *pakhsa*, pebbles). The internal walls were installed on “fills” 50–70 cm thick, which provided a perfectly flat surface. This oldest construction technique in Central Asia (multiple pouring of a foundation pit for construction) is preserved to this day in public housing [2].

The Kusamiyya madrasa shows that already in the middle of the 11th century, on the territory of Maverannahr, an architectural type of madrasa building developed, the main planning composition of which was subsequently developed in classical madrasas of the 15th–17th centuries throughout Central Asia and Khorasan (madrasas of Samarkand, Bukhara and Gijduvan, Herat and Khargird).

After the Mongol invasion in the 13th century and the movement of Samarkand from the Afrasiab settlement to the territory of Rabad, the Kusamiyya madrasa no longer functioned as a city educational institution, but was used as a refuge for pilgrims (*zaviya*) at a revered out-of-town shrine. It was in this role that the building of the madrasa of Ibn Battuta found itself in the 1430s. According to the planning data (cells for living), the madrasa optimally corresponded to the function of the *zaviya*. The madrasa was used in this role until the end of the 14th century [3].

Only under Temur, during the massive construction of the Shah-i Zinda ensemble, the madrasa was partially dismantled into bricks, and the Bezymyanny-2 mausoleum of the late 14th century was installed on the main façade (southeastern wing). The base of the main portal with access to the corridor of the Shah-i Zinda ensemble was preserved until 2004.

This communication concerns the history of the formation of madrasas as higher educational institutions in the Muslim East, with a brief overview of the enormous heritage and experience in the development of educational schools in Eurasia from ancient times, which preceded the emergence of mediæval madrasas and were the basis of the organisational form and training programme, way of life and moral standards in madrasas.

Such a review is necessary, if only because in some works incorrect statements have appeared that Muslim madrasas had neither parallels nor previous experience. Madrasas in the Middle and Near East, including Central Asia, appeared at the end of the 9th and the beginning of the 10th centuries (written sources do not contain earlier reports), became widespread in the 11th–12th and the subsequent centuries.

The general aspects in the educational system have become especially clear since the formation of world religions – Judaism, Buddhism, Christianity, Islam and various movements associated with these faiths, the main one of which is monasticism and the spread of monasteries of various types. It was at the monasteries that the first dormitory schools appeared, in which, in addition to theology, general education diplomas were also given. Already at the first acquaintance with the problem, an undoubted similarity in organisational forms, methods and training programmes in monastic schools and madrasas is striking. This similarity is so expressive that it leaves no doubt about the general paths of development of the educational system in Eurasia. Parallels can be traced in the cohabitation of students and teachers in madrasas and monasteries, in the “closedness” of these institutions, in the ascetic lifestyle in madrasas, close to the monastery, in the existence of special statutes regulating the life of students in madrasas and monastery schools, in the training programmes, where religious and secular disciplines were mandatory, ranging from elementary literacy (learning to read, write and count) to the highest achievements in astronomy, mathematics, geography and other sciences [4].

Monastic schools, like madrasas, were of different levels, scale and significance (large and small, urban or rural, state or private, etc.) and the degree of education in them was accordingly different. In this case, only the general trend is considered.

The first educational institutions, even before monastic schools, arose in the countries of the Ancient East (Sumer and Akkad, Babylon and Assyria, Egypt, India and China) several thousand years BC. These were schools of different levels. There were priestly schools at temples, palace schools for training the nobility, and scribe schools for the needs of administrative and economic management. In these states, the temple priesthood owned enormous wealth, had great political power, was the custodian of all scientific knowledge, and had numerous document archives and libraries. The focus of science in the ancient Mesopotamia of the mid-2nd millennium BC, in addition to temple schools, was the so-called “e-dubba” – a type of secular school – an Academy, where mainly scribes were trained. “Scribe” was an honorary title for an educated person. Babylonian and Assyrian science had a relatively high level [5].

In ancient Greece and Rome, the priesthood did not play an independent role – the position of priest was elective. Higher schools for their time arose in the 6th–5th centuries BC in Athens and Rome. Around the middle of the 1st millennium BC, in Greece, gymnasiums arose – state educational schools, which were later established in the Hellenic East, in ancient Greco-Bactria. The French archaeological mission excavated a gymnasium in Ai-Khanum (northern Afghanistan), 3rd–2nd centuries BC, arranged according to the type of Greek educational institutions. The rudiments of higher education can be considered as revolving around major scientists in Greece, after whom schools were named. These future departments at universities, centres of higher education, were concentrated in large cities with large libraries (Alexandria, Rhodes, Pergamon, Antioch, Orontes). They introduced us to law, philosophy, history and poetry. Schools opened the door to a political career. The Greek education system formed the basis of Roman, then European and Arab education [6].

In the countries of the Asian East (China, India, Japan), schools developed under the influence of the dominant ideologies there – Confucianism, Taoism, Buddhism, Shintoism, Hinduism, Islam. As elsewhere in antiquity and the Middle Ages, the monopoly on education belonged to the church. In these countries, as in Egypt, schools existed at large temples. In India, temple schools were intended mainly for children of the upper castes – brahmins and kshatriyas. There were special Brahmin caste schools that trained professional priests. In addition to reading and writing, these schools studied the texts of sacred books, epic poems, mythology, grammar, literature, history, philosophy, mathematics, astronomy and medicine.

At Buddhist monasteries, in addition to primary and secondary schools, there were higher theological schools, in which mathematics, astronomy and other sciences were also studied. Books and manuscripts were copied in monasteries. Monastic schools had their own characteristics, but there were also many similarities with the first Muslim madrasas and universities of medieval Europe.

With the adoption of Buddhism in the 6th century AD, monastic schools appeared in Japan. At the beginning of the 8th century, an attempt was made to create public schools in Japan. In schools they studied Chinese classics, philosophy, laws, history and mathematics. Under feudal rich houses, clan schools developed – they studied knightly military science, classical literature, mathematics and etiquette. Comprehensive schools at monasteries and churches were typical for Christian Europe and Russia.

In the Arab Caliphate, at the first stage of education, the main thing was Islamic theology and jurisprudence. The formation of a new statehood in the Caliphate required, first of all, the strengthening of religion and the orders, laws and moral principles based on it. These “new” norms in the Muslim state were based in whole or in part on the old, established laws of the ancient and ancient world – Babylonia, Assyria, Egypt, Greece and, mainly, Rome. The entire structure of Islamic society, with all its specifics, including the education system, was a continuation of the culture that historically took shape and developed on the territory of Eurasia from ancient times [7].

In the first centuries of the Hijra, the teaching of Islamic theology and jurisprudence took place in mosques, where large libraries were built. It is known that until the second half of the 9th century, not only Muslim children, but also Jewish and Christian children studied in mosque schools. This is an indication that Muslim theology was not a suppressive program. Under the Abbasids there were “dabiristan” schools. Judging by the name – (*dabir* ‘official’) these were secular schools where officials were trained. Every more significant mosque had a library. There was a custom to bequeath your books to mosques. There is a legend that the beginning of the library in the Merv mosque was laid by the Iranian ruler Yazdegerd III in the middle of the 7th century, who brought his books there [7].

The libraries of Merv were famous even later. There were 12 public libraries in the city (waqf), one of them had 12 thousand volumes. Scientists, paying a deposit, kept up to 200 books in their homes. In the Arab Caliphate, at the first stage of education, the main thing was Islamic theology and jurisprudence. The formation of a new statehood in the Caliphate required, first of all,

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In the 9th–10th centuries in the Arab Caliphate, the rulers, viziers and rich nobles themselves were book lovers, spent huge amounts of money on books, and built book depositories (*khazinat al-hikma* – ‘treasuries of wisdom’) where people could study. Often those who worked in libraries were supported at the expense of the owner. Learning was held in high esteem, books were valued higher than other property. There were separate large libraries in which special “Houses of Knowledge” were created, some for theological debates, others for teaching students [9].

Caliph Mamun (813–833) became widely known as a major cultural figure who contributed to the development of science and education. Under his patronage, translation activity began, which began in the 5th century under Mansur (754–775), thanks to which outstanding works of ancient Greek and Hellenic science and philosophy became available to Arabic-speaking scholars. At the same time, the assimilation of Iranian and Indian culture continued, which expanded the Arabs’ understanding of the world around them. At the beginning of the 9th century, under Caliph Mamun, the “House of Wisdom” was established in Baghdad with a rich collection of manuscripts and an observatory was erected in the vicinity of this city. With the direct participation of this enlightened caliph, Muslim dogma was influenced by ancient philosophy, the Mu’tazilite doctrine (rationalistic direction) was developed, declared the official ideology [9].

Qadi Ibn Hibban (d. 965) bequeathed to Nishapur a house with a library and living quarters for visiting scholars and scholarships for their maintenance. Along with libraries, a new form of scientific institutions arose, in which the storage of books was combined with training or payment for work performed within their walls. In the 10th century, new names appeared in the Caliphate – not “Treasury of Wisdom”, as before, but “House of Science” (*dar al-ilm*). The “House of Science” with a library containing books on any branch of knowledge was established by the poet and scientist Ibn Hamdan (d. 935) in Mosul. Access to them was open to anyone who sought knowledge, and the poor were given paper. Another vizier at the beginning of the 11th

century in the western part of Baghdad, he founded the “House of Science” with a magnificent library, where up to 100 copies of the Koran alone were kept, and in total there were 10,400 other books [9].

The poet and head of the Alid nobility, ar-Radi (d. 1015), founded the “House of Knowledge” for students (*talabat al-ilm*) and assigned them maintenance. Vezir ibn Killis kept his private Academy and spent up to 1000 dinars on scientists, copyists and bookbinders. When the madrasa was founded in the 10th century, the teaching of theology and jurisprudence continued to take place in parallel in mosques. Up to 500 listeners gathered in the Nishapur mosque, the scientific centre of the entire East, and up to 300–700 in Baghdad. All the above-mentioned educational institutions in the Arab Caliphate, including the mosques in which training was conducted, with their procedures, charters and programmes, were the immediate educational environment on the basis of which the first madrasas were formed in Arab countries.

From the end of the 9th and the beginning of the 10th century, in the countries of Islam, special higher educational institutions arise – madrasas (Arabic *madrasa*, from the verb *darasa* ‘to study’). In Hebrew, this word corresponds to *midras* – teaching, interpretation of the law. It is assumed that the word *midras* was known to the Arabs even before Islam. Traditions from the time of Muhammad speak of a Jewish *beit midras* in Medina. The emergence of madrasas was caused not so much by the growing need for knowledge, as A. Mets believes (large audiences of 500 or more listeners gathered in mosques), but by changing teaching methods. The usual manner of lecturing was replaced by interpretation (*tadris*) and debates, for which the mosque was not a suitable place. At the same time, the enormous role of libraries and mosques as educational and scientific centres remained throughout the second millennium AD.

In the madrasa programme of the 10th–12th centuries, in addition to spiritual sciences and jurisprudence, a large place was also given to the teaching of *adab* – a course that incorporated a number of branches of rational, aesthetic and literary knowledge and, to a certain extent, reflected the scientific worldview and moral standards of the intelligentsia of the 9th–12th centuries. The earliest written information about a madrasa in Central Asia belongs to Narshakhi, who in his “History of Bukhara” reports about the Farjek madrasa, which burned down in 937 during a big fire in Bukhara.

In Samarkand under the Samanids in the 1st century there were 17 madrasas organised by the Mu’tazilite and Kerramian sects. In this regard, V. V. Bartold suggested that the birthplace of the first madrasas was Central Asia, that madrasas appeared in the extreme east of the Caliphate under the influence of Buddhist

monasteries – *viharas*. A. Mets, based on written sources, considered Nishapur, the largest scientific centre of Khorasan, to be the place where the first madrasas appeared.

There are numerous reports about madrasas of the 10th–11th centuries in Nishapur. The earliest of them dates back to the beginning of the 10th century (912). According to Yakut, education in this madrasa began with reading and various readings of the Koran. Utbi talks about the Sabuni madrasa in Nishapur, where a huge collective work on the interpretation of the Koran was kept, compiled by order of the Seistan Khalaf (943–1003), who spent 20,000 dinars on it.

Mukaddasi reports about the madrasa of Maverannahr and the madrasa of Merv, in which each teacher was assigned content. Ghaznavid historian Beykhaki reports 20 madrasas with waqfs in Khuttalyan. Mahmud Ghaznavi (d. 1030), after the 12th Indian campaign (1018–19), erected a large madrasa at the cathedral mosque in Ghazna. The premises of the madrasa were filled from ground to ceiling with the works of outstanding scientists “on ancient and modern sciences.” These works were taken from the libraries of the kings, as booty from different regions of the world, including Iraq. In Isfahan, the Seljuk vizier Nizam al-Mulk (11th century) built a madrasa with an amazing minaret. On the territory of north-western Iran (Khargird, Rey) back in the 20th century. The ruins of two madrasas from the 11th century have been preserved. Islamic rumours that developed by the 10th century played a certain role in the formation of madrasas.

The most common interpretation in Central Asia was “Hanifi,” but there were also Shafiites. In the Shafiite cathedral mosque of Gurganj (Kunya Urgench) at the beginning of the 13th century. Minister Shikhabad-din Khivaki, who had extensive knowledge of all sciences, taught in five madrasas. At the Shafi'i cathedral mosque, he built a library, the like of which “has never existed before or since,” according to sources.

Central Asia of the 10th–12th centuries was famous for the names of major mediaeval scientists – encyclopedists: Farabi, Ibn Sina, Beruni, Khorezmi, Buzjani, al-Balkhi, ar-Razi or Narshahi, who moved around the cities of the entire Muslim East to study sciences and gain knowledge in madrasas, private schools and libraries.

In the 11th century under the Khorezmshah Mamun-2 ibn Mamun (1009–1017), the famous “Mamun Academy” was created in Gurganj, where a large circle of scientists was grouped. The pride of this Academy were Beruni and Abu Ali ibn Sino. The fragmentary and accidental nature of the rare written news that has reached us about the first madrasas of a thousand years ago does not yet provide grounds for placing the “homeland of the madrasa” in

one or another city of the Arab Caliphate. It would probably be more correct to proceed from the general level of culture, including education, in the regions where schools of education at all levels were born.

In any case, Bukhara and Samarkand in Transoxiana, Nishapur and Merv in northern Khorasan, Baghdad and Damascus of the Middle East, with their ancient culture can equally be the main successors and continuers of the ancient educational culture in the Muslim East.

It should be noted that there are some similarities in the curriculum and organisational forms in the early madrasas and the first universities in Europe, which appeared in the 11th–12th centuries (Italy, France, Spain, Portugal, England). Students and teachers lived in special buildings – colleges, and training took place there (as in madrasas and monasteries). In universities, as in monasteries and madrasas, there were strict regulations of the life of students; in the curriculum, in addition to faculties in various sciences, there was a mandatory theological faculty. In the Middle Ages, there were similarities in the teaching methods in madrasas and universities – lectures and debates. Later, the development paths of madrasas and universities became increasingly different. The role of the first madrasas in the Middle Ages was extremely influential. With the constant and compulsory study of theological sciences, madrasas, along with libraries at scientific centres, were conductors and relays of scientific achievements.

The relationship between theology and secular sciences in madrasas changed throughout the Middle Ages. In the late Middle Ages, spiritual education within the framework of orthodox Islam occupied an increasing place until it became the only direction.

The emergence of madrasas was a natural continuation of the development of one of the important aspects of the general civilisation of medieval society – the education system, which developed over a long period of time and goes back centuries.

The issue of studying, preserving and using mediaeval madrasas is very relevant and in demand. Especially when Samarkand becomes the centre of the tourism industry of the Central Asian region. To study, preserve and use the madrasa buildings as architectural monuments and sources of knowledge, it is necessary to preserve them using modern technological programs and equipment. One of these areas is 3D scanning or digitisation of these buildings using laser scanners [10].

This work began thanks to the “3D Digital Silk Road” project involving participation of employees of Lublin University of Technology and those of Samarkand State University.

3. Summary

As is well known, madrasas played a huge role in the training of personnel with higher education and the development of science, culture, art, literature and other areas. In addition, government officials and employees, imams of mosques, maktab teachers, military personnel, trade workers, artisans and others received education in madrasas. Therefore, the study and preservation of them is of great historical and social importance. Not many of these objects have survived in Samarkand today. A number have been restored and are used for various social and public purposes. One of the forms of preserving Samarkand madrasas is 3D digitisation of these objects. Thanks to the joint work of Samsu and LUT specialists, we have experience in this area. Therefore, in the future it is necessary to plan and develop a project for 3D digitisation of Samarkand madrasas, which have survived to this day. This is a highly realistic task in the conditions of the city of Samarkand.

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Research on the history of the early mediaeval period of Khorezm from the 1920–1930s to the turn of the 21st century

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Abstract

To date, there has been a large collection of studies devoted to the Great Silk Road and the role of Central Asian countries in it. The historiography of Khorezm's history in the early mediaeval period is also very rich. Research works started in the 1920–1930s are more related to the activities of Russian researchers. By elucidating the topic, information is also given about the research works carried out from the 1920–1930s to the turn of the 21st century.

Keywords: Khorezm archeology-ethnography expedition, "One belt – one road" Mizdahkhan, M. M. Mam-betullayev, Lo Weiduna, Xin Yusai and Zhou Gupin

It should be noted that the scientific study of the early mediaeval trade cities of Khorezm with the help of archaeological research began in the 1920–1930s.

In 1936–1937, the information about the early mediaeval cities of Guldursun and Norinjan in South Karakalpakstan and trade relations was partially reflected in the research of Ya. G. Gulomov [1].

The second period of the study of early mediaeval trading cities is closely related to the activities of the Khorezm archaeological-ethnographic expedition organised in 1937 under the leadership of the famous archaeologist and ethnographer S. P. Tolstov, which for more than 40 years covered many

mediaeval identified and scientifically studied the monuments of centuries: cities, settlements, caravanserais and similar monuments [2–4].

S. P. Tolstov, M. G. Vorobyeva, M. S. Lapirova-Skobla, Ye. Ye. Nerazik, A. V. Gudkova, Yu. P. Manilov, V. N. Yagodin, A. A. Yerusalmitskaya and other researchers and scientists published [2–14] on the basis of the results of archaeological research in the studied area also provide valuable information about the place and role of Khorezm on the Great Silk Road.

From the 1940s, the results of the research carried out by the Khorezm archaeological-ethnographic expedition staff, antiquarians from Karakalpakstan and researchers from Khorezm in the lower reaches of the Amudarya and Syrdarya, the Aral Bay and the northwestern direction, illuminating the system of trade relations found materials were announced to the general scientific community [2–7, 9, 10].

During the years 1958–1961, the Khorezm archeology-ethnography expedition explored such trading cities as Shahrliq, Puljoy, Bugrokhan, Munchogli, Zamakhshar, Tuproqkala, Yorbakirkala and Hazorasp [5, 11, 15, 16].

In 1962, 1964–1965 and 1966, archaeological excavations were conducted in another large trade centre – Mizdahkan – by a group of the Karakalpakstan branch of the FA of Uzbekistan under the leadership of V. N. Yagodin. As a result of these studies, the layer of the early mediaeval period of the city was also studied [17, 18].

In studying the history of trade cities and their economic life it is also important to study caravan routes and their routes. From the 1930s to the 1990s, a number of caravan routes were archeologically researched, which allowed to determine the trade relations between the trading cities of Khorezm with neighbouring and distant countries. One of such caravan routes was the route connecting Khorezm trade cities with settlers between them and Eastern Europe, which passed over the Ustyurt plateau. There was a lot of information about trade routes passing through Ustyurt. In addition to cities, there are many ruins of towers, caravanserais and cisterns on the Ustyurt trade route.

S. P. Tolstov pointed out that the Bulok, Kusbulok, Belovli, Churuk and Uchquduq caravanserais on this caravan route belong to the 9th–10th centuries [19, 20].

At the 24th session of the UNESCO General Assembly held in 1987, the approval of the international project “The Great Silk Road – the Road of Communication” on the comprehensive study of the Great Silk Road is also part of the study of the topic became of special importance. In the summer months of 1991, a special international expedition was organised through the Republics

of Central Asia and Kazakhstan by the decision of the United Nations Organisation (UNESCO) for the purpose of researching the Great Silk Road. The expedition aimed to restore the ancient trade routes between the peoples of the East and the West, to restore the historical ties between the countries located on the Silk Road, and at the same time to further strengthen their international relations. More than 100 representatives of social sciences and other fields from more than twenty countries took part in it. This expedition was carried out under the humanitarian slogan “The Great Silk Road – the road of dialogue”. From the 1990s, the results of the research carried out by Khorezm researchers in the lower reaches of the Amudarya and Syrdarya, as well as the Aral Bay and in the northwestern direction, and the discovered materials illuminating the system of trade relations were announced to the general scientific community [21–25].

M. M. Mambetullayev’s article on the trade relations of the cities of Khorezm can be included among the first studies written on the topic of the years of independence [26].

Starting from 1997, as a result of the archaeological excavations of the Khiva regional department of the Ya. Gulomov Institute of Archeology, the Khorezm Mamun Academy and the archaeological group of the Urganch State University, unique items related to the branches and infrastructure of the Great Silk Road that passed through the oasis were obtained. In particular, new important information was obtained about the ancient settlements of large and small towns and villages in the Khorezm oasis, the trade routes of the early Middle Ages in the Khorezm oasis and Karakalpakstan [23].

The issue of trade relations conducted by Khorezm in various branches of the Great Silk Road in the late 20th century and the beginning of the 21st century was also reflected in the studies of prominent specialists of the republic. In particular, E. V. Rtveladze’s monograph and articles on the detailed history of the Great Silk Road revealed that Khorezm also took an active part in these trade relations. For example, the author’s monograph *The Great Silk Road*, published in the late 1990s, should be highlighted [27].

A lot of research has been done on the history of Khorezm’s trade relations with the Volga, South Siberia and Eastern Europe through the Northern network of the Great Silk Road. Works and articles of researchers such as Ye. Nerazik, A. Martirosyan, I. Yu. Pastushenko, M. Kalmenov, A. Bijanova, O. P. Zhdanovich or S. G. Botalov, also give information about trade routes connecting Khorezm with the Volga and Siberia, Eastern European regions, the role of Khorezm in the entry of products from the East to these regions or the products brought from Khorezm itself and taken from [28–36].

The Great Silk Road and its importance, the place and role it played in the history of Central Asian countries is one of the topics of interest to foreign scientists. The number of studies by modern foreign authors devoted to this topic has increased significantly in recent years.

In China, interest in issues related to the Great Silk Road has grown especially after the “One Belt – One Road” project. For the implementation of this project, separate research institutes were created and many scientific works were published. For example, in the works of authors such as Lo Weidun, Xin Yuitsai, and Zhou Guping, various issues related to the problem were considered [37–40].

In general, based on the analysis of archaeological and historical research conducted in the years after independence, it can be said that instead of Khorezm’s position on the Great Silk Road, a lot of information is devoted to its trade relations with European and Eastern countries. In time, the source basis of the problem expanded, new scientific and theoretical approaches and concepts were formed. These scientific results, in turn, are of great importance in imagining the general scope of issues related to the topic, and showing the achievements and shortcomings of the relevant research.

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Mediaeval cities of Khorezm on the Great Silk Road

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Abstract

The article examines the history of trade relations between Khorezm and the countries of Eastern Europe, as well as mediaeval Khorezmian cities located along the Great Silk Road.

By the 8th–10th centuries, the main caravan routes were finally formed in the territories of Eurasia as a transit, interregional and internal system. Among them, the transit route was more significant for Khorezm. Since the early Middle Ages, one of the branches of the trade route from Central Asia to Byzantium passed through Khorezm. This trade road went from Sogd to Khorezm, then through the Ustyurt plateau along the northern coast of the Caspian Sea, the steppes and foothills of the North Caucasus and the passes of the Greater Caucasus Range to the city of Sevastopolis (Sukhumi).

Keywords. The Great Silk Road, Khorezm, Khorezmian cities, Bulgaria, Khazaria, Tabari, Makdisi, Istakhri

In the history of trade relations along the Great Silk Road, the study of trade relations of Khorezm¹¹ has a great importance. In the Middle Ages, the Khorezmians controlled all the northern trade routes connecting European countries with the East, including the Volga, Don and Dniepre rivers with access to the Caspian and Black Seas. Khorezm was the main centre of all trade between the Muslim

¹¹ Khorezm is a historical and cultural region in the lower reaches of the Amu Darya, not far from its confluence with the Aral Sea. First mentioned in sources from the 7th century BC.

world and Eastern Europe, which since ancient times played the role of an intermediary between the ancient civilisations of the Middle East and the distant North [1]. Residents of the region made a huge contribution to the creation of the culture of the people of Eurasia.

By the 8th–10th centuries, in the territories of Eurasia, the main caravan routes were finally being formed as a transit, interregional and internal ways. Among them, the transit route was more significant for Khorezm. Since the early Middle Ages (6th century), one of the branches of the trade route “from the Turks to the Greeks” passed through Khorezm. This trade road went from Sogd to Khorezm, then through the Ustyurt plateau along the northern coast of the Caspian Sea, the steppes and foothills of the North Caucasus and the passes of the Greater Caucasus Range to the city of Sevastopolis [2].

Two main roads led from Khorezm to the lower reaches of the Emba, Ural and Volga rivers. The shortest of them was the road from Gurganj (Kunya-Urgench) through Shemakhakala (medieval Zamdian), the Kulanly caravanserai (mediaeval Jit) and the settlement of Alan-Kalu. Further, skirting the Barsakelmes hills from the west, the road came out to one of the descents from Ustyurt, Myn-su-almaz, and then followed along the Ustyurt plateau in the direction of the lower reaches of the Volga [3]. The second, longer one, started its road from Khorezm to the Lower Volga region and ran along the eastern cliff of the Ustyurt cliffs through Aibuir-Kala, Pulzhai, Karaumbet, Uch-Kuduk and the Beleuli caravanserais. It was studied in detail by the Khorezm archaeological and ethnographic expedition under the leadership of S. P. Tolstov [1].

In the lower reaches of the Volga, in the middle of the 7th century the Khazar Khaganate was formed, with its capital in the lower reaches of the Volga. Situated at a key crossroads of Eurasian trade routes, its capital cities of Semender and Itil were a centre for the goods and political life of the Asian counterpart of southeastern Europe. In fact, during this period there was a revival of relations between Khazaria and Central Asia; among its Muslim population there were also Khorezmian colonists.

Perhaps, from this time the revival of the Great Silk Road began through Khorezm to Eastern Europe. Subsequently, with the emergence of Volga Bulgaria (9th–14th centuries), some types of material culture penetrated from Khorezm to Eastern Europe – glass items, semi-precious stones (turquoise, carnelian), ceramics, toreutic items (silver bowls and dishes). And in Khorezm itself, the Great Silk Road stimulated the emergence of a number of cities associated with the Eurasian trade system.

By the 10th century there was a lot of historical and archaeological evidence that allows us to conclude that the country at this time was experiencing a rapid process of economic recovery. This was primarily clearly reflected in the rapid growth of the number of Khorezmian cities. If we compare the figures for the cities of Khorezm, which we can extract from sources for the 8th and 10th centuries, a very revealing picture can be seen [4].

The Muslim historian Tabari, in his story about the conquest of Khorezm by the Arabs in 712, said that there were only 3 cities in Khorezm – Kyat (Qiyot), Khazarasp and apparently Urgench. The Arab geographer Al-Istakhri (wrote around 930–933) wrote about 13 names in his listing of the cities of Khorezm. The author of “Hudud al-alam” listed 9 names of the cities of Khorezm (Kas, Khushmisan, Nuzhaban, Gurganj, Kardnazkhas, Badminia, Dekh-i Karategin, Kardar, Khiva), omitting such significant centres as Dargan and Khazarasp. And finally, al-Maqdisi, who wrote around 985, already listed 32 Khorezmian cities.

According to the Soviet archaeologist S. P. Tolstov, all these lists are confirmed by archaeological data: if during the 8th–10th centuries we have, taking into account the incompleteness of Tabari’s news, there was a very slight increase in the number of cities, then the 10th century gives us a very sharp jump in which it is impossible not to see the reflection of a deep shift in the economic structure of the country [4].

The growth of cities is undoubtedly one of the important manifestations of the general economic rise of the country and the strengthening and expansion of economic ties of the resurgent urban civilisation of Khorezm on a new basis with the surrounding steppe and more distant countries.

Arab sources vividly paint us a picture of the exceptional economic activity of Khorezm in the 10th century, and the arena of activity of Khorezmian merchants, firstly, in the surrounding steppes of present-day Turkmenistan and western Kazakhstan and, secondly, the Volga region – Khazaria and Bulgaria, and then the vast Slavic world of Eastern Europe.

Istakhri tells us already at the beginning of the 10th century: “Khorezm is a fertile place, abundant in food and fruits, there are only nuts in it; it produces many items of cotton and wool, which are exported to distant places. Among the characteristics of its inhabitants are wealth and the desire to show their courage. They are more scattered than all the inhabitants of Khorasan (to foreign places) and travel more than all others; in Khorasan there is no large city in which there would not be a large number of inhabitants of Khorezm... In their country there is no gold or silver mines, and no precious stones; most

of their wealth comes from trade with the Turks and cattle breeding. Most of the slaves of the Slavs, Khazars and their neighbours, as well as Turkic slaves, and most of the furs of steppe foxes, sables, foxes, beavers and others fall to them” [4].

Ibn Fadlan tells us interesting information about the trade of Khorezm with the Turks. In “Hudud al-Alam” it is written: “Kyat is the main city of Khorezm, the gateway to Guz Turkestan, a storage place for the goods of the Turks, Turkestan, Transoxiana and the Khazars, a meeting place for merchants... The city has great wealth”.

Especially interesting information comes from al-Maqdisi. When describing items exported to the countries of the caliphate from the regions of Khorasan, the longest list was given for Khorezm: “From Khorezm – sables, grey squirrels, ermines, steppe foxes, martens, foxes, beavers, painted hares, goats, wax, arrows, white bark poplars, caps, fish glue and fish teeth, beaver stream, ambergris, kimukht (a type of leather), honey, hazelnuts, falcons, swords, chain mail, birch, slaves from the Slavs, rams and cows – all this from the Bulgars. And they produce grapes, a lot of raisins, cookies, sesame seeds, striped clothes, carpets, blankets, beautiful brocades, mulham bedspreads, locks, coloured clothes, bows that only the strongest people can string, special cheese, whey, fish. Ships are built and finished there” [4].

This list is doubly interesting. Firstly, it gives us a significant expansion of the range of products of the Khorezm handicraft industry exported from Khorezm. According to Istakhri and Khudud al-Alam, Khorezm is depicted as a predominantly agrarian-pastoral country and at the same time a centre of intermediary trade between the countries of the East, the Turks and the Volga region, in particular the largest slave trade market. Exports include, along with northern raw materials and local agricultural produce, products of the local textile industry. In al-Maqdisi, it is possible to see the appearance of items from the metalworking (locks), weapons (bows), and shipbuilding industries among the exports [4].

The following lists the mediaeval cities of Khorezm located along the Silk Road, which are known to us from Arabic written sources:

Dargan is a city on the left bank of Khorezm, located on the way to the Amu Darya. Its ruins are located 3 km south of the village of Dargan-Ata. It was a large fortress with a vast open settlement outside its walls. The fortress was founded in the 6th century and functioned until the Mongol invasion. The ruins of the city are located on the edge of a floodplain terrace, rising above the vast tugai strip of Dargan-Ata [5]. In the 10th century in place of these tugai there were continuous cultivated lands with 500 vineyards. Near Dargan there was a busy crossing place of the Amu Darya [6].

Khazarasp – in the 12th century, it was an impregnable fortress. The toponym Khazarasp is etymologised as “Thousand Horses”. During the period of the Khiva Khanate, it was considered the second capital of the Khanate. The medieval Khazarasp corresponds to the ancient settlement of Div-Salgan, located on the outskirts of the city of Khazarasp, the regional centre of the Khorezm region. The Khazarasp fortress had a square shape. The lowest layers date back to the 5th–4th centuries BC [7].

Khiva or Khivak is one of the cities of Khorezm. In the 10th century the name Khiva was given to one of the canals drawn from the Jaihun River on its western side. Ships sailed along this canal and sailed to the city of Khiva. In the 10th century it was a vast city at the edge of the desert, on the banks of a canal, with a beautiful cathedral mosque. The city was surrounded by a wall [6]. The inner fortress of the late medieval city of Khiva was called Ichan-Kala, and the outer city was called Dishan-Kala. Khiva belonged to the type of cities of the Kushan period and never changed its location since its foundation [5].

Ardakhushmetan was a city located on the left bank of the Amu Darya, west of the capital city of Khorezmian Kas. The toponym Ardakhushmetan was formed using the Sogdian topoformant *mēθan* – “house”, “dwelling”, “abode of people (gods)” [6].

Safardiz was a city located at a distance of 5 farsakhs from Khiva and 3 farsakhs from Kas [6]. In the 12th century Safardar was mentioned – a village near the Jayhun River, not far from Amul, on the way to Khvarazm. According to M. E. Masson, this fortress was located between mediaeval Amul and the city of Visa on the left bank of the Amu Darya, where in the Middle Ages the main caravan route from Khorasan to Transoxiana passed [6]. Safardiz was localised on the site of the present city of Khanka [5].

Nuzvar is a city on the left bank of the Amu Darya. In the 10th century it was a small city with a fortress surrounded by a moat and iron gates. A caravan route passed through the city. The fortress had two gates; they were approached through a bridge that was raised at night. Near the western gate there was a bathhouse, the like of which did not exist in these parts. The cathedral mosque was located in the middle of the bazaars, which were almost all covered. It corresponds to the site of Buldumsaz, where life continued until the beginning of the 13th century [5].

Kardaran-Khas was a city or fortress on the banks of the canal of the same name, on the left coast of the Amu Darya. According to al-Muqaddasi, Kardaran-Khas was located 3 farsakhs west of Khazarasp on the way to Khiva. It had a fortress with wooden gates and a moat [6]. The city is identified with

the ruins of the Kaladzhik fortress, located between the cities of Khazarasp and Khiva [5].

Kardar was a city in northern Khorezm. At the beginning of the 8th century on the right bank of the Amu Darya, the Kardar or Kurdar district is mentioned, the inhabitants of which rebelled against the Arabs [8]. Its administrative centre is located 10 km from Kegeyli, on the site of the ruins of Khayvankala, or on the canal of the same name, on the right bank of the Amu Darya, below the modern Khojeyli.

Mazminiyya is a city on the right bank of the Amu Darya. The settlement of Bograkhman, located 17 km north of Kungrad, is identified with it. The name of the settlement is associated with the name of the Karakhanid ruler Bograkhman, who conquered Bukhara in 992. But this ruler had nothing to do with Khorezm. Here, we are probably dealing with the legend of Hakim-Ata Bakirgani, who allegedly enjoyed the respect of Bograkhman and was married to his daughter [5].

Mizdakhan was a city on the right bank of the Amu Darya. It was located 30 km east of Kunya Urgench or on the site of the Mazlum Khan-slu settlement, 7–8 km south-west of the city of Khojeyli.

Kat or Kas – according to al-Sa'alibi, the capital of Khorezm, the city of Kas, was also called Khwarazm. According to al-Sam'ani, in the Middle Ages there was a city called Khwarazm, which was conquered by Qutayba ibn Muslim al-Bahili. This refers, of course, to the city of Kas, which al-Sam'ani mentions elsewhere as a city in Khwarazm. The size of the city in length and width was approximately a third of a farsakh. Its markets were very lively and brought in large profits. When the city was washed away by the river, the inhabitants built a new city next to it. According to al-Muqaddasi, Kas was also called Shahrstan, and it was equal in size to Nishapur. Its central mosque was located in the middle of the bazaars. The columns of the Kasa Mosque were built from black stones [6].

In "Hudud al-Alam", Kas was also called "the gateway to Ghuz Turkistan." It was a trading centre of the Turks, Turkistan, Mawarannahr and the Khazars. It was a gathering place for merchants. The owner was called "Khwarazmshah". The inhabitants of Khwarazm were warlike and active fighters for the faith. According to Yakut, Kas was a large city located 20 farsakhs from Jurjaniyya, east of the Jayhun (Amu Darya), while all other cities of Khorezm were located west of the river. The name of the city Kas translated from Khorezmian means "wall in the desert", although there was no wall around the city. On the outskirts of the city there was the fortress of al-Fir, built of clay and mud

brick in the form of 3 fortifications, one inside the other. The fortress was visible from a distance of 10 miles or more. It was washed away by the Jayhun River, which carried it away in pieces every year [6]. With ancient Kas, which was the capital of Khorezm since the 4th century AD, the ruins of Shaikh Abbas Vali, located near the city of Biruni, the regional centre of Karakalpakstan, were identified.

Thus, archaeological data convincingly confirm literary sources about the intensive exchange of goods that took place from the middle of the 6th century AD along the Volga–Don route, connecting Constantinople, and therefore Eastern Europe with Khorezm and Sogdiana [9].

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Akchakhan-Kala – the ancient capital of Khorezm

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Abstract

This article discusses the issues of the Akchakhan fortress, one of the ancient capitals of Khorezm, and from the text it is possible to get acquainted with the materials of Russian archaeologists from 1956, investigations conducted by G. K. Khojaniyazov in 1982–1985, and the joint Sydney–Karakalpak expedition of 1995, and some information about the jewelry and material culture of the ancient capitals of Khorezm. There are also some materials about the current state of the fortress.

Keywords: Akchakhan, Akchakhan fortress, walls, arch, citadel

1. Introduction

One of the most pressing problems in the history of ancient Khorezm statehood is the question of its early capitals (Iron Age, 10th–5th centuries BC). According to information recorded in archaeological literature, from the last quarter of the 6th century BC, in the region of the right bank of Khorezm to the Amu Darya, fortresses were built in the Kaltaminor canal system (the height of Yonboshkala in the Akhchadarya basin and the area of the village of Shorahan, Bozorkala (late 6th century BC), Dingilja (5th century BC), Khazarasp (5th century BC), Khiva (5th century BC) on a plain connected to the foot of its bank by the main irrigation

structure from the Amu Darya in the left region [1]. The period from the end of the 5th century BC – the 4th century BC, after the Khorezmians gained independence from the power of the Achaemenids, the national state of Khorezm contributed to the development of Uzbek statehood.

The Khorezmian king Farasman and his descendants built the Amu Darya irrigation structures on sections of the right and left banks of the river. For those who actively pursued the policy of building villages and cities, this process attracted the attention of the great encyclopaedist Abu Rayhan Beruni, who said: “They (the Khorezmians) built 300 villages and cities along the coast of irrigation structures, their ruins have survived to this day.” Akchakhankala is one of these settlements on the right bank of the Amu Darya.

2. Method and materials

In the 1930s, local residents used the toponym “Akhchakhankala” for the monument, and now it is known as “Kazakhliytgan”. This monument, which is one of the fortresses of early antiquity, is located in the middle of high moving sand dunes in the north-eastern part of the Ozod village in the Beruni district of the Republic of Karakalpakstan.

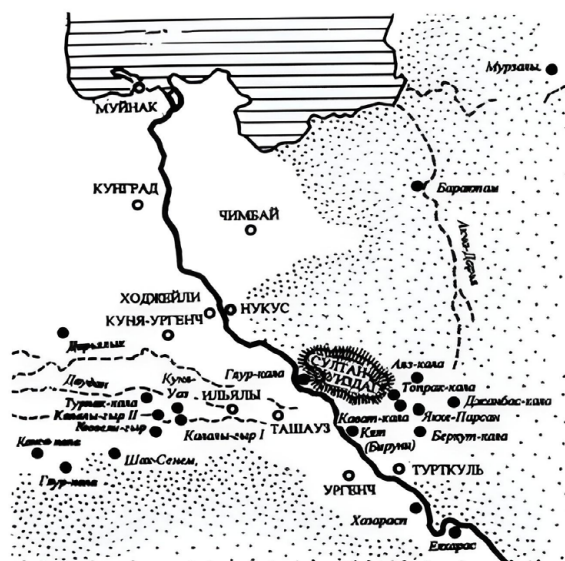


Figure 1. Cities and fortresses of Khorezm in the ancient era
(source: <https://studfile.net/preview/1853156/page:9>)

The fortress was first mapped by the Russian engineer B. V. Andrianov in 1956, after which preliminary archaeological excavations began (Fig. 1). As a result of partially carried out works, Andrianov came to the conclusion that the fortress belonged to the Kushano-Afrigid period [2].

In 1982–1985, excavations at the monument were carried out by the Karakalpak archaeologist G. K. Khojaniyazov, who, based on examining the materials found, noted that its historical period dates back to the 4th–3rd centuries BC – 3rd centuries AD [3].

During the years of independence, interest in Akchakhankala increased even more. In 1995, an agreement was signed between the Academy of Sciences of the Republic of Uzbekistan and the University of Sydney, Australia, and excavations began at the site. Professor V. N. Yagodina from Karakalpakstan contributed greatly to organising the international expedition. Every year, Professors A. G. Betts and S. W. Helms from the University of Sydney, F. D. Kidd (Australia), E. Baker Brit (USA), K. G. Dali (France), Michel Minardi (Italy), S. Hoshimov (Tashkent), Karakalpakstan archaeological scientists G. Khodzhanliyazov, N. Yusupov, A. Iskandarova, Sh. Amirov, V. V. Yagodin, A. Bekbauliev and others participate in the undertaking from the beginning to the end of the autumn season [4–9].

The Akchakhan fortress, like the ancient fortresses of the Khorezm oasis, traditionally consists of two parts: internal and external fortresses, and is architecturally rectangular in shape. Both the inner and outer fort are surrounded by separate defensive walls. They are connected to each other through a gate (Fig. 2).

The total size of the outer fortress is 56 hectares. The walls of the castle were rebuilt from mud bricks measuring $41\text{--}43 \times 41\text{--}43 \times 11\text{--}13$ cm on a straw foundation. The thickness of the external walls is 1.7 m, of the internal ones – 2.1 m. The defensive wall was made in two rows, between both walls there was a special 2.3-m-wide hall (corridor) for archers. On the walls of the fortress towers were built every 23–30 m, and at similar distances along the outer walls – turrets as archery posts. As a protection against sudden external attacks, a long and deep ditch was dug under the wall and filled with water.

There is a 5–6 m wide gap between the north-eastern walls of the fort, which, according to researchers, could be the gate of the outer fort.

As a result of research carried out in the fortress, it was found that more attention was paid to the defense of the inner fortress than the outer one. That is, in fact, these protective walls were built in three layers. The inner fortress covers an area of 13 hectares. It is clear that special attention was paid to its protection, because the entrance to the city gate is made of six

labyrinthine barriers. The buildings of the Ichan-Kala (inner fortress) differ from the Dishan-Kala (or outer one) in their many floors. The first and second floors of the three-story protective walls were covered with wooden beams, and the third, highest floor remained open [10].

Through the walls of each floor, there was a long corridor for archers, both the first and second floors were covered with wooden columns; only the upper part of the third floor was left open. On all three floors, holes were made for archers every half-meter along the entire wall. On the first floor, there are about nine hundred bullet holes. If we count the holes in the floors at a distance of about one and a half meters from each other, then the number of such holes will be two thousand and seven hundred. This means that as many archers and shooters took part in the defense of the fortress [10].

The arch was built on a very high foundation and could be approached from the qibla gate towards sunset along a ramp six meters wide and thirty meters long. Considering that this structure is located high above all the buildings and walls of the fortress and in the very centre of the monument, it could serve either as a royal palace or a temple. In this regard, researchers have not come to a common conclusion [4].

The area of 28×16 meters served at one time as a residential building, and its top was covered with wooden beams in the form of a barn, and the beams were supported by wooden posts. Since the lower floors of the building have not yet been fully excavated, it is difficult to say anything about what discoveries await archaeologists there. However, in addition to the central building, there are two more buildings in the western and northern corners of the inner fortress. The area of the first is 100×80 meters, the second is 60×55 meters, and each one is surrounded by a separate wall.

These structures were interpreted by researchers as a “mausoleum”, “temple”, “fortress”, and next to them were the remains of a hundred-column hall [10].

In the northern part of the Akchahan fortress, remains of a wall stretching from west to east have been preserved. The distance between the fortress wall and the remains of the building walls is 60–90 meters.

As a result of archaeological excavations, it became known that this wall was restored simultaneously with the fortress. This wall may have served as the first obstacle in the enemy's path. The wall was 3 meters wide and 5–6 meters high. Archaeologists believe that this wall is the oldest wall on the southern side of the island [10].

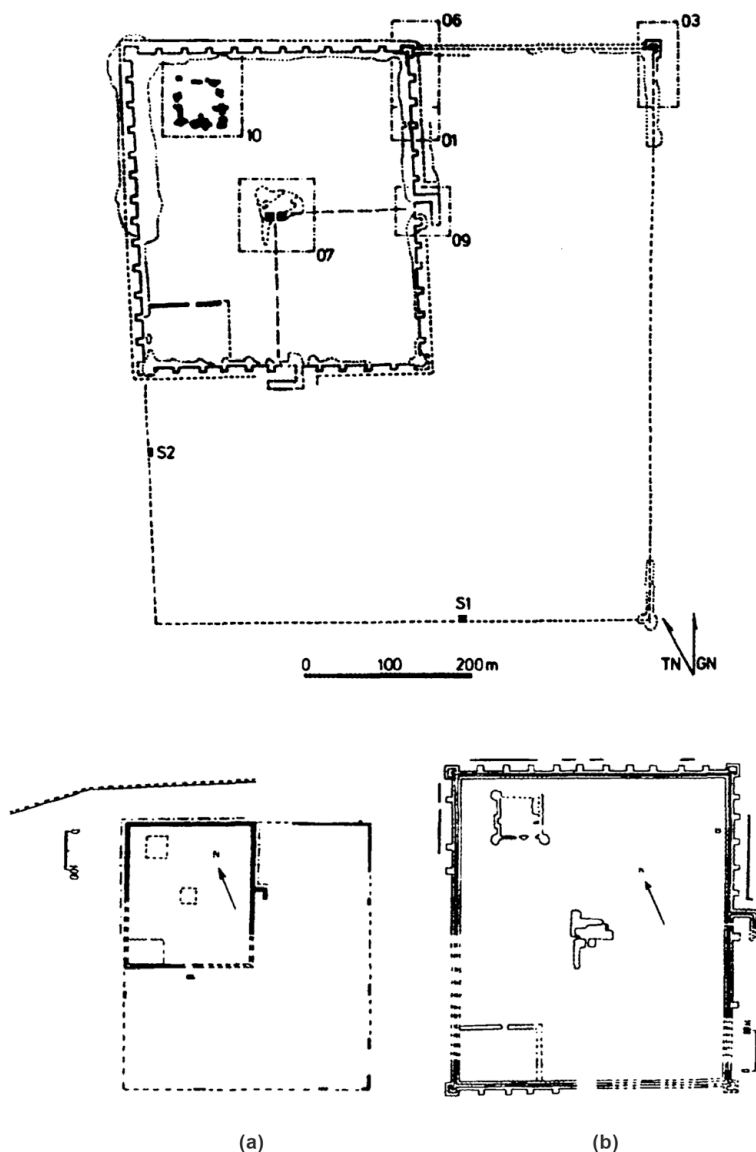


Figure 2. Schematic plans of the fortifications at Kazakhliytogan [5]:

a) general plan (Helms et al. 2001. Fig. 4), b) plan of the upper town, c) plan of the lower town [6]

Crafts such as pottery, carpentry and bone processing were well-developed in the city. Here, large stones are carved into patterns and shapes, elements used in architecture, women's jewelry skillfully made from precious stones brought from Sultan Weiss Mountain, small boxes for cosmetic paints such as usma and henna, crafts such as bone writing pens, hairpins, knife handles were found among art objects [7].

During excavations carried out by archaeologists in the Akchahan fortress in 1995–2018, unique antiques were found. Including all kinds of figurines, stone tools for threshing grain, pottery, and others. The most unique of them are the statues of gods and horses, camels and other animals that were worshiped by the inhabitants of the fortress in ancient times. Almost all of them are made of clay and fired in khumbuz. The clothing and appearance of the figurines of the gods are made very skillfully [6, 7].

3. Conclusions

In short, in addition to the statues of the “god” that the local population worshipped, a statue of a cow was also found here, considered sacred for the peoples of the Southern Aral Sea. The discovery of this statue in our oasis, reminiscent of the Hindu god of worship, “Budistaft,” proves that there were also Indian traders in “Akchakhankala.”

This object also proves that one of the routes of the Great Silk Road, which connected other regions with the Mediterranean Sea, passed through the Akchahan fortress. Currently, the eastern sides of the fortress are occupied by dunes, and on the northern side of the monument, remains of houses have been found, indicating human habitation, and traces of cultivated fields, stretch for 3–4 kilometers. This means that the situation around the city was typical of the Khorezm cities of antiquity, and the surrounding areas were agricultural oases.

Based on an analysis of the architectural style of the castle and the ceramics found there during archaeological excavations, it was concluded that people lived in Akchahan Castle from the 4th century BC to the 5th century AD and it was a bustling city with a large population.

Another important news for this archaeological site is the discovery of unfinished and semi-finished coins in one of the rooms inside the fortress. It is known that such semi-finished coins were not put into circulation. Conclusion: the room where the coins were found was probably at one time a mint. That is, if we take into account that only rulers had the right to mint coins, this fully confirms that the Akchakhan fortress in the ancient period was the capital of ancient Khorezm during certain periods.

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The role of Ayazkala and Kalajikkala in the defense system of the ancient fortresses of Khorezm

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Abstract

This article provides information about the ancient fortresses of Khorezm (Ayazkala and Kalajikkala), their functions and how they have been preserved to our times.

Keywords: antique, castle, Ayaz, arrow, burj, defense, Karakum, Karakalpakstan, Bagat, S. P. Tolstov, Yu. Gulomov

An ancient centralised state developed in Khorezm, and ensuring its security on trade and communication routes became an important task in the policy of the central and local military-administrative authorities. Therefore, military fortifications were built along trade routes, and special armed security groups and troops were organised.

The construction of military fortifications on the borders of Khorezm and caravan stops on trade caravan routes, as well as the construction of many fortresses in the interior of the country according to architectural designs, required, first of all, centralised organisation and implementation.

Secondly, in a relatively short period of time, the goal of creating a new system of large defense structures on the territorial scale of the state was put forward. In our opinion, in such conditions it was necessary to use all the opportunities that were available to the state.

The construction of individual fortresses, fortified palaces and temples in oasis-regional agricultural centres, communication and trade routes and the borders of the country, as well as the creation of a state defense system in general, required the supply of raw bricks. According to researchers, bricks were prepared in almost all agricultural regions of the Khorezmian state and centrally imported for new constructions [1].

One of these defensive structures is the Ayaz fortress (Fig. 1). The site consists of three fortresses built from the 4th century BC to the 7th century AD. The surviving structures are part of a series of settlements on the outskirts of the Kyzylkum desert, which protected them from the attacks of nomads and Sakas of the Syr Darya delta [2]. Part of the Ayaz fortress was built by the Kushan Empire in the 2nd century. It is believed that the now destroyed fortress was built as part of the fortifications that guarded the borders of the Kyzylkum desert. In addition to the remains of a fortress that served for defensive purposes and was subsequently eroded, the remains of several residential buildings were also discovered there [3].

Beginning with the Ayaz I fortress, it was built at the end of the 4th or the early 3rd century BC, during which Khorezm became independent from the Achaemenids. The Ayaz fortress was part of a chain of castles that protected agricultural settlements from attacks by outsiders. The fort was located on a hill about 100 m high, which gave a better view of the surrounding plains. The fort is rectangular in shape with sides measuring 182 and 152 m (about 60 and 50 ft) in length and runs from north to south [4, 5].

At the southern end of the fortress there is a square gate, a typical element of Khorezmian border fortresses. The enemy had to attack parallel to the south-eastern walls, and the invaders were powerless to attack from above. A huge gate, guarded by two rectangular towers, leads into a small rectangular room. This room was visible from all sides through the high walls, and if the first gate had been breached, the archers could still have struck the enemy. The fortress wall consists of an inner and outer wall, between which there is a vaulted passage about 2 m wide. The walls are up to 10 m (3.3 ft) high. The walls were fortified in the 3rd century BC with 45 semi-elliptical watchtowers spaced 11.5 m apart in the north and 14 m apart in the east and west. The castle was used until the 1st century BC and served as a refuge for the local population until the early Middle Ages [6].



Figure 1. Ayazkala I

(source: <https://en.wikipedia.org/wiki/Ayaz-Kala>)

As is known, since ancient times the Khorezm land was located in an area surrounded by deserts, and agriculture, which was the main source of subsistence, was based on artificial irrigation. The irrigation networks in the area are one of the oldest such systems in the world history, providing the entire region with water, the source of life. Naturally, such networks served not only to supply water to lands remote from the river, but also to develop an urban culture that began to slowly emerge in its vicinity. One of the ancient fortresses of Khorezm that arose in these parts is Kardaronkhos, or, as we know it, the Kalajik fortress (Fig. 2). This fort is oriented towards sunrise, stretching from west to east, and has an irregular rectangular shape. Today, with the exception of the eastern wall, the remaining parts of the fortress are fairly well preserved. Its northern wall is 184 m long, the southern one is 221 m, the western – 72 m, and the eastern – 114 m [7].

The ground around the fortress is covered with a layer of soft salt, and in the centre there is a small lake, formed by the influence of underground waters and the adjacent lake. The height of the eastern wall is 12–14 m, and its thickness reaches 2.5 m. On the northern wall there is a tower 16 m high, the base of which is 25×15 m. Traces of a living room were found in it. The castle is surrounded by 2 rows of mud brick walls measuring $45 \times 45 \times 15$ cm, and between these two walls there are passages for archers and city defenders, typical of the ancient fortresses of Khorezm. That is, the fortress was restored in accordance with the requirements of mediaeval military equipment. It can be seen that the fortress served as one of the largest military fortifications in the region after Khazarasp.



Figure 2. Kalajik

(source: <https://uzbekistan.travel/en/o/kaladzhik-wellness-center-of-ancient-khorezm/>, <https://telegra.ph/XORAZMGA-KELISHINGIZ-UCHUN-7-SABAB-11-12>)

In addition, to the east of the fortress a large ancient village can be noticed that is not protected by a wall. This feature is characteristic of all large military fortresses of antiquity. In general, the castle belongs to the type of fortified fortifications of the Kanguy period. It is believed that life in the castle ended at the beginning of postantiquity. As mentioned above, the first reason for the appearance of the fortress were its irrigation structures. From the records of Arab travellers we can know that two farsakhs (a farsakh is an old measure of length equal to about 5 to 5.5 km) from Khazarasp there was the Kardaronkhush canal, which was larger than the Khazarasp canal and led to the city or fortress of the same name. According to Makdisi, this canal is located 3 farsakhs to the west of Khazarasp, on the road to Khiva. Researcher Y. Gulomov noted in

his work that Kardaronkhos is the current Kalayadzhik fortress. In the works of the 10th century travellers Istakhri and Makdisi and in the work *Hudud al-Olam*, the author of which is unknown, it is said that from Khazarasp to Kardaronkhos there are three farsakhs and to Khiva five farsakhs [8].

These data are also consistent with modern measurements between the three objects. However, although Makdisi's work mentions the existence of the Zardukh fortress between Khiva and Kardaronhos, this is rejected by most researchers. In the 10th century, Cardaranchos was not a city, but a fortress with large wooden gates and a moat [8]. Abulgazi Bahadir Khan in his work [9] calls this city "Kardan Khast". The orientalist De Guy also recorded this name in his works [9].

The works of Muniz and Agohi say that Cardaranjos was located near Lake Nukuz, in the Besharik region [10]. As mentioned above, life existed in this territory until the beginning of the 1st century AD, and later, between the 5th and 8th centuries, the city rose again and the small fortress of Kalajik appeared 1.5 km from it. During this period, the revival of life in the fortress is associated, as said above, also with irrigation structures, and we can see specific signs of development in the fortresses of Khazarasp and Almaotishgan to the south of the Amu Darya. However, as already pointed out, most of the Kichik–Kalajik fortifications were lost due to many years of being under the water of the lake. In general, this fortress was not only a military object, but also an important historical centre in terms of trade, as it is located on the border of the desert and the Khorezm region. Although the monument was archaeologically studied 3 times: in 1973–1974 by Y. Gulomov, in 1991 by V. A. Zavyalov and in 2000–2002 by Sh. Matrasulov, it has not lost its scientific significance. Studying the history of this castle may be the key to many unresolved problems in our history.

In conclusion, it should be noted that at the beginning of the 4th century BC Khorezm developed as a separate kingdom. Most of the country's population lived in agricultural oases based on artificial irrigation.

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The importance of the infrastructure formed in the Khorezm oasis on the Great Silk Road and the specific features of this system

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Abstract

The rapid development of modern technologies creates an opportunity to fully illuminate the historical processes within the subject, as in all fields. This topic provides information about the history of caravanserais and cisterns, which are examples of the infrastructure of the Great Silk Road, and the architecture of their creation.

Keywords: infrastructure, farsakh, Talaykhan-ota, Istahri, caravansera

The Great Silk Road is considered a communication route that combines not only economic, but also socio-political and cultural processes, and Khorezm has a special place on this road.

In the system of internal communication roads of Central Asia, the roads in the middle course of the Amudarya have a particular role. In ancient times, those territories, from Kalif to Dargan, which is considered the border of Khorezm, did not belong to Khorezm, Sughd or Bactria. The fact that 45 monuments belonging to the ancient period were found in the spaces located in this area indicates its regional importance in the considered period, located as it was on the border of Khorezm, Bactria and Sugdiyana. Among these monuments, small forts found near important crossings of the Amudarya occupy a special place. They were built to control the river's waterway and

crossings [1]. The main places in the Khorezm oasis – cities, forts, fortresses – were located along large canals from the lower reaches of the Amudarya to both banks of the river. Research shows that there are 14 ancient monuments on the left bank of Khorezm, and they are mainly located within the network of the oasis system along the Kaltaminor (Bozorkala), Tozabogyob (Kirqqiz or Burgutkala), Yakka–Porson and Gavkhara canals.

The system of internal roads in the oasis was formed in accordance with the location of the spaces, and the roads connecting the administrative centre with other cities, fortresses and sources of raw materials, fields and pastures formed its main network. The roads connecting Khorezm with Sughd and Margiyona and the steppe regions in the north were of great importance in the relations of the oasis with the neighbouring regions [1].

After the conquest of the territories of Central Asia by the Arabs, the Khorezm region was attracted to more active trade relations with other Eastern countries. Many Arab tourists who travelled to Central Asia wrote about it in their works. According to the testimony of Arab scholars such as Ibn Fadlan, al-Maqdisi, al-Istahri or Ibn Rusta, Khorezm played a significant role in the foreign trade of Movarunnahr, especially in transit trade with the peoples of Eastern Europe, the Volga and Siberia.

“There are no gold and silver mines in the country of the Khorezm people, and there is no mention of precious stones. They earn most of their wealth from trading with the Turks and raising livestock,” wrote the Arab traveller al-Istahri.

Khorezm people are hardworking traders, who created such a history on the Great Silk Road and paid special attention to the construction of infrastructure that would provide better conditions for trade in the system of caravan routes. In particular, they paid special attention to the construction and architecture of the caravanserais where the caravans could stay, as well as the cisterns that could produce ice-cold water in the hot desert (Fig. 1).

Along the Amudarya River, which established ancient trade routes, there were up to 25 stationary crossings of different eras with double forts on both banks of the river. Arab geographers Ibn Khordadbeh and Kudama, Istakhri and Havqal, Muqaddasi and other authors left very detailed information about the distances between Central Asian cities, main centres and intermediate stations in their travel books of the 9th–10th centuries [2]. It has been reported that there are many rabats, mansions, caravanserais, cisterns and wells along the road (Fig. 2). In a number of places, residents of the surrounding area carried buckets of water to the roads on both sides. In the mediaeval road

books, the distances between cities and stations are shown in Persian lengths – farsakhs¹² (5–6 farsakhs during the day, i.e. 25–35 km). The time and distance of the passage depends on the topography of the land and the complexity of the road: steppe, mountain passes, convenient flat valleys [2].



Figure 1. Beleuli Caravanserai

(source: <https://ru.wikipedia.org/wiki/Жаслык#/media/Файл:Белеули.jpg>)



Figure 2. Rabati Malik Caravanserai

(photo by the author)

After the Arab conquest and the establishment of Islam, the roads built by the Arabs for military garrisons in the 7th–8th centuries and the stations near the settlements were used as fortified forts or fortresses for the Ghazis.

¹² Farsax (farsang) – the distance unit is equal to 6 km.

By the 9th century, almost every village had rabats, whose residents were obliged to build the fortress walls and maintain the garrison there. By the 10th century, after the establishment of Islam in Central Asia, the castles-rabats intended for Ghazis began to be adapted as reception houses, apartments for Sufi hermits or merchants – caravanserais and hotels for other needs. According to the information of Arab travellers Istahri and ibn Khawqal, there were more than 10 thousand caravanserais in Movarounnahr, which was a trade centre in the 10th century.

Building roadside inns was a profitable business and considered pleasing to God. Caravanserais were built mainly with donations, and in some cases on behalf of the government or trade associations. They were very profitable and were often declared endowments for the benefit of madrasahs or hospitals. Roadside caravanserais are an independent socio-economic and economic structure, and are used to transport to urban centres, handicrafts, grains and fruits and other household items, and at the same time there was a dependence on the supply of meat and dairy products, raw hides, felt, etc. from the nomadic steppe population. Khorezm caravanserais of the 11th–12th centuries were distinguished by the uniqueness of their planning. They are inside a rectangle with a circle on the outside, an open courtyard inside and buildings along the perimeter (Deu-qala, Talaykhan-ota, Orta-kuyu, Ak-Yayla), genetically the oldest local construction and similar to the round buildings preceding them [3].

In addition to the traditional routes described by 9th–10th c. geographers on the road maps, caravans were drawn to the right bank of the Amudarya, and other roads were used. Thus, the 14th-century traveller Ibn Battuta travelled along the Eastern Road in 1333 with a caravan from Khorezm. He stated that the caravan travelled from the border of Khorezm to Kat for 4 days and there were no villages on the way. Then the caravan went from Kat to Bukhara without water for 6 days through the desert called Sibaya, and then went to Vabkanai (Vabkent), 4 farsakhs east of Bukhara. From there, he walked for 1 day to Bukhara along a green road with nice gardens [4].

In 1952, on the left bank of the Uzboy River, which had dried up, excavations were carried out in the Talaikhan-ota caravanserai, which disappeared in the Karakum deserts from the 9th and perhaps the beginning of the 15th century, near the caravan route. First of all, archaeologists were attracted by the complex water supply system. The modern well was located 13 km away from the building, which was too far because of the high water consumption. That is why the builders of Talaykhan Ota took into account the possibilities of

using rainwater. “Water supply” started at a distance of 80 m from the building, where it served as a water collection area. From there, two trenches were laid that approached a deep tank with a capacity of about one-and-a-half hundred cubic meters. During the construction of the entire system, the smallest deviations of the terrain were taken into account, and the most technically correct slope was obtained [5].

In conclusion, the development of trade in the early Middle Ages had an impact on the road network and its infrastructure in Khorezm. As a result of the construction of caravansarais and cisterns in order to create convenience for merchants on the roads, the trade relations of various residents moving to the north of the region have been revived. It should be noted that this, in turn, had a positive effect on the development of cultural relations.

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Muslim monuments and shrines inhabited by dervishes (based on the example of Khorezm)

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Abstract

There are a lot of historical and cultural monuments in Khorezm, among which those related to Sufism received the recognition of the population. Attention was paid to such monuments during the Khiva Khanate, and they were constantly restored. The funds received from them were large, and the population had a need for such facilities. Dervishes living in these historical objects served as the only health care for the population of that time. In this article, we will talk about such Muslim dervishes and their temporary abodes.

Keywords: dervish, qalandar, zhanda, dervish kachkula, malomati

1. Introduction

One of the Russian authors wrote that, “every educated European who had a chance to meet dervishes on the streets of Tashkent, Samarkand and other areas of Russian Turkestan, undoubtedly thought about these mysterious people. Under the name of ishans, murids or dervishes, they flood Sart villages and Kyrgyz nomads and in the most outrageous way exploit the religious feelings and material well-being of the more easily accessible people” [1]. The Russians were afraid that they were capable of being the most dangerous and elusive political agitators against the existing state order. Therefore, many European

authors were interested in the dervishes. They accumulated a lot of knowledge and wrote a lot of literature. But Muslims themselves also have a large independent literature on the issue of dervishes, and the best, most reliable sources in this case are the works of dervish writers themselves, kawa Sufi poets of Arabia and Persia, who lived during the period of internal and all-round development of dervishes and its formation in certain religious-mystical institutions.

We know that the monuments of history, culture and architecture of the peoples of Central Asia mainly consist of mosques and madrassas. These monuments, which made a great contribution to the development of Islam, are associated with the names of certain historical figures. Most of the historical monuments of Khorezm relate to the activities of Sufis, the most famous representatives of the Sufi order of Islam. The country already had enough conditions for this order, which flourished and reached its highest level of development during the time of the Great Khorezmshahs. Dervishism, the highest point of Sufism, was the propagator of this order in its practical aspects. The Sufi dervishes will be divided into two groups. Sufis either wandered or lived in one place, being local Sufis. The mausoleums of Sulto Uwaisi Baba, Yusuf Hamadoni and Pakhlavon Mahmud, which are the largest shrines and monuments playing an important role in the socio-political and cultural life of the Khorezm region, are associated with the names of such great Sufi dervishes.

2. Method and materials

Sultan Uwais Karani and Yusuf Hamadani are the greatest representatives of Sufism. They were born in Hamadan. The most perfect books of Sufism were written with their pen. Symbolic graves of these Sufis are found in many parts of the Muslim world. The sources say that it is not known whether they were in Khorezm, but the dervishes of Jahangashta left an indelible mark on the places where they stayed. The premises of the mausoleums of Sultan Uwais Baba (Fig. 2), Yusuf Hamadani (Fig. 1) and Pakhlavon Mahmud were built after their death. Over the years they became places where dervishes lived or stayed. Although the fight against dervishism was fierce, it was active until the beginning of the 20th century.



Figure 1. Yusuf Hamadani Mausoleum
(source: <https://dkm.gov.uz/uz/yusuf-hamadoni-machiti>)



Figure 2. Uwais Baba Mausoleum
(source: <https://meros.uz/ru/object/sulton-uvays-bobo-majmui>)

Exploring the life of dervishes, the Russian researcher P. Pozdnev writes about this: “Contrary to the Muslim religion, do not give Divine respect to anything or anyone other than God alone. The honouring of saints spread among the Mohamedan peoples, who, instead of God, now worshiped people and even animals and soulless objects. And they were called wali, sheikhs, dervishes and so on. Monuments were even erected in honour of these people and prayers were addressed to them for some kind of help. Basically, most of

the people who come to these monuments are unmarried people who remain in solitude” [1]. Dervishes lived and guarded these monuments and were called pious. They devoted themselves to a solitary life at the monuments of some deceased saint (Fig. 3). Having settled at any monument, a famous dervish, with his exploits and visible piety, little by little gains his popularity among the Mohammedan peoples, which completely overshadows the glory of that deceased saint, over whose monument he will be and acquired the holiness of the latter to transfer to the former. Instead of turning to the dead, people begin to turn to the living. Dervishes from different orders go to the monuments of saints: Naqshbandi, Bedawi, Halveti, Jagriye and others. Those who settled in these places are called sheikhs and they have one or two murids who live with them as servants.



Figure 3. Suleiman's Throne (Kyrgyzstan)

(source: <https://www.amerikaovozi.com/a/sulaymon-tog/3913566.html>,
https://www.bbc.com/uzbek/news/story/2009/09/090904_sulaymon_tog)

The Dervishes of Jahongasht were highly educated compared to the dervishes who lived in the villages. They went through 4 levels of dervish laws and reached the highest level. That is, those who were able to communicate with Allah.

When the time comes, then, according to the rules of the order, the student must dedicate sacred monuments to travel through Muslim countries. On the last Friday the sheikh remains only with his students, he will resume the conversation about travelling through the holy countries. And it was decided that the next day, Saturday, the young murid should begin his journey. On Saturday the murid got up early and waited for what the sheikh would say. The Sheikh does not keep his disciples waiting long and after morning prayers he gives his disciples excellent advice. And to one of them he gave his donkey, which

the disciple rode for many years. In addition, he gave the consul, a stick made of iron inside which had a dagger and a tiger skin. But the most expensive of them was the nuska or hamele (amulet) which the sheikh wore around his neck for a long time. Having received the blessing of the sheikh, the dervishes set off on a journey and travelled around the world. Wandering dervishes in Khorezm are called “qalandars” [2].

Some of the dervishes lead a wandering life until death, others only temporarily. Temporary wandering dervishes behave more reservedly than those who wander until the end of their death. Dervishes renounced marriage, the accumulation of wealth, and generally the pleasures of this world and learned to live in torture and pain.

Until the end of the 19th century, the dervishes lived in the mausoleum of Pakhlavon Mahmud in Khiva. The disabled and mentally ill were treated here. Sources confirm this. For example, the inscriptions on the door of the mausoleum of P. Mahmud (under the gold ring on the door handle) say that “people with bandaged heads and sick hearts are treated here.” There is no need to worship anything else while in this country. It is said that through this door religion gains strength and spreads. This door reached the ring, which is part of the throne [3].

Houses built in Khorezm in honour of representatives of Sufism often served as housing for dervishes. Dervishes lived here for some time. In addition, they also lived in cemeteries or in places considered sacred by the population (Fig. 3).

Among the dervishes were Uwais, Qalandars, Malomatis, Devans, Rindis, Javonmardis, Kharobotis, Qutbs, Abdals, Hafiz, Kahudos, Palangposts, and sometimes Chiltans.

When they got close, the whole neighbourhood shouted: ‘Hak! Right! Right! Hm! Oh, Hugh! Oh manhu! Oh my God! Laysal Hodu laysal Hack!’ ‘Peace to God!’, he would say. The ground trembled from the trampling of their feet [4].

In oral history there is information that Sufis will be 356 (and in Khorezm 360) or 40. When 356, then they are avliyo, and when 40, then they are chiltans. The missing number of “sahib-i-tasarrufs” is replenished by the so-called abdals or “saints of Allah”, “nukebs” – representatives of governments. Some sources say that there are always seventy abdals [1]. They move around in cases of death of Rijal el-Ghaibam. In turn, the abdals are replaced by nukebas, who are always eighty in number [5].

In addition to the information about Khiva, there is valuable information about the saints who lived in the oasis and their dwellings in the work “Dili Garaib” written by the son of Khudoyberdi Koshmuhammad, who lived in Khiva in the 19th century. While giving information about the cities of Khorezm, he said: “Another city of Khorezm is called Urganch, most of its inhabitants are descendants of Prophet Jacob. His eldest son Shamun’s god-given grave is in Mizdaqkhan, now known as Khoja eli (Khojayli). Nowadays, Urganch is abandoned. The tombs of the martyr Sheikh Najmiddin Kubro and Hazrat Khwaja Aziz Khan, may their secrets be holy, are located there” [6]. In the author’s work, “There is a tomb of Sayyid Alauddin Khivaqi and 300 great martyrs are buried inside the Khiva fortress. And outside, Hazrat Sheikh Abul Vafai Khorezmi (15th century) and a thousand other Sheikhs around him are in peace,” he cited important information. He continued: “200 paces from the south-east of this city, there is the residence of Sheikh Husayn Baba, may the secrets be holy. There grows a tree called gujum, he writes. The author wrote down information about the existence of several other shrines in the city of Khiva, where they were buried four thousand steps away from the city of Kozli, father and sixty noblemen, that is, murids of Najmuddin Kubra named Muhammad [6].

At the beginning of the 20th century, the “Riyaz al-Zakirin” written by Allahyar ibn Khudoyberdi by the order of Muhammad Rahim Khan II of the Khans of Khiva contains information about the shrines located in the Khanate of Khiva and famous saints in the oasis [7].

3. Views related to the Chiltans

Chilton (Perso-Tajik “chihilton”), according to religious ideas, the legendary 40 spirits with supernatural power or “forty people” are invisible, inseparable mythical creatures with supernatural power [8]. It is characteristic that the number of chiltans neither increases nor decreases. Forty chiltans are added to one supreme spirit on earth, making forty one chiltans. It is interpreted that Chilton, who rules the world, stands in the “navel of the earth” [9]. In the narratives, chiltans are sometimes interpreted as living among them in human form, and are usually imagined to be found in tombs and such uninhabited places. M. Andreev indicated cemeteries, mountains and caves on the outskirts of cities as places of residence of chiltans. Among the people, chiltans are considered patron spirits, and they are interpreted differently in ethnographic and religious literature and articles.



Figure 4. Tomb of Najmuddin Kubra

(source: <https://silkadv.com/en/content/nadzhmetdin-kubra-mausoleum>)



Figure 5. Sayyid Alovuddin mausoleum

(source: https://people-travels.com/storage/images/sights/design/Khiva_Mausoleum_of_Sheikh_Said_Alauddin_2.webp)

Even in the Khorezm oasis, views related to chiltons were not widespread, but were formed in their own way. According to popular legends, Hazara saint Sheikh Husayn Baba lived as one of the forty chiltons and told his children that they are actually thirty-nine people, one person in each circle and in each place. According to the legend, Sheikh Husayn Baba was 20–25 years old when he saw a group of young men sitting around a campfire on the road while excavation work was being carried out. When one of the young men greets Husayn, he recognises them as “Forty Chiltons”. After the conversation, the Chiltons accepted Husain into their ranks, and from that moment on, his sainthood and merits were revealed to the people. According to the informants, the site of “Forty Chiltons” is located in Mukhamon village of Hazorasp district, and there is also a cemetery called “Forty Chiltons” on the south side of the cemetery of saint Qironch Baba, the disciples of Sheikh Mukhtar Vali. There are

various legends about this place among the people. The shrine of Najmuddin Kubro in Khona Urganch (Fig. 4) is also popularly known as a place where chiltons gather.

4. Conclusions

In conclusion, it is worth saying that many shrines of Khorezm related to Sufism became a place of residence for the worldly dervishes. Such places include “Qirq chilton” in Khozarasp district, Najmiddin Kubro in Kokhna Urganch (Fig. 4), Syed Aloviddin in Khiva (Fig. 5), Pakhlavon Mahmud, and Sultan Uwais mausoleums in the territory of the Republic of Karakalpakstan.

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Protection of cultural heritage monuments in the Khorezm region: problems and their solutions

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Abstract

The article examines the environmental and legal protection of cultural heritage objects in the Khorezm region: problems and their solutions, as well as issues of their use. The current state of existing cultural heritage monuments is also analysed, and scientific, theoretical and practical proposals for improvement of this field are presented.

Keywords: Sredkomstaris, mosque, madrasah, Gurganj, Khiva, UNESCO

1. Introduction

In the modern world, where the 21st century is recognised as the era of knowledge and intellectual thinking, restoring the cultural heritage created by our ancestors, preserving and researching it as the spiritual heritage of today and future generations has risen to the level of the sacred duty of every person. In particular, in the decree “On measures of further development the system of manuscript preservation, scientific research and promotion” adopted by the President of the Republic of Uzbekistan Sh. M. Mirziyoyev, today we can see that important conservation tasks have been set for future generations [1].

The cultural heritage of a nation is one of the important components of its entire history, culture and identity. In general, culture and cultural heritage act as a link between peoples and nations. This is the basis for harmony and peaceful coexistence. To date, there are a total of 8138 tangible and intangible cultural objects in the territory of the Republic of Uzbekistan. Among them, there are 4732 architectural monuments, 682 monumental art objects, 580 shrines and others. Cooperation between Uzbekistan and UNESCO has a great role in preservation, restoration, rational use and protection of these objects.

2. Literature review

We know that in the 1920s and 1930s, as a result of the sovietisation of social and cultural life in our country, the promotion of “new culture”, and the fight against religion were widely spread in the society, the activities of religious institutions and organisations, mosques and madrasas were stopped. The shrines, mausoleums and houses in remote areas were neglected and turned into ruins. At the same time, in order to protect historical and natural monuments, the Central Asian Committee for Museum Works, Ancient Monuments, Art and Nature Protection was established [2]. (It was called *Sredkomstaris*. In 1928, a branch committee of this organisation in Uzbekistan – *Uzkomstaris* was established).

In 1922, there were 84 mosques and 64 madrasahs in the city of Khiva, later 12 of which became ruins or were completely destroyed [3]. Information about architectural monuments was traditionally reported to the press [4], but it was not possible to repair the monuments.

In 1937, a scientific-research group was formed including Ya. G'. Gulomov, B. N. Zasipkin, R. N. Nabiyev and other specialists, in order to conduct archaeological and restoration research in some historical monuments in Khiva, and in addition to that research, preliminary repairs were carried out in the traditional dwellings of Ichan Qal'a, particularly, restoration works are carried out in some structures of the old arch and the Polvan gate [5].

Prior to these works, in 1928–1929, an expedition under the leadership of A. Yu. Yakubovsky began to scientifically study the archaeological and architectural monuments of Old Urgench (Kunya–Urgench). Among the architectural structures, the mausoleums of Sultan Takash, Turabekxan and Najmiddin Kubra, as well as the tallest mediaeval tower of Gurganj (Kunya–Urgench) and other monuments in Central Asia [6] (now located in the Tashkhovuz region of Turkmenistan) were studied.

4. Analysis and results

It is known that in 995 Amir Ma'mun, who united Khorezm, moved the state capital to Gurganj (Kunya–Urgench). A large number of mosques, madrasahs and other public buildings were built in the city. The Mongols completely destroyed Gurganj (Kunya–Urgench), later Amir Temur rebuilt a part of the city, by this time Gurganj (Kunya–Urgench) was called “Urgench”. In the middle of the 19th century, Muhammad Aminkhan, with the aim of moving his residence to the territory of Kohna Urgench (Kunya–Urgench), built a fortress called “Khorazmbog” there and tried to restore the artificial irrigation system around it, but the situation of water shortage in the surroundings of Kohna Urgench caused the termination of these works [7].

In 1936–1937, Ya. G. G'ulomov, T. Mirgiyozov and R. Nabiyev conducted archaeological excavations in the vicinity of Qubатов on the right bank of the Lower Amudarya. As a result, ossuaries and ceramic caskets were found in the Khorezm oasis, testifying to Zoroastrian funeral rites [8].

In the 1920s and 1930s, it should be noted that information on folk legends and cultural traditions was published among the studies of the historical and cultural heritage of the Khorezm oasis [9, 10]. Also, in 1936, the orientalist P. P. Ivanov found the documents of the Khiva khans' archive, which were taken to Petersburg in 1873 and later preserved in the National Library. The scientist studied them and translated some of them too [11].

In 1937, the Khorezm archaeological expedition was organised under the leadership of S. P. Tolstov. From the beginning, his tasks were limited to making a map of the archaeological monuments in the Khorezm oasis and conducting excavations in some of them. However, in the steppes surrounding the oasis, the existence of hundreds of ancient ruins of different periods was found [12]. Therefore, among the problems of archeology, the study of the history of architecture, art and religion was put forward, and the process of solving it began in 1945.

In the researches of the Khorezm expedition, the study of the material culture of the cities located along the mediaeval caravan routes, including Kohna Urgench (Kunya–Urgench), Shemahaqal'a, Shahsanam, Shahrlik, and others became important [13, 14]. Also, studies were conducted in cities such as Jigarband and Sadbar, whose history and culture are limited in historical science [15, 16]. The information obtained as a result of these scientific works served to reveal the unique aspects of the culture of urban planning in the Khorezm oasis, as well as its role and importance in the development of civilisation.

During the 1950s–1980s, a number of important works were carried out on the study of material and cultural heritage, as well as in the renovation of architectural monuments, and a deeper scientific research. In 1967, “Ichan Qal’a” was recognised as Khiva State Memorial Reserve. It was entrusted with the task of scientific-research and promotion-enlightenment centre, storage of historical, architectural, literary and artistic monuments [3]. In the creation of this reserve, the research and initiative work of archaeologists, ethnographers, art historians and architects such as Ya. G’ulomov, S. P. Tolstov, R. N. Nabiyeu, G. A. Pugachenkova, I. I. Notkin, A. A. Lesanov, L. Monikovskiy and others were of great importance. Since the 1960s, the number of publications on the history of Khorezmian architecture and architectural art has been increasing [17–22], but scientific and scientific-popular literature in the Uzbek language has hardly been published.

At the same time, according to the official requirements, in order to implement the policy of the former period, extensive promotion of “Soviet culture” was carried out and exhibitions were organised in accordance with them. A number of architectural monuments in Khiva were adapted to modern needs and were used as hotels, shopping centres, “houses of happiness” and teahouses [3].

After the independence of Uzbekistan, many historical monuments were included in the UNESCO World Heritage List such as “Ichan-Qala” in Khiva in 1990, “Samarkand as a crossroads of cultures” in 2001, the historical centre of Bukhara in 1993, and the historical center of Shahrisabz in 2000. To date, the Republic of Uzbekistan has ratified many UNESCO conventions in the field of culture, including the 1972 Convention on the Protection of the World Cultural and Natural Heritage, the 1993 Convention, the 1954 Convention on the Armed Protection of Cultural Property. The 1970 Convention on Measures to Prohibit and Prevent the Illicit Import, Export and Transfer of Ownership of Cultural Property, the 1996 convention about the Instrument for the Safeguarding of the Intangible Cultural Heritage. Also, following these international agreements, the Republic of Uzbekistan adopted special laws and legal documents forming the national system for the protection of cultural heritage:

- Law of the Republic of Uzbekistan “On Protection and Use of Cultural Heritage Objects” which came into force on August 30, 2001;
- Law of the Republic of Uzbekistan “On protection and use of archaeological heritage objects” which came into force on October 13, 2009;
- Law of the Republic of Uzbekistan “On Museums” of September 12, 2008;
- Law of the Republic of Uzbekistan “On Archive Work” dated June 15, 2010;

- Law of the Republic of Uzbekistan “On import and export of cultural assets” dated August 29, 1998;
- Law “On cultural activities and cultural organisations” in 2021.

Officials, legal entities, citizens and foreign nationals shall be held criminally, administratively and otherwise legally responsible for violating the legal acts on the protection of cultural (historical-cultural) heritage in accordance with national legislation. The task of each state is not only to describe them in detail in the national legislation, but also to implement them in practice in order to preserve their cultural heritage and use it wisely. The problem of classification of objects of ownership of cultural values into two types – goods and things – is a matter of the near future. It is clear that referring to the experience of European countries helps to develop appropriate mechanisms for the protection of cultural values and accordingly, solves the issues of access to them as a constitutional opportunity guaranteed by the state, ensures cultural development.

4. Conclusions

In short, in the 1920s–1930s, heritage protection was distinguished along with the development of traditional historical local studies, the establishment of museums, the study of architectural monuments and the implementation of preliminary repair and restoration works, as well as the organisation of archaeological expeditions.

During the second half of the 1940s and 1980s, the range of knowledge about the historical and cultural heritage of the Khorezm oasis expanded, and experts from various fields of historical sciences participated in the scientific research conducted in the oasis. However, among the above-mentioned political and ideological shortcomings, the lack of scientific and popular literature in the languages of local people aimed at a wide readership, the historical and cultural heritage in Uzbekistan and the neighbouring republics of Central Asia is not widely studied.

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The shrine of Sheikh Mukhtar Vali and the Silk Market

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Abstract

The article presents the mausoleum of Sheikh Mukhtar Vali, one of the ancient historical monuments of the Republic of Uzbekistan, located in the Khorezm region, which today is considered one of the main places of pilgrimage, and a source of materials related to its history. This shrine of 14th century architecture is located on one of the branches of the Great Silk Road and played an important role in the life of the inhabitants of the oasis in its time.

Keywords: The Great Silk Road, China, Khiva, Khazorasp, Mausoleum of Sheikh Mukhtar Vali, Astana, silk, raw silk, mulberry tree, place of pilgrimage

1. Introduction

Khorezm is located on one of the branches of the Great Silk Road, a route conducive to the creation of many historical and cultural monuments in this country. Most of them date back to the 9th–14th centuries. One of these sites is the mausoleum of Sheikh Mukhtar Vali. Located in the Yangarik region, it is included by researchers on the list of places of pilgrimage of international importance in the republic [1].

Many tourists from different parts of the world come to visit memorial monuments of international significance, especially from countries of the Muslim world.

2. Main material

Khorezm, famous in itself, also reflects the renown of the Great Silk Road, on which it is positioned and to which it owes many of its historical and cultural monuments. Most of them date back to the 9th–14th centuries. One of these monuments is the mausoleum of Sheikh Mukhtar Vali. This site, located in the Yangarik region, is included by researchers in the list of places of pilgrimage of international importance in the republic [1].

Many tourists from different parts of the world come to visit shrines of international importance, especially from countries of the Muslim world.

The architecturally outstanding sites of Khorezm are similar in construction style. For example, Pakhlavon Mahmud, Said Mokhroyi Jahan, Said Alovuddin, Uch Avliya, Abdol Baba, Shahimardon, Sheikh Mavlon Baba, Bibi Khojar (Khiva), Sheikh Mukhtar Wali (Yangiaryk), the shrines of Said Ata (Khonka), Yusuf Hamadoni, Voyangan Baba (Shavot) are not only sacred places, but are also known as unique architectural monuments and are inventoried on the UNESCO list.

These mausoleums (of Sheikh Mukhtar Vali, Najmiddin Kubro or Fakhriddin Razi) of the 11th–14th centuries, and their structures, built of baked brick without decoration, had the shape of a dome. The tiled sagans in the cave (size 2 × 1.2 m, height 1.25 m) have a prismatic shape and are luxurious. Most of the saganas in the oasis sanctuaries are sirkor-dakhma. The edges of the sagana are divided into rectangular manifestations, and the edges of the zanjira are covered with a fine white islimi pattern on a dark blue base (Pahlavon Mahmud, Syed Alovuddin). The shrine will be twice as wide as the tomb. Most shrines built as a complex have a porch decorated with rows of wooden columns. The premises are illuminated from all four sides. Ganchkori fences are installed on the roofs. The ceiling and interior of the mausoleums are plastered with ganch. All mausoleums have wooden doors with carved flowers. The mausoleums built by the masters of Kokhna Urgench were distinguished by the decoration of the dakhma and the style of cladding. For example, “The most beautiful secret dakhma in the Muslim East is the dakhma in the mausoleum of Najmiddin Kubro (XIV century) and Mazlum Suluva (XVI century) in Mizdak Khan.” Multi-room buildings – the mausoleum of Yunus Khan (Khiva) and the mausoleum of Khorozsheikh Baba (Urganch Tum)

consist of two rooms located in a row on a common area, and the mausoleums of Astana Baba (Sheikh Mukhtar Wali) and Osman Sayyid Baba (Gurlan) are located on a square stage, with a front porch consisting of a vaulted room and sharing the same width of a two-room building behind them [2].

Since we are talking about the mausoleum of Sheikh Mukhtar Wali and its history and significance on the Silk Road, we will first look at its history.

The mausoleum of Governor Sheikh Mukhtar is a memorial monument located in the vicinity of Astana, the village of Astana, Yangaryk district, Khorezm region. Locals call it “Ostaa buva”.

This monument was built in honour of a famous clergyman who lived in the 13th century. The famous Islamic scholar Sheikh Mukhtar Wali was actively involved in the spread of Islam in Khorezm in the 14th century. The term “sheikh” is a name given first to learned men in countries where the religion of Islam spread, and then to scholars and jurists. In Tariqa it is used for a person who has the right to educate people who have entered this path and test them.

Sheikh Mukhtar was born in 1202 in Astana, Khorasan (territory of Iran). According to the stories, by the grace of God he was ordered to set out. He chose a camel and departed. According to sources, the sheikh at that time was 16–19 years old. According to legend, his camel sat down when it approached a certain place, that is, when it reached the village of Astana, Yangaryk region. At that time, this land, which was a desert, was improved by Sheikh Mukhtar after finding a ruler and therefore this land was named Astana. Sheikh Mukhtar Wali lived here, engaged in agriculture and trade.

According to another tradition, Sheikh Mukhtar demonstrated his divine favour by meeting Sayyid Otapir, one of the famous pirs of Khorezm. According to folk legends, Syed Atapir had a white mulberry tree, and Sheikh Mukhtar Wali immediately planted the mulberry tree in the ground. Therefore, he was nicknamed “Vali”, and Sayyid married his sister to him. Pakhlavon Mahmud wrote in his works that the sheikh was one of his teachers who taught him the science of madrasah.

When Sheikh Mukhtar Wali arrived in Khorezm, he asked the Khorezmshah to give him land that had not been assigned to him, acquired the land on which the current mausoleum is located, improved it and gathered people there. After his death, he would be buried where he lived. Later, the graves of the sheikh himself, his wife and relatives were located there [3].

The mausoleum has been repaired several times to this day. When it was first built, it was a sagana with one or two domes. According to historical data, during the time of Muhammad Rahim Khan I (1806–1825), Sheikh Mukhtar

built a mausoleum, a dome with a high pediment, a house, a mosque, residences for pilgrims, sheikhs and priests over the tomb of the khan or governor. A new single-column porch and barn were also built. This mausoleum in the village of Astana consists of a complex of rooms built over many years. Locals believe that everyone should visit this place. According to them, this land is the threshold of Mecca, which is why they say that before going to Mecca, you should come to Astana Buba. In the 19th and 20th centuries it was very crowded. Because trust and faith in the Sheikh and his merits have been attracting people here for many years. The site was known as a shrine, hospital and site of traditional events. It goes without saying that such popularity led to the creation of a market around it. Many authors report that in the 19th and 20th centuries villages were founded here, and there was a silk market. Ethnographer G. P. Snesev describes the silk market organised every Friday next to the mausoleum of Sheikh Mukhtar Vali, or the selection of melons held every September at the shrine of Yusuf Hamadoni.

“Various performances were organized at the festival, people had fun, clowns, puppeteers and gatekeepers performed, wrestlers fought. Mostly women and children, including childless women, came to Sayil both for the festival and to ask for a child. The biggest spectacle of the procession is the ceremony of dragging chariots, which is also performed in processions at other shrines and sanctuaries. On the days of the holiday, the saint supposedly forgives all the good and bad deeds of people, because it is said that the saint forgives” [4].

After people ate food cooked on the sacred fire, the leftovers were poured into water. It was based on good intentions: the belief that the coming disaster would be washed away. Even today these ceremonies are performed at shrines. Residents make sacrifices (bull, camel, sheep and chicken) to the saint in whom they believe, prepare and distribute ritual food – *korma* – to people. It is held on Wednesday at the Yusuf Hamadoni Temple, on Thursday at the Pakhlavon Mahmud Temple, Ziynalbuwa Temple, on Friday at the Sheikh Mukhtar Wali Temple and every day at the Sultan Uwais Temple. At the Baba Voris Temple in Khiva, this ceremony on Thursday is performed mainly by women.

We focus on markets around historical sites that used to be holy places. Most of them sold silk and porcelain products imported from China. Silk, which was the main product of the Great Silk Road, was sold at points located on direct branches of this route.

We know that goods from the East first reached Byzantium. However, by the 11th century, Western Europe's purchasing power had increased. Therefore, not only silk, jewelry, leather, wool and carpets, but also military equipment

and other products occupied an important place on the Great Silk Road. As a result of the development of production, silk products imported from China and India were introduced to other regions and to the West. The development of crafts created the basis for improving areas. Sources indicate that specialisations developed in cities, including silk stalls and markets, where silk products were sold separately.

The comprehensive political, economic and cultural development of Khorezm is associated with the era of the Anushtegin Khorezmshahs. Although military activity intensified during the Khorezmshah period, they tried to develop external and internal trade relations and make the Great Silk Road a safe trade route. During this period, Khazorasp, Khiva, Gurganch and many other cities, which are the main trading cities located on the northern branch of the international trade route, received further development [6]. Zakaria ibn Muhammad al-Qazwini writes: The cities of Khorezm are full of life and trade is very developed. Various handicrafts, jewelry, clothing, carpets, leather, wool, oil, soap, weapons, saddlery, dried fruits, silks, jewelry, etc. He wrote that many products were popular both in the domestic and foreign markets. Also during this period, professions developed, and high-grade silk was produced from cocoons [5].

Yaghut Hamavi, who visited Khorezm in the 13th century, also recognised that the cities of Khorezm were rich and beautiful, trade was developing, and markets and stalls were crowded. At the same time, Gujumu said that there were many mulberry trees in Khorezm, and mulberry is necessary for silkworms. We can conclude from this that in Khorezm silkworms were raised and cocoons were grown, and silk was obtained from cocoons. This indicates that the production of silk products in the region did not develop rapidly, but progressed gradually. The merchants of Khorezm brought and sold valuable yarn and silk fabrics, household items and weapons in trade with the settlers. On the other hand, goods from Iran, Syria, Egypt, the countries of Asia Minor and the Caucasus were brought to Khorezm. In the large markets of the oasis, products made of flax, silk, cotton and wool, imported from Syria, Palestine, Iraq and Egypt, were in great demand. Merchants from Asia Minor also carried out extensive trade in carpets, silk and semi-silk fabrics in the markets of Khorezm. With the help of Khorezm merchants, Russian merchants purchased many goods brought from the east, in particular fine jewelry, valuable weapons, silk and cotton fabrics and gauze. Although after the Mongol invasion the cities were destroyed and trade ceased, during the development of the Golden Horde the cities of Khorezm were quickly restored and opened up a wide route for trade relations. The Northern Network would become

a busy road again. The role of Khorezm was especially great in trade relations with the Volga region and Eastern Europe [7]. By the time of the Timurids, as a result of the sack of the cities of Khorezm and the turn of the northern network to the south, economic life here slowed down again. With the crisis of the Timurid state, the ancient and historical Great Silk Road lost its significance. During the time of the khans, trade relations were limited only to domestic markets, and merchants rarely entered foreign markets. In subsequent periods in foreign relations, in addition to the three khanates, Iran had trade relations with India, China and the countries of the Middle East. During the time of the khans, production relations were based primarily on manual labour, and in the West, production began to industrialise.

In the 16th–18th centuries and later, zandoni yarn was known in Russia as “zenden”. Silk production played an important role in the handicraft industry of Uzbekistan, among which silk fabrics produced in the Fergana Valley, Bukhara and Khiva were considered an important item of trade. Lumot was notable. According to this information, there was a lot of silk in those places, and striped kimkhob, satin, dukhoba and gazlamas with small flowers were woven from it. A lot of cotton was grown there. It was made from grey gauze, tent, coarse thread gauze, olachi, veil (transparent white scarf), raw surp and other gauze [8]. Also, D. Rukavkin noted in his data that in Khiva there was a large amount of cotton and silk, and mulberry trees were planted along the banks of the water and in the gardens [9]. After the 17th and 18th centuries, as a result of Russia’s orientation towards Central Asia, the Khanate’s dependence on Russia in foreign relations gradually increased.

In the Khiva bazaars of the 19th century, some artisans had shops where they prepared and sold their products. The store served as both an enterprise and a stall, for example, for blacksmiths, coppersmiths, tinsmiths, chest makers, etc. Tanners, silk weavers, shoemakers and others worked at home, and on market days they took their products to the market and sold them [10]. British spies assessed the internal trade of the Khanate and noted that little cotton was grown in Khiva, sheep skins were of average quality, there was little raw silk, and silk products were produced [11, 12]. In the 19th century, Khazorasp was one of the main silk production regions. The Khanate mainly grew raw silk and sold it abroad. During this period, due to the development of the textile industry in Russia, there was a great demand for yarn and silk products. The sources note that in the first half of the 19th century a large number of silk products were brought to the Nizhny Novgorod fair.

3. Conclusions

Generally speaking, the mausoleum of Sheikh Mukhtar Vali was not only a place of pilgrimage, but also a large silk market. The silk products brought here were later developed by the local population as crafts. However, handmade silk fabrics could not match the elegance of factory-made products. However, through these markets the products reached distant Russian markets.

Also, the preservation of the mausoleum of Sheikh Mukhtar Vali was based on the fact that the local population saw it as a place where saints lived. It was enhanced by the fear of invaders in Muslim countries to destroy tombs and mausoleums. They were mainly only damaged by weather, precipitation, humidity and neglect. For this reason, it is important to preserve them and study their architectural structure and history. It is worth noting that the fact that these monuments were located on the territory of the cities of the Great Silk Road, in turn, played an important role in the appearance of subsequent mausoleums in settlements.

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Historical and cultural objects of the Sufi order as a place of healing (sacred places and traditional Islamic medicine)

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Abstract

This article highlights the influence of Sufism on the sociocultural and religious views of the inhabitants of Central Asia, including in Khorezm, their significance in their daily life. The main attention is paid to the place of manifestation of holy places in the historical and cultural heritage and shrines of Khorezm, their construction and the health of the population. The question is considered using the example of three shrines: Mecca, mausoleums of Sultan Uwais Baba, Pakhlavon Mahmud and Yusuf Hamadani and others. The article also provides information about the specialisation of the above-mentioned objects of historical and cultural heritage in the treatment of diseases, as well as about the methods of Sufi medicine.

Keywords: Sultan Uwais baba, Pakhlavon Mahmud and Yusuf Hamadoni, Sufi medicine, chillyakhana, Sufiavliyo, science-laduni

1. Introduction

One of the common methods of practising cult medicine before the 20th century in Central Asia was considered to be holy places, revered by believers on the basis of religious legends. These places became objects of pilgrimage and healing.

The existing graves of saints in almost every street of Khiva, Bukhara, Samarkand, Merv, Kunya Urgench and others were used to treat various diseases. They had different ranks in terms of strength.

There were almighty holy places where they could receive “healing” from all ailments. Among the Sunnis, Mecca and Madina were considered such, and among the Shiites, Karbala, Nazhif and Mashhad. These places were considered pan-Muslim. There were places of lower rank, but of international importance: Zangiota (Tashkent region), Shah-i Zinda (Samarkand), Bakhovuddin Naqshbandi (Bukhara), Takhti Sulaymon (Kyrgyzstan), P. Mahmud, N. Kubro, Sulton Uwais, Yusuf Hamadoniy (Khorezm), Shakhimardon (Fergana), 360 Buva (Turkmaniston).

In addition to these sanctuaries, there were many places of worship of a regional nature.

The annual pilgrimage to Mecca, one of the five pillars of Islam, was considered difficult for Muslims to achieve. The pilgrimage (in Arabic *hajj*) commemorates Muhammad’s journey there from Medina. The persons who have performed it bear the title of *hajji*. They hold a great position among Muslims and were considered saints. Exalting Mecca, it was endowed with the epithets: Umm-ul-Kuro, Umm-ul-Madoni – the mother of cities, etc. The full name of it is Madonat Rasul-ullah or Madonat un-Nabi – the city of the prophet. It is located in the north of Saudi Arabia. At the time of the pilgrimage, a large number of pilgrims remained on the road, unable to endure the heat and lack of water. Therefore, there were many shrines of local significance.

2. Method and materials

Depending on what disease prevailed in the area, there were holy places profiled for these diseases. For example, in almost every quarter one could find them for eye, skin diseases and malaria. Holy places where people with eye diseases were treated were called Guzli bobo. Guzli – from the Uzbek *guz* – ‘eye’, *bobo* – grandfather, patron. Almost all people suffered from eye diseases during the spring and summer [1].

The method of treatment was as follows: the patient turned to a minister of worship, who took seven grains of wheat and read a saying from the Koran over them, blowing on them. Taking these seven grains of wheat from the hands of the clergyman, the sick person approached the grave of the saint, saying: “In the name of Allah, the merciful, the merciful, bring healing” and with this grain passed over the eyes from the inner corner of the eye to the outer, doing this seven times [1]. It must be said that malaria was a true scourge of the peoples of Central Asia until the twentieth century, bringing all kinds of suffering and many deaths.

In this case, the holy places where patients with malaria went were called “*isitma avliyo*”, in Uzbek *isitma* – ‘malaria’, *avliyo* – ‘holy’.

The method of treatment was as follows: the clergyman took a black thread, tied seven knots, and before each knot he read a saying from the Koran. This thread was then tied onto the patient’s hand like a bracelet.

Holy places for the treatment of skin diseases were most often located near mud and springs. The main one was considered to be the Ayub spring of Job, located on the outskirts of the city of Bukhara [2]. The patients drank water from the spring and washed the affected area of the skin with holy water; the clergyman read prayers over this procedure.

Treatment of whooping cough: The grave of Khoja Bordi, located in the city of Kagan near the station, was considered a hospital. Children with whooping cough were brought here, milk was poured into a green bowl that had not been consumed from, which was always illuminated by the minister of worship, and the child was given this milk to drink. After the child drank the milk, the bowl was broken.

Treatment of neuropsychiatric patients: In Khorezm, the main hospital for these diseases was the mausoleum of Sheikh Yusuf Hamadan, located eight kilometers from the urban centre of the Shavat region. According to literature and the statements of informants, the saint was not buried here, but had been in this area for three days.

Staying at the grave of a saint or not far from it was considered healing, so the sick were kept in the adjacent houses of clergy, for which they paid fabulous money. The sick, who had no means, were kept in the open air. Treatment was limited to the reading of prayers by clergy and the use of a whip (blow with a whip). During treatment, which was carried out in the open air, all patients were kept on chains [1].

Holy places for the childless: There were a lot of childless families and there were also many reasons for this, including marriage of underage girls or severe physical and mental trauma.

The ministers of cult medicine had a lot of methods and means used in the treatment of such patients; they did not disdain anything for their own profit, using everything. For this purpose, a chillahona was organised, where for forty days the minister of worship read a prayer over the sick woman. The patients left with the hope of having a child, promising to make a sacrifice if the child appeared, and tied a small piece of material to the saint’s banner.

Religious and mystical medicine of Central Asia in the period under review underwent high development.

The most ancient healers of this group are called shamans. They appeared during the period of decomposition of pre-class society, adapting to all subsequent religions: Zoroastrianism, paganism, Islam, etc.

Shamanism, assimilating the ethnic characteristics of the peoples of Central Asia, took deep roots in the traditions of the peoples. In this regard, its varieties include: chupchi, guliger, bakachi, zhoduchi, zhodugar. The healers of the cult of Islam became especially widespread: avliyos, ahuns, bibis, duokhons, mullahs, otinbibis, otinois, saidids, khalpas, hojas, ishans, dervishes, qalandars, murids, murshids, prs, sufis, fakirs.

The vitality of healers of religious-mystical medicine is explained by the inculcation by cult ministers of superstitions, beliefs and the origin of diseases from evil spirits, about healers-miracle workers, whom they clothed with an aura of holiness. The healers of this group were intuitive psychotherapists; they achieved a therapeutic effect by knowing the psyche, customs, morals, culture and traditions of the patient.

Of great importance in achieving a therapeutic effect was the ability to make the patient believe in the power of the healer's supernatural abilities, high skill in dealing with patients (affection, patience), psychotherapeutic techniques (incantations, spells), the ability to use various musical instruments (rattles, tambourines), the selection of which was carried out while taking into account the characteristics of the patient.

We know that Sufism was highly developed in Khorezm. Many manifestations of Sufism, which flourished here, attracted the attention of the people with their divine properties. After their death, the places where they were buried were consecrated, becoming sites of pilgrimages. Over time, such places have become abodes of divine healing. Among such places, the shrines of Sultan Uwais Baba, Yusuf Hamadani and Pakhlavon Mahmud should be mentioned.

3. Historical monuments of pilgrimage

Sulton Uwais bobo. The memorial monument dates back to the 17th–19th centuries and is located on the territory of the current Beruni district. Sultan Uwais (his real name is Suhail ibn Omir ibn Rushon ibn Nohia ibn Murod), a representative of the Murordi tribe who lived in the village of Karan in Yemen, was born in 625. Sulton Uwais died at the age of 32 in the battle of Sifra, fighting in the ranks of the army of Caliph Ali against Muawiyah's troops. He was

buried in the village of Sofa in Syria [2]. Sultan Uwais became famous for his activities in collecting and studying hadiths. His followers erected a symbolic mausoleum in his honour and turned it into a place of worship. There is no information in the sources that they were personally in Khorezm. But during the reign of Allakulikhan (19th century), a large mosque and 10 chillakhanas (a special room for performing the fasting ritual) were built here in honour of the sheikh (Fig. 1). The complex is rectangular in plan (21.5×53 m), built in the direction from north to south. The mausoleum of Sultan Uwais-Bobo is located in the northern part of the complex. In the southern half there is a mosque with an ivan, a number of hudjras and a living room [3]. The entrance to the complex is from the west. The mausoleum of Sultan Uwais-Bobo was built in the traditions of Khorezm architecture from baked bricks.

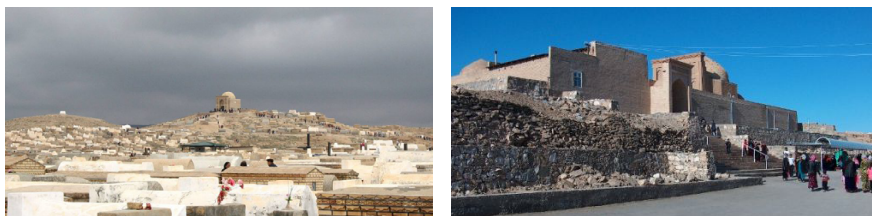


Figure 1. Sultan Uwais shrine

(source: https://uz.wikipedia.org/wiki/Sulton_Uvays_bobo_majmui, <https://meros.uz/ru/object/sulton-uvays-bobo-majmui>)

Yusuf Hamadoni (local name *Ulli pir*). Sheikh Yusuf Hamadoni was born in the village of Buzanjird near the city of Hamadan. He will die in the Afghan city of Bamiyan and, according to his will, his body will be transported and buried in Merv [4]. The sheikh at one time created his own religious doctrine, which had its followers in the Muslim East. In his teaching, the sheikh improved many Islamic concepts, which were later included in the great teaching of Naqshbandiyya. He largely predetermined the practice of tasawwuf, which spread in Transoxiana and Khorasan. Hamadoni chose the path of enlightenment among the people through conversations, edifications and instructions. He was a popular preacher and his *khonako*, where he lived, was called *Khuroson Kabasi* – ‘Khorasan Kaaba’. He presented complex passages of religious teachings and the Koran in accessible language. According to the testimony of Abduholik Gijduvoni [5], the sheikh travelled a lot, walking thirty times to Muslim shrines in Mecca and Medina. In his travels he met and had long conversations with more than two hundred sheikhs. Always, all my life, I kept the spirit, regardless of whether it was in the holy

month of Ramadan or not. Many thousands of people sought to touch the hem of his robe, believing in his holiness. Thus, they were converted into followers of his teachings, following the path of tasawwuf. It is known that he converted 8 thousand from other faiths to the Islamic faith.

He himself was pure in his worldview, kind to people, fair, honest and sincere, he demanded the same from others, he never scolded or called them names. If his conversations and sermons towards dishonest people did not have an impact, he removed such people from himself, tried not to notice them and considered them his enemies. The four caliphs Abdullokh Khorazmiy, Hassan Bukhoriy, Akhmad Yassaviy and Abdukholik Gijduvoniyy alternately served as his murids.

Five books came from his pen: *Rutbat-ul-hayot* (his most important book), *Kashf* (has not reached us), *Risola dar dobi tariqat*, *Risola fi annal kavna musa-harrun lil-inson*, *Risola dar ahlok wa munojot*. In *Rutbat-ul-hayot* the sheikh answers 10 important and subtle questions of the Islamic tariqa, skillfully citing information from the Koran and hadith, poetic and historical books [6].

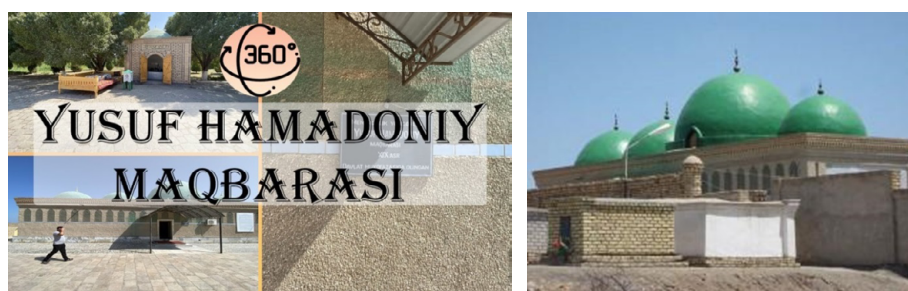


Figure 2. Mausoleum of Yusuf Khamadoni

(source: <https://ziyoratga.uz/ru/mavzolej-yusufa-hamadani>, <https://dkm.gov.uz/uz/yusuf-hamadoni-machiti>)

The Yusuf Khamadoni complex is located in the Shavat district of the Khorezm region (Fig. 2). This complex arose at the burial site of the dervish Abu Yaqub Yusuf ibn Ayyub, who was born in the city of Hamadan (western Iran). A mausoleum was erected over his grave, of which almost nothing remains to this day.

The destroyed structure was partially rebuilt and reconstructed in the 19th century. The dervish's grave is symbolised by a black marble crypt, decorated with floral patterns and inscriptions. The Yusuf Khamadoni complex was reconstructed in 1991–1995. 50 rooms (chillakhona) have been built adjacent to the complex for those who come here. Around this shrine there are four

other shrines related to this place. They are logically connected to each other and pilgrims visit them one after the other.

In the western corner of the mausoleum there is a prayer room with a central ivan. It forms the main part of the complex. Today, the Yusuf Hamadani Mosque is an important Muslim temple and a place of worship for believers.

Pahlavon-Mahmud. The main cult centre of Ichan-Kala – the Pakhlavon-Mahmud memorial – was formed at the grave of the patron saint of Khiva, poet and philosopher, professional wrestler and master furrier Pakhlavon-Mahmud (1247–1326). He was revered not only in Khiva, but also in Iran and India as the patron saint of fighters and poets, and a healer of diseases. According to legend, the poet was buried in his workshop [7].

In the 14th–17th centuries. A city cemetery appeared around his burial. Already Shirgazi Khan, when building his madrasah at the beginning of the 18th century, purposefully oriented it towards the burial of Pakhlavon-Mahmud.

The early mausoleum of Pakhlavon-Mahmud was rebuilt in 1810 by Muhammad Rahim Khan I (1806–1825). The new mausoleum included the old tomb and a khanaka with a high double dome, the silhouette of which became one of the main symbols of Khiva. A memorial courtyard was built in front of the entrance to the mausoleum, and the gates of the old cemetery became the entrance portal of the Pakhlavon-Mahmud memorial. At the beginning of the 20th century. By order of Asfendiyar Khan (1910–1920), a two-story korikhona was built on the western side of the courtyard, and a summer ivan mosque was built on the eastern side. The majolica cladding of the memorial includes many cartouches with religious sayings, poems by Pakhlavon-Mahmud and the names of the masters (Fig. 3).



Figure 3. Pakhlavon Mahmud mauzoleum

(source: https://uz.wikipedia.org/wiki/Pahlavon_Mahmud_majmuasi)

4. Analysis and conclusion

The 3 shrines considered above are the most famous historical and cultural complex of Khorezm. The people of Khorezm have been using these locations as places of healing and pilgrimage for several centuries. Until the 1950s, they were considered the main destinations for restoring the health of Khorezm residents. People used them to treat childlessness, mental and occupational diseases.

When we study the history of Khorezm, we see that folk medicine was well developed here. Until modern times, the medical works of Abulghazi Bahadir Khan, Ar-Jurjani, Ar-Razi, Ibn Sina and Al-Biruni have been the main guide. Diseases of the body and organs were cured by the instructions in these works. However, folk medicine is not effective in treating diseases of unknown cause, such as childlessness, mental illness and unexpected occupational diseases. For this reason, the population tried to cure such diseases through divine means. In these treatments, which are called *Ilmiy Laduni* – the science of witchcraft, great attention is paid to the divine purity of the patient and the healer and restraint of the ego. In this regard, the role of Sufism dervishes was also great. The sharp scholars of Sufism gave up all the pleasures of this world (wealth, family, entertainment, food and drink) and devoted themselves to the afterlife. The saints of Sufism acted as mediators between God and man. Their mission was to deliver various remedies to people through divine means.

The methods of treatment of the local population were carried out as follows:

1. The method of receiving spiritual power – that is, receiving the power that can be given to him from God through the saints.
2. Healing through the forgiveness of sins (repentance or reconciliation).
3. By beating or drinking (beating by saints or continuous drinking in handicraft workshops or *waqf* lands belonging to mosques).
4. Performing charity work (darveshona, donation).
5. By lighting a lamp on the saint's grave.
6. Tying a handkerchief or a piece of one's clothes to a tree, a tree, hugging trees, warming oneself by fire, rolling in the dirt.
7. Drinking water from holy wells and springs, thereby purifying oneself or getting rid of illness.
8. Preparation of ceremonial dishes.
9. Those who tried to get healing by divine means by making sacrifices to the saint.

The people of the Khorezm region and the Republic of Karakalpakstan, as well as from various parts of Central Asia, turned to Sultan Uwais baba from the shrines mentioned above for treatment of childlessness and getting rid of witchcraft. Until the 1950s, people used to crowd into the chillahans established here. Childless women wishing to have children by tying pieces of cloth to trees consecrated by saintly people. In addition, they rolled women down from the hills here, made various dolls and cast spells on them. Dolls and trees of this type are still available today.

Despite the atheistic struggles during the years of the Soviet Union, people continued to visit the shrine of Grandfather Sultan Uwais. Only this was done secretly. However, after the 1990s, this place became crowded with people and became a centre for making sacrifices, tying cloths to trees, and publicly worshiping stones, water, fish and the mountain itself. According to researcher Z. Abidova, the annual income from pilgrims amounts to 7,917,000,000 soum [8]. However, Abidova did not count the value of sheep, rams, chickens and roosters that are left here alive because they have been cured of diseases, succeeded in having children or solved other problems.

The shrine of Yusuf Hamadoni was the main place of treatment until the 1930s; during the Soviet period, the majority of the population secretly turned to it, and after independence, about 40–50 patients with severe, moderate and mild schizophrenia visited its clinic every month. Quranic verses were read here to the sick for 40 days (there is a belief among the people that sick people are chained and the chain is untied as a result of reciting one Quranic verse every day and the patient can recover in forty days).

We see the same situation in P. Mahmud's mausoleum. Russian scientist L., who was in Khorezm in 1873, said that it was a place of treatment. Kostenko wrote, "In the mosque (mausoleum) of Pahlavon's father, there is also a place for the sick, orphans, captives, cripples, mutes and others, who live from the funds of the mosque (mausoleum)" [9].



Figure 4. The door of P. Makhmud's mausoleum
(The photo was taken by M. T. Jumaniyozova during field practice. 2022)

Focus on Figure 4. It is a double-sided door installed in the mausoleum of Pahlavan Mahmud by Shah Niyaz Khan, who was the Khan of Khiva in 1698–1703. Inscriptions of 42 lines are written on it in a circular manner. The inscription that connects the two panels of the door reads: “Lord, those whose heads are bound in pain (line 31), accept the prayers of sick hearts” (line 32) [10].

This indicates that people who had their heads tied (mentally ill) were healed in this place, and the mausoleum was a healing centre [10]. The mausoleum of P. Mahmud is located in the heart of the Ichon Castle complex. It was turned into a tourist centre in the middle of the 20th century. It is precisely from that period that this land officially ended the task of treating mental illnesses, but strengthened the task of treating infertility [11, 12].

In conclusion, it is necessary to say that the mausoleums built in honour of the representatives of Sufism have not lost their importance as places of healing among the people of Khorezm. Years of political campaigns, struggles and bans seem to have paid off. However, as we get deeper into the population, we see the opposite of this situation. Of course, they turn to modern medicine for diseases, but at the same time, ancient traditions are used [13].

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The history of the press in Khorezm and its role in the coverage of social and political life: account and analysis (1920–1945)

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Abstract

The article analyses the history of stone lithography, which was launched in the Khiva Khanate, and later recognised as the first press in the Khorezm oasis. The period of press history from 1920 to 1945 is covered, and the topics addressed in the newspapers are reviewed.

Keywords: stone lithography, press, printing house, newspaper, papers, manuscripts

1. Introduction

The method of lithographic book printing, that is the printing of handwritten text with the help of specially processed lime stone covered with ink, was common in many eastern countries. In the 19th century, literary life in the Khiva and Kokand khanates was livelier than ever, and Arabic language works came from Turkey, Iran, and India. In Russia (Kazan, Orenburg), Azerbaijan (Baku), Crimea (Bakhchysarai) printed materials using Arabic fonts were found that were not circulated in Central Asia. In the Central Asian region, local lithography appeared in the last quarter of the 19th century [1–4].

2. Literature review

The first lithographic printing house in Turkestan – lithography was established at the initiative of Khiva khan Muhammad Rahimkhan II Feruz. According to researcher F. Ernazarov, the stone machine was brought to Khiva by Feruz from Geneva. Some reports indicate that it was brought from Iran. The first edition of the Khiva lithography was made in 1874 [5]. Ibrahim Sultan, an Iranian special printer, began his first work in lithography and was the first to print in this manner. He took Otajon Abdalov as an apprentice when he found it difficult to work alone in the newly formed stone. Abdalov worked here for five years as a student and then as a full-time printer. He himself mentioned that his first four years of service in the lithographic printing house were apprenticeship, and later he began to work independently [6]. Initially, some documents were published in lithography. After Ibrahim Sultan left for Iran, Otajon Abdalov was responsible for all the work on the stone. According to A. N. Samoilovich, the stone print was moved to Tozabogh in 1908 in the field yard of Muhammad Rahimkhan [7–10]. Some of the books published by the palace printing house were stamped “Khurshid”. Abdalov, the first master of the Khurshid lithographic printing house in Khiva, noted on the 50th anniversary of the establishment that it was founded in 1874. Thousands of lithographic books published in printing houses comprised more than forty titles, literary, artistic and religious. With the launch of lithography in Khiva, the printing of books was revived, and there was an opportunity to publish many copies of classical literature and immortal samples of history [11, 12].

3. Analysis and results

The masters of the Khiva palace lithography initially began to publish books on local paper, but due to the fact that the paper did not accept the paint well, they continued to publish on Russian paper [13]. The composition of the title page varied. In many cases, the orange (rhombus) ornament appears on the title page of the book. In some books, an oval-shaped ornament consisting of twisted horns or flowers with leaves is found. The books were usually placed in a green leather case [14]. According to A. N. Samoilovich, the stone print was moved to Tozabogh in 1908 in the field yard of Muhammad Rahimkhan [15]. It was headed by Khudaibergan Muhrkan at that time. Samoilovich studied the work of the lithograph – the khan’s printing house was working in the central part

of the Tozabogh garden, occupying the sunny side of the *chordara*. The work to be printed came down to a room where the calligrapher copied it with lithographic ink. In another room, the copy dropped page by page on the stone and traces of the copy were taken from it. Eventually stone could hold four pages, while previously only one [7]. The printing press was moved manually, with two workers standing in front of it: one rotated the wheel, and the other rotated the pages. A third worker spinned the paint on a separate table. According to Samoilovich, the khan's library in Tozabogh contained about 200 manuscripts and many books on Turkestan, Kazan, Ottoman Turkish, Persian and Indian editions. It was known that the khan's library contained not only Khiva lithographic editions, but also other foreign lithographic editions. Along with Otajon Abdalov, Muhammad and Khudaibergan Harrot, Khudaybergan Muhrkan, Ismail Devon, Komil Devon, Madrahim Saidashev and others worked in the Khiva printing house. The lithography of the Khiva palace lasted until 1910 (until the death of Muhammad Rahimkhan). Isfandiyarkhan was not interested in the activity of lithography. No Khiva edition was mentioned in the bibliographic descriptions of the literature published in Turkestan from October 10, 1910 to February 26, 1911 [11]. It is known from history that on February 2, 1920 the last Khiva khan Said Abdullakhan was overthrown in Khiva and the Khorezm People's Soviet Republic was established [16]. This newly formed government began to make effective use of the lithography service to disseminate its notices and announcements to the public. At the initiative of Otajon Abdalov, on March 8, 1920, the first newspaper *Inkilab kuyashi* ('Sun of the Revolution') was published [17]. This printing house also took a leading position in the printing of paper money of the new republic. During this period, Otajon Abdalov also made a significant contribution to the development of lithography in Khorezm. He prepared apprentices like Ota Miskinov. He was also a good chemist. He also made special colour editions and ink mixtures for printing newspapers, magazines, and books on lithography [16].

According to A. Bobakhonov, 2 printing houses operated in the Khiva Khanate. In this regard, O. Abdalov's activity began in the Khiva Khanate and published the first newspaper in the Khorezm People's Republic, which existed until 1924 [18]. In 1924, the Khorezm People's Soviet Republic awarded him the Order of *Gyzyl Zimet* for his services in the spiritual and educational sphere. After the national delimitation, the newspaper began to be published as a publication of Khorezm district faction committee, district executive committee, district town council and district youth committee. In 1920, printing

equipment, electric motors and letters were sent to the Khorezm Republic. In October 1921 and September 1922, two pairs of printing equipment were brought to Khorezm, together with printing specialists, 700 kilograms of Russian and Uzbek (Arabic) letters, a small electrifier and a machine. Otajon Abdalov worked together with Alexey Salopov and Gustav Shneidel in setting up this equipment. Abdalov followed the political processes related to state life, including that of the Young Khiva movement, and published the manifest presented to Khiva Khan Asfandiyar on April 5, 1917, and distributed it among the people [18]. Abdalov was recognised as one of the founders of the national press of the Karakalpak people [19]. In 1924, at the request of the printers of the Karakalpakstan autonomous region, he participated in the establishment of the *Erkin Karakalpoq* newspaper in Turtkol [19]. According to A. Bobokhonov, Afzal Tahirov, who came to Khorezm with the referral of the Turkestan government, also actively worked in the field, and at the same time he was the editor of the newspaper *Inkilab kuyashi* ('The Sun of the Revolution') [20, 21].

Inkilab kuyashi was published in March 1920. Initially, newspapers were published in lithography, later in nail printing, the first issues were in two pages in a large format. They appeared in the Uzbek and Turkmen languages. Since the 1930s, newspapers have been published in districts as well. In the 1930s and 1940s, the newspaper *Bul tayyar* ('Be Ready') was published as a children's newspaper [22]. The first editions of *The Sun of the Revolution* were in 30 x 42.5 lithographic size and published once a week. In the issue of March 5, 1924, it is said that the circulation of this newspaper was 300–400 copies [9]. It was published once due to the inconvenience of lithography. In particular, preparing the heavy mold (stone) for manual printing, changing the next page stone, turning the lithography axis by two typists, and preparing ink for printing required a lot of manual labour from the printers. Since 1922, it can be seen that *The Sun of the Revolution* was published twice a week, considering that the newspaper was published daily in the 1940s, or that the first edition was a weekly, the achievements of the newspaper in twenty years of publication were visible. The first editor of the newspaper was Mullah Bekjon Rahmonov [20]. He was a representative of intellectuals in the Council of Supervisors, a member of the "Young Khivalik" movement, and one of the enlighteners of his time. During the Second World War, there were 2 regional and 5 district newspapers in the Khorezm region. Announcements were made, emphasizing that service work would be organised in particular locations; such announcements included job offers for typographers. Advertisements can also be cited, including those for typists and mechanics;

some “naborshchiks” (typesetters) were also invited to work. In the press, events in the Union republics or the Soviet state appeared at the front, based on TASS-UzTAG data; developments in European countries, as well as World War II in Western Europe were related, based on reports by Reuter’s agency. From the first issues of the newspaper, we can see that in the period from 1945 and during the Soviet Union, the main issues covered concerned agricultural production. The agrarian sector has always taken an important place in the overall economic development, and the issues of increasing the cultivation of cotton and other agricultural products, and the implementation of the 5-year plan in the form of production of raw materials have been in the centre of the press [23].

4. Conclusions

1. The books published in the Khiva lithograph became popular among the people, inspired by the cultural and enlightenment growth of the population, inspired the creation of new works by scholars and writers, and replenished the looted khan’s library [24]. The establishment of the Khiva lithography did not preclude the copying of manuscripts. Khiva calligraphers copied rare manuscripts, historical works, translations, bayozs and divans during this period as well.
2. The significant role and contribution of Muhammad Rahimkhan II Feruz in the increase of manuscripts and lithographs created in the Khiva khanate should be acknowledged. The literary atmosphere created by Muhammad Rahimkhan II flourished in the valley of the Khiva khanate during the years of political crisis [25].
3. It can be seen that agricultural production was the main leading topic in newspapers.

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The way of life of the inhabitants of the Kelteminar culture

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Abstract

The article presents an analysis of the history and rich cultural heritage of the Khorezm oasis of Kelteminar culture and the way of life of the population. The analysis of data is presented through the results of archaeological expeditions and sources.

Keywords: Lower reaches of the Amu Darya, Aral Sea region, Amu Darya, Kelteminar, Akchadarya, Sarygamysh, Djanbas, S. P. Tolstov, Ya. G. Gulyamov, A. V. Vinogradov, Y. B. Bijanov, hunting, fishing

The history of the Khorezmids living in the area of Amudarya and alongside of Aral Sea dates back to the distant period – the Neolithic, which began in the 4th millennium BC and was called the New Stone Age. According to the research of the well-known archaeologist S. P. Tolstov, our ancient ancestors created such grand cultures as Kelteminar, Tozaboyop, Suvyorgan, Amirobod and left their traces as monuments from the distant past.

The study of the ancient way of life in the areas of the South Aral played a crucial role in the research of the Khorezm Archaeology–Ethnography Expedition. As a result, from the beginning of the processes of assimilation of the Lower Amudarya lands by primitive communities in distant times, traces of anthropogenic influence have been identified in the environment

at different historical stages. They were the basis for changing natural-geographical conditions [1].

In the earliest period, the paleogeography and climate of Ustyurt, alongside Aral and Kyzylkum, did not correspond to modern geographical conditions. The plains, now deserted in the territory of Aral, had provided sufficient drinking water during the Paleolithic, Mesolithic and Neolithic stages of the Stone Age [2]. This is evidenced by traces of lakes and river tributaries that dried up in the distant past in these areas.

An example of this can be cited as a result of archaeological excavations carried out at Yesen 3 and Churuk 12 around the Borsakelmas abbey in the south-east of Ustyurt, which is characterised by unfavourable conditions for current life, as a result of archaeological excavations [3].

Archaeologist Ye. B. Bijanov managed to find artefacts from the ancient Stone Age in the hunting lodges around Karakduk [4].

From the cultural layer of primitive settlements around Shahpakhta in the Asaka-Ovdon monastery, ancient Stone Age weapons have been found and studied [5, 6].

Similarly, in the vicinity of the Jayronkuduk and Aydobol wells in the Ustyurt region, monuments of the Mesolithic and Neolithic periods have been found and studied [7, 8].

In addition, at the Burli 3 site on the left bank of the Amudarya and on the ridge of the northern and western ridge of Mount Sultan Uways on the right bank, weapons were also found from the late Paleolithic and Mesolithic periods [9].

5th–4th millennium B.C., the Akchadarya Basin, the Kaparas oasis in the Tuyamoyin system, and Sargamishboyi, many water basins and lakes were formed in Uzbay areas, and the world of flora and fauna along their coasts made it possible for human habitation.

Archaeologist A. V. Vinogradov, in the course of his research, recorded more than 30 archaeological monuments of the Neolithic period in the Akchadarya basin [10].

Naturally, the development of life and culture in the Khorezm oasis was closely related to the Amudarya, the only source of water. The formation of the natural-geographical environment and the anthropogenic landscape as a result of the activities of the Amudarya and its descendants formed the geological and geomorphological state of the lowlands of the South Island basins.

The peculiar flow of the Amudarya and its ancient tributaries, which depend on its water dynamics, caused the sedimentation of the layers of clay

it contained as the water rose and fell. In diverse lowland areas, the historical period from the Neolithic period to the Middle Ages has evolved and gradually changed the natural-geographical environment and the anthropogenic landscape.

The hydrography of the Amudarya, the directions and flow history of its ancient selves, have become important issues in the paleogeography of Central Asia. In the sources, the correct illumination of the geography and hydrography of the Amudarya by Abu Rayhon Beruni, was first emphasised by S. P. Tolstov. He writes that Beruni's conclusions in this regard are, surprisingly, consistent with the results of a modern geographical and archaeological study of the Amudarya themselves [11].

A special study on this topic was made in Ya. Gulomov's monograph *History of irrigation of Khorezm* [12].

It is the daily way of life of the holders of culture, the social order, the paleoecological, landscape-climatic conditions of the places where they lived, the specific characteristics of cultures, the chronological framework, the economic base, the intercultural relations of the communities while reasonably finding a scientific ye chime, but the origin of the culture the issues of historical roots, ethnic associations of the population, anthropological type, language, economic, cultural and ethnological image are becoming controversial and problematic in science.

In the study of the Neolithic period of Central Asia, the lower basins of the Amudarya and Zarafshan rivers, as well as the Kelteminar culture studied in Kyzylkum, have a special place. This study of culture, initiated by S. P. Tolstov, had its scientific grounding as an independent culture established by A. V. Vinogradov. The historical-cultural communities of Kelteminar are so widely dispersed that the analysis of the archaeological material evidence found from their spaces reveals that, on the one hand, they are common blood-sister communities united in terms of material culture, way of life, social and economic foundations, on the other hand, the different climatic, environmental conditions of territorial latitude have also shown to be composed of a cultural complex of communities whose culture is indigenous. Thus, A. V. Vinogradov made a scientific basis in the composition of culture by distinguishing such cultural variants as Akchadarya, Lavlakan or Lower Zarafshan [10, 13, 14].

Considering the ancient right bank of the lower Amudarya stream – the Akchadarya Basin, many spaces belonging to the Kelteminar communities have been discovered from the banks of the basin. The basin consists of the southern and northern parts. The southern basin, which begins near

the town of Four Lakes, faces north with three main tributaries, and rises to the slope of the Sultan Uzdag mountain range. The stream of water that circulates around Sultan Uzdag from the west passes north through the narrow corridor of the Akchadarya, forming here the northern Akchadarya basin, which is also relatively larger in volume than the southern basin. Both basins, like the ancient tributaries of the Zarafshan River, formed an integral part of the Kyzylkum with their natural conditions. Spaces belonging to Neolithic communities in the Northern Akchadarya basin are virtually unknown. From the areas of the Southern Akchadarya basin, on the other hand, the base spaces were found in a categorical state [10].

On the scale of the Akchadarya basin, no spaces belonging to the first stages of the Neolithic period have been found. The Tolstov space huts, located by side with Djanbas 4 space belonging to the middle-Djanbas stage of the development of the culture of the Kelteminar communities. According to A. V. Vinogradov, Djanbas formed a holistic part of the village, consisting of 4 houses. The results of the archaeological research carried out in the Akchadarya basin have made it possible to collect interesting sources, including the material culture of the last stages of the cultural development of the Kelteminar communities. The importance of stone weapons, ceramic vessels, tombs or ornaments is unparalleled as a source in defining the specific characteristics of the culture of the Neolithic communities of the Akchadarya basin. Kelteminar culture is stone-based – microlithic, parabolic industry, in the early Neolithic stage the trapezium as well as microlithic arms in the form of “horned trapezium” were more used in marriage, in the middle Neolithic stage Kelteminar-type arrowhead tips were widely used, trapezium-shaped microlithic weapons went out of their way of life. From the remains of ceramic vessels captured in the study of the monuments of the Akchadarya basin, we learn that they were vessels with high cylindrical necks, spherical, ovoid bodies, truncated or tubular taps. However, these types of vessels are not very similar to the ceramic vessels of Kelteminar communities in other regions (inner regions of Kyzylkum, the Lower Zarafshan). The structure of these vessels and the fact that red and sometimes yellow dyes were used in their patterns belong to the material culture of the farming communities of the southern regions of Central Asia. These arguments provide information on the intercultural affiliations of communities [15]. At the last stage of the development of the culture of Kelteminar communities in the Akchadarya basin, it is observed that colourful floral patterns also appeared on the border of some spools. Instead of egg dishes, canvases with a flat state of the tag part began to be used in marriage.

In this way, it became clear that even at this stage, the communities created their own material culture.

Thus, while there was a stream of water in the Akchadarya, which was active at the same time as the Sargamishboyi Delta during the Neolithic period, it was not as abundant as in earlier periods.

Thus, in the 5th–3rd millennia BC, the areas that became water basins between the Kyzylkum and the Karakum heaps, which represented the geographical position of the surroundings of the Akchadarya, Sargamishboyi and the areas connected to their shores, were mastered by the people of the Neolithic period, and the geography of ethnic processes testifies to the expansion [16].

According to A. S. Kes, during the Neolithic period, that is in the 6th–5th millennia BC, the waters of the Amudarya tributaries of the Davdon and Daryoliq poured into the reservoir in the centre of Karakorum, giving rise to a lake known in geography and historical literature as Lake Sarygamysh. The water of the Akchadarya, which begins in the eastern direction near the town of Four Lakes, is directed towards the Aral Settlement through a wide corridor on the plain.

The Sarygamysh, alongside the Aral basins and the Akchadarya were formed precisely by this Neolithic period [17–19], an anthropogenic landscape has formed on their shores. It is natural that prolonged anthropogenic exposure, while leading to drastic changes in the natural environment, has also led to a change in the lifestyle of the population living in these areas [1].

Until now, there were views that the seed communities, which were representatives of the Neolithic Kelteminar culture in the area, were originally engaged in subsistence farming and were engaged in productive farm types only by the Bronze Age [17]. Only in some studies has it been concluded that from the presence of very small microliths (the simplest scythe teeth) in the monuments of the Kelteminar culture, representatives of it may have been engaged in even the simplest farming. At the same time, the most recent studies indicate the existence of ponds formed from the Amudarya waters in the Lower Amudarya areas in the 6th–5th millennia BC, suggesting that these puddles could be used for slow simple farming and pottery. It is emphasised that, given the existence of cultural links, the question of the period of formation of the first farming skills in the oasis of ancient Khorezm should be reconsidered [20, 21].

During the Neolithic period, the waters of the Amudarya were not at the level of breaking north from the Akchadarya estuary. This caused large amounts of water to accumulate in the southern Akchadarya basin in the IV–III

millennia BC, leading to the formation of a large number of lakes and swamps here. In the North Akchadarya Basin, BC. The relatively few settlements dating from the first half of the II millennium and earlier can be justified by the fact that there was no water flow in the area. In the southern Akchadarya basin, however, most of the Neolithic hunter-fishing grounds are recorded on hills and ravines [22] due to excessive water.

According to the information recorded in the publications that formed the basis of the results of archaeological research, the history of the assimilation of Khorezm was associated with the process of population migration. In particular, according to researcher Ye. Bijanov, during the Pleistocene glaciation, the northwestern and southeastern regions of Ustyurt were mastered by hunters during the ashel period. It is worth noting separately that as a result of the scientific triumph in the study of the premises of Stone Age hunters in the Ustyurt region, anthropological materials from the Cascajal tomb belonging to the Neolithic period were obtained [7, 23]. In his dissertation, which completed the results of scientific research conducted in the Ustyurt area, the researcher has comments on the fact that the basis of the material culture of Neolithic seed communities is not indigenous, the specificity of its development path [24].

It is known from historical data that Late Stone Age material from the Burli – 3 space on the eastern foot of Mount Sultan Uways was carried on by the hunters who carried out the ethnic process on an adoptive farm [9].

During the Neolithic and Aenolithic periods, the lifestyle of the inhabitants who lived in the southern slopes of the Island was dominated by subsistence farming. S.P. According to Tolstov's conclusion, the northeastern Isles were the last Neolithic (second half of 3 thousand years) seed communities who raised large and small royal pets and ran a production farm [25].

V. M. Masson believes that the transition to a production farm during the Neolithic period was symbolised by two methods, namely farming-livestock (Joytun) and livestock (Caltaminor) farms [26].

B.C. Due to the strong water pressure of some tribes of Amudarya in the IV–III millennia, a large mass of water makes its way through the ditches between the Karakum and the hills and begins to move southwestward through the south of Ustyurt towards the eastern bay of the Caspian Sea. This resulted in the formation of the 550 km Long Waterway [1]. However, this waterway operated for a short time, in B.C. On the border of the III–II millennia, the flow of water almost stopped across the border. B.C. From the beginning of the II millennium, there was no water flow in it [27, 28].

B.C. As a result of the mudflow of the tributaries in the Sargamishboyi delta at the end of the III millennium, the Akchadarya tributaries are revived again [1]. This period is considered the most active period of Akchadarya. The presence of large amounts of water also gives rise to the flow of water in the Northern Akchadarya Delta. This is evidenced by sand sedimentary rocks reaching up to 1.5 m that appeared over Neolithic settlements in the Akchadarya basin [10].

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The social structure of the early Saka tribes of the Aral sea region

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Abstract

In the socio-economic system of the first Sakas in the Aral sea region, the middle-class and ordinary members of the communities were of great importance in the production process according to the tasks of daily activities and economic work (livestock, livestock-farming, hunting, fishing, handicrafts and mining). A large patriarchal (father-son) family was formed on the basis of the pastoral society. Such families, originating from a common ancestor, were united in the clan system. The clan communities were part of the tribe. Along with territorial and kinship ties, clan-tribal traditions and common beliefs were the most important unifying factor.

In the social structure of the early Sakas in the Aral sea region, various layers such as warrior-shepherds, priests, heads of large families and clans, as well as tribal leaders were distinguished by their position, practical knowledge, organisational activities, and their place in the life of society. The management system was based on the principles of “military democracy”. Important socio-economic issues were discussed at the council of clan-tribal leaders (elder people) and community meetings.

Keywords: Saka, military democracy, people’s assembly, Afshin, Sparetra, Zarina and Tumaris

1. Introduction

Since ancient times, a large number of clan communities living in the steppes formed a social unit of society – a tribe. According to researchers, among the territorial and kinship reasons in the social environment of the steppe tribes, the common clan-tribal customs, beliefs and rituals were the most

important unifying factor. This is because strict adherence to the requirements and rules of the old traditions and customs of clans had become the only tool as a collective will [1].

According to archeological and written sources, the social organisation and management system of the early Sakas preserved the traces of ancient social traditions of seed farming. As an example, this is proven by the traces of matriarchy in the social system of the Saka-Massageteans, the high status of women in the community and the unification of tribes by women, the implementation of leadership duties in military alliances (ruler-princesses, Zarina and Tumaris). The tradition of discussing issues related to public affairs and religious rituals in gatherings of senior members of clans and armed warriors (“people’s meeting”) also has ancient roots.

Organisational and management tasks in the communities of steppe herders were performed by people who were distinguished from others by their quality, knowledge and experience. This activity was beneficial to all and fulfilled the requirements of community interest. According to the historical ethnography, people who were engaged in such organisational and administrative activities are called “big man” and “adults”. In different periods, even in the late Middle Ages (in the case of Central Asia), the concept of “big” was applied to officials [2]. It is natural that this argument should be an echo of the management system of distant times.

In our opinion, compared to the above-described management system of the Aral sea region, from the 9th–8th centuries BC, the social structure of herdsman societies has become more complex. Different social strata emerged within the tribes. This is evidenced by large burial structures (Northern Tagisken) and burial equipment in the graves of the early Sakas (Uygarak, Sakarchaga). In the social system of cattle-breeding tribes, the separation of clan nobles and clan-tribe noble classes coincided with this period.

At the end of the 8th and in the 7th century BC, tribal associations were formed as a result of seasonal migrations of nomadic herders, who changed their territorial location in accordance with the needs of their farms, moved in the direction of pastures during the seasons. Within such a large organisation, the management system was sophisticated.

The tasks of introducing innovations in the management system of the clan-tribe association, protecting cattle herds and their grazing places from external invasions and robberies, and on the other hand, organising military campaigns to foreign lands, were defined. In this regard, the political relations between the Sakas and the Medes, mentioned in written sources, can be

cited as an example. The armed majority of the Sakas were involved in these processes. Their activities were associated with economic interests. During their successful implementation and capture of prey, the social status of military leaders and warriors grew. The occurrence of this incident occurred during the period of increasing military duties of the herdsmen community.

The first Sakas of the archipelago were not characterised by cities and defense structures. Cavalry archers formed the basis of their military forces. Among the warriors, the priests who fulfilled the traditions and beliefs were separated, and then their free activities appeared. There were also priestesses.

As a result of the development of metallurgical industries, special groups of artisans such as team members engaged in mining work, metal caster and tool makers, and gunsmiths emerged. Taking into account the great importance of the military sphere in the life of the Sakas, the social position of the weapons manufacturers was important.

2. Literature analysis on the subject

The study of the social system of the Saka tribes is based on written sources, starting with the German scientists I. Marquardt and A. Herrmann in the late 19th and early 20th centuries [3]. As a result of the acquisition of archaeological materials, it became possible to compare written and physical evidence in the course of research. In the study of the history and culture of the Sakas in the Aral sea region, this method was first used in the works of S. P. Tolstov [4], as well as in the solution of tasks related to the topic, more aspects of source science or [5], on the other hand, archaeological data were taken into account [6].

In our opinion, written and archeological data that are related to the research are complementary media, and it is appropriate to use the results of their comparative analysis. For example, I. V. Pyankov's [7] article on Massageteans describes the content of the sources in detail. However, the question of compatibility of the considered sources with the historical reality, the reality of life was not revealed by the author completely.

Apparently, aware of the possibility of such a problem, Herodotus at the beginning of his stories made comments such as "it is said", "according to the stories of some". For example, about the Massageteans who lived on the islands of Araks, the ancient Greek historian wrote: "On Araks, as they say, there are many islands the size of Lesbos. On these islands live people who in the summer eat various roots dug out of the ground. In the summer, they collect

ripe fruits from the trees and then store them in reserve.” [8]. By reading this, the Massageteans might be described as termites who lived in the era of the primitive collective system. But this does not correspond to the historical truth.

Long after the time of Herodotus, Strabo, who did not critically review the above information, almost repeated it: “Inhabitants of islands that do not cultivate land and eat roots, wild fruits, drink juice squeezed from fruits” [9].

Based on the comparative analysis of written and archaeological data, including the results of new investigations, the history of the social structure of the early Saka tribes of the Aral Sea region has not been adequately covered. Some aspects of the topic were considered in publications from the beginning of the 21st century [10]. The existing scientific information is the source basis of the issue. It is important to draw on generalised interpretation of the data [10].

3. Research methodology

The article uses the methods of source analysis, comparative analysis of scientific views and approaches, generalisation of historical data and the principle of objectivity.

4. Analysis and results

In the 9th–8th centuries BC, fundamental changes took place in the economic forms, lifestyle and culture of the society of Eurasian steppe cattle-breeding tribes. It was during this period that a system of seasonal distribution of pastures and water sources was formed for year-round migration, feeding herds of livestock [11].

Cattlemen who have exploited copper, tin and lead mines made great progress in the field of metallurgical works and the development of weapons. The increasing number of bow and spear points, bronze daggers and long-handled knives are noteworthy among the objects found in the settlements and burial mounds. The reason for the increase of weapons and their improvement was the need to protect the private property, settlements and pastures of various herding communities. Additionally, there was a high probability of using these weapons during the occupation of new pastures and meadows, organising raids on neighbouring territories, acquiring someone’s property through mutual struggles [12].

Rivalries between tribes, “incessant raids”, “battle ranks”, the actions of “bloodthirsty enemies” and the events of the eras dominated by military interests are all covered in the *Avesta*. The source contains information about various weapons (lances, daggers, shields, helmets, etc.) as well as chariots and cavalry archers with “swift horses” [13].

The materials of the Northern Tagisken mausoleums located on the banks of the Inkardarya River of the Lower Syr-Darya (large burial structures, large chambers with an area of 15–50 square meters, the presence of 40–60 pottery vessels in some graves, bronze and gold objects) indicate a highly developed social stratification. In the clan-tribe social system of herdsmen of this period, clan leaders and clan chiefs were distinguished by their high position and their place in society [14].

Such large burial structures of from the 7th–6th centuries BC have not yet been found in other territories. The Southern Tagisken and Uygarak burial mounds located along the banks of the Inkardarya River and the Sakarchaga burial mounds on the left bank of the Amudarya were cemeteries of separate clan communities of the first Sakas.

The wooden-walled tombs, covered with beams and reeds, are similar to the structure of the Saka dwellings – cellars and sinch huts with pillars, i.e., the “house of the dead” of herdsmen, their living quarters. According to the data of historical ethnography, from primitive times, death was evaluated not as the end of life, but as a transition from one state to another on the path of life [15]. Therefore, the funeral ceremony was carried out according to the age, gender and position of the deceased in the community. In this case, the burial equipment serves as an important resource in the reconstruction of the economic sectors, professions, lifestyle and social structure of the ancient inhabitants of the Aral Bay [16].

In the Uygarak and Sakarcha burial mounds, the dead were placed in their graves in shoes and clothes. The number of burial equipment in each grave (tools, pottery, household items, weapons, jewelry) was related to the position of the deceased person in social life.

According to these signs, burial monuments of clan leaders, military nobles, like the Northern Tagisken mausoleums of the early Iron Age, have not been identified in the Aral sea region. At the end of the 8th and in the 7th century BC, semi-nomadic cattle-breeding tribes spread across the steppes of Eurasia from the lower Dniepre and the northern shores of the Black Sea to Southern Siberia. They were also engaged in farming, hunting and fishing. In various regions (the northern shores of the Black Sea, Altai, Tuva) were found “royal” burial mounds, rich in burial equipment.

Herodotus first reported about them. According to the Greek historian, Scythian kings were buried in large rectangular tombs. The corpses of the concubine, winemaker, cook, horseman, messenger and guard, who were strangled with the deceased king, as well as gold dishes were buried in the tomb. Such burials have been confirmed by archaeological researches. For example, 84 horses were buried in the Arjan burial mound in Tuva [17]. Quantitatively, this figure is one Uygur number. The burial rites mentioned above probably refer to the burial custom [18]. Bones of horses were not found in the burial mounds of the first Sakas in the Eastern Aral Bay. Sarikamishboyi graves have them, and all graves also have horseshoes. Bronze domes decorated with horse harnesses, water bottles and *yuganchas* were found in both men's and women's graves. According to these signs and other physical evidence, the Sakas entered the sphere of steppe herding cultures, which in history is called the "Scythian-Siberian" world. Their way of life, economic sectors and customs had common features. This is also evidenced by burial equipment that was similar in many respects.

In our opinion, the term "Scythian-Siberian world" has a more historical-geographical character, so it is appropriate to use the concept of the "Scythian-Saka" economic-cultural circle, taking into account the cultural features of steppe herders. During his time, K. A. Akishev wrote that the historical traditions of the tribes of these regions went back to the period of the Andronovo culture, noting the common features of the culture and social system of the Sakas of the Aral Sea and Eastern Kazakhstan (Yettisuv) [19]. The transition to a semi-sedentary and nomadic lifestyle also began in the late Andronovo period. These processes determined the essence of the social system.

According to O. A. Vishnevskaya, the size of the Uygarak burial mounds, the amount and types of burial equipment in the graves indicate changes in the socio-economic life of the first Sakas of the Aral Bay, as well as property and social stratification. In order to prove his opinion, the researcher paid attention to the topography of the burial mounds and noted the presence of graves belonging to individual families in the cemetery of different clan groups [6]. According to the burial equipment, social strata such as clan leaders, warrior-riders and priestesses who performed the duties of priests were separated from the military leaders of the tribal associations.

Among the objects found, the stone and bronze mace were interpreted as a symbol of power and control. The upper part of the bronze gourd was decorated with the image of the head of a wild bird. Among the Scythian tribes, a sword-dagger made of bronze was a symbol of royal authority and

demonstrated military power. There was an image of an eagle on the crests of Scythian military leaders.

It is possible to agree with O. A. Vishnevskaya's statement about the history of the Scythians, but the graves of military nobles and kings were not investigated in the Uygarak and South Tagisken Saka cemeteries, most of the studied burial mounds belonged to middle-class and ordinary members of the clan-tribal communities [6]. According to the identified weapons (bronze daggers, spears and bow arrowheads), cavalry archers formed the basis of the Saka army. Among the weapons of the Sakas in the army of the Persian king Xerxes, Herodotus mentions "Saka bows and daggers" and military weapons, and comments that "among the Persians, in fact, it was common to call all Scythians Sakas [16]. Similarly, Herodotus distinguished the bow, spear and axe among the weapons of the horse and foot warriors of the Massageteans [20].

It should be noted that the work of the ancient Greek historian does not contain information about local military leaders of the Sakas or other Central Asian tribes. For example, in the work of Herodotus that is related to this topic, there are the following lines: "The leader of the Bactrians and Sakas was Hystaspes, the son of Darius and Atossa, the daughter of Cyrus", "the leader of the Parthians and Khorasmians was Artaboz, the son of Farnak, and the leader of the Sogdians was Azan, the son of Arteus" [8]. The fact that King Xerxes' brother Hystaspes led the combined army of the Bactrians and Sakas indicates the great military importance of cavalry archers in the ancient Persian kingdom.

L. T. Yablonsky, according to the materials of Sakarcha, distinguishes groups of warriors, horsemen, priests and priestesses and ordinary members of the community in the social system of the Sakas. According to the researcher, the lower social layers of pastoral tribes are evidenced by narrow, shallow graves with almost no burial equipment (or only one pottery vessel) [21]. Some of the most famous warriors served as priests at one point in life. Iron and bronze sacrificial knives were found in their graves along with bronze arrowheads.

In the graves where women were buried, stone urns were found, which are symbols of fertility beliefs, as well as equestrian equipment and weapons [6].

In the Saka-Masagetean society, the issue of the social position and high rank of a woman is a separate topic. According to V. I. Abaev's studies in the field of linguistics, in the Saka-Masagetean world, the female household manager was designated by the term *afsin*, and in later historical stages this term was applied to the owners of houses and property, and in the early Middle Ages, *afshin* belonged to the rulers of Ustrushona and Sugd regions that reflected the concept [22].

Women had a high social status in the communities of the “sayrima” steppe tribes mentioned in the “Yasht” book of the *Avesta*. Starting from I. Marquardt, according to the opinions of various researchers, the Sayrima tribes should be compared with the Savromats (Sarmatians) who lived between the Don and the lower Volga [23]. According to Herodotus, the women of the sauromata “observe their ancient customs, they go hunting with their husbands and even without them, they go on campaigns and wear the same clothes as men” [16]. In the world of steppe cattle-breeding tribes (Sairimas, Sarmatians, Dakhs, Saka-Massageteans), women had equal rights with men in many respects. Herodotus’ sources also confirm this [20].

The work of the Greek historian Ctesius contains the following noteworthy information: “Cyrus started a war against the Sakas and captured their king Amorg, after the queen of the Sakas Spartara, her husband, fell into the hands of the enemy, she gathered a large army of her countrymen, men and women, and went to start a war against Cyrus. She defeated Cyrus and captured many Persians. ...Cyrus, king Amorite, invaded the Derbices. Together with the Derbices, the Indians took part in the battle, and they supplied war elephants. After the Derbices ambushed the elephants and attacked, Cyrus’ horsemen began to retreat. Cyrus fell from his horse. An Indian warrior stabbed Cyrus in the thigh and wounded him. He died after this injury” [7].

Ctesius says that in the new battle the Persians were victorious, thirty thousand Derbices and nine thousand Persians died on the battlefield. On the eve of his death, Cyrus appointed Spitak as the leader of the Derbices [24].

In fact, Derbices are considered a tribe of the Massageteans. In the stories of Herodotus, the leader of the Massageteans, the “princess-ruler” Tomaris, was mentioned. Until the beginning of the campaigns of the Persian king Cyrus II, in the history of Sakas-Massageteans, social relations and management system developed with their own characteristics. The formation of this management system corresponds to the period known as “military democracy” in history [25].

Chronologically, this stage can be defined as the transition period to the early Iron Age. Written sources contain information about the wars of the Sakas and the Medes of this period. Located southwest of the Caspian Sea, Media flourished during the reign of Cyaxar (625–585 BC) and conquered the southern regions of Central Asia – Hyrcania, Parthia and Areia [26].

According to Ctesius, the Parthians left the Median state and asked for help from the Sakas, “they handed over their province and city to the Sakas.” Because of this, a long war began between the Medes and the Sakas, with long battles that

resulted in heavy losses on both sides. Eventually, a truce was concluded between the Sakas and the Medes, with the Parthians subject to the Medes, but the terms of the truce stated that both sides “remained masters of what they had previously possessed, and became eternal friends and military allies”. Ctesius continued his story and wrote: “At that time, a woman named Zarina reigned in the land of the Sakas, and she was higher in rank than other Sakas women with her passion for military affairs and courage. In general, this tribe has brave women who take part in military risks along with their husbands, but Zarina stood out among them for her beauty, and was excellent in her purpose and work.

Ctesius, who served in the court of the Achaemenid dynasty, probably got acquainted with the legends of the Sakas. It is possible that the truth of life and information belonging to historical reality lie under historical narratives. According to researchers, the stories of Greek historians about Princess Tomaris and Princess Zarina belong to the heroic epic genre, which was created against the background of the struggle against foreign invaders.

Most of the communities of the first Saka tribes were composed of middle-class and ordinary members, who gained great importance in the production process. They grazed cattle and small livestock, were engaged in sheep and camel breeding, and acquired agricultural and professional skills. Taking care of cattle determined the order of life of the Sakas. Livestock was the main measure of community wealth and the most important source of nutrition. Therefore, the landscape of “deep blue lakes with high waves and fat cattle grazing around wide rivers” described in the *Avesta* continued the traditions of the old way of life in the conditions of the steppe.

In the Early Iron Age communities of the southern and northeastern regions of Central Asia, the main productive forces were formed by the members of a large patriarchal (father-son) family consisting of several small families, which occupied an important place in the life of society. Such families had their own dwellings, private property and labour tools, herds of cattle and food reserves in the society of shepherds in the steppe conditions. They formed an economically self-sufficient farm and became part of the clan. Groups of related families descended from a common ancestor were united within the clan. There were economic and customs relations between them [27].

5. Conclusions and recommendations

The social structure of the first Sakas in the Aral sea region developed based on the traditional social relations of the pastoral tribes of the steppe. In this system, territorial and kinship relations, common customs, beliefs and rituals of clans and tribes were in urgent importance.

Within the Saka society, large families with their own private property and cattle herds were separated and became part of the clan, and several clan communities formed an ethnic and social association of nomads – a tribe.

Organisational and administrative activities in the clan-tribe association were related to tasks that satisfied the common interests of the communities, such as organising and implementing economic affairs, controlling and coordinating the internal and external relations of the community members, and performing religious ceremonies.

In the 7th century BC, the military associations of Sakas-Massageteans were formed. In particular, Cyrus II and Darius I encountered such associations in their campaigns against the settlers. The structure of these associations is based on the principles of “military democracy”, its governance system is defined by the position and actions of clan heads and military leaders.

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Implemented works on the study and promotion of the historical-cultural heritage (on the example of the Khorezm Region)

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Abstract

In this article, many practical works are analysed in order to restore the ancient history and rich cultural heritage of the Uzbek people, to pass it on to the next generation, to serve the development of the spirituality of our people, and to convey it to the world community.

Keywords: UNESCO, cultural heritage, historical-architectural monuments, archaeological-ethnographic reserve

1. Introduction

Over the centuries, both the material and spiritual wealth formed during the historical development of mankind, has developed and made a worthy contribution to human civilisation. That is why the Uzbek people have been trying to pass on their material and spiritual culture, created over a long period of time, to the next generation, enriching it on the basis of high human values. Many practical works are being done in Uzbekistan today to restore the ancient history and rich cultural heritage of the Uzbek people, to pass it on to the next generation, to serve the development of the spirituality of our people, and to convey it to the world community. Among other historical and cultural regions of Uzbekistan, the oasis of Khorezm has a special place as an area where

extremely diverse cultures and traditions have been connected for thousands of years. Wide-scale efforts to preserve and protect historical and cultural heritage, to develop the sphere of their protection and use, to restore such objects and ensure that they are kept in their original state as much as possible, are bearing fruit. The work carried out on the protection and use of cultural heritage objects serves not only to study and promote history, but also to preserve the priceless historical heritage of the growing young generation, to strengthen their sense of national identity, and to inculcate high spirituality in the society. The works of local researchers contain information about the history of cities, historical-architectural monuments, problems of their preservation and repair, national traditions and the importance of tangible and intangible heritage.

2. Literature review

In particular, the works of A. Abdurasulov, K. Khudayberganov, Yu. Rahmanova, D. Bobojonov and M. Abdurasulov describe the city of Khiva, its history, architectural monuments, their spiritual and sight-seeing significance. In Z. Abidova's research, the issue of shrines and national values, their role in social and cultural life was studied. There are also studies devoted to the clothes and jewelry of the Khorezm oasis, their characteristics and customs [1]. From the research, we can understand that in the development of the country, along with spiritual wealth, the importance of our material wealth is also great, and that it has risen to the level of state policy. Therefore, today we need to deeply study the cultural heritage and shed more light on its aspects affecting spirituality. During the period of independence, a lot of attention was paid to the maintenance and repair of architectural monuments. First of all, as a result of archaeological research conducted in the city of Khiva, it was proved that it is one of the most ancient cities [2–4]. In particular, a number of scientific works, books and albums about the city of Khiva published on the occasion of the 2500th anniversary of the city have appeared [5–8]. In 2008, the republican scientific-practical conference held at the Khorezm Ma'mun Academy was aimed at the preservation of monuments of material heritage [9]. In the following years, great attention was paid to the issue of cultural heritage and its importance at the scientific conferences held at the initiative of the National Democratic Party of Uzbekistan [10, 11]. Today, the image of the ancient Khorezm oasis is changing radically. New buildings and houses are being built in harmony of historical and modern traditions. Good works are being carried out in order to

solve social and economic issues in accordance with high requirements and to improve the living conditions of the population. In this process, special attention is being paid to the study of ancient history, the preservation of monuments and examples of culture, the accumulation of accumulated spiritual values, the inculcation of virtue and creativity in the minds of our youth, and the formation of a sense of patriotism. Spirituality, ensuring the development of science and accelerating innovation processes are closely related to the systematic reforms implemented in our country. At the same time, Khorezm is also an “archaeological-ethnographic reserve” famous for the ancient history of the Uzbek people, unique culture, historical monuments and monuments of cultural heritage. From this point of view, the interest in the history of material and non-material culture of Khorezm is very strong at the world level. We can see this from many studies, pamphlets and monographs published in the Internet and in paper both at home and abroad. International cooperation is of great importance in the study and preservation of tangible and intangible cultural heritage. In Uzbekistan, the International Convention on the Preservation of Intangible Cultural Heritage, adopted in 2003, serves as an international legal basis. The initial efforts to ratify this Convention in Uzbekistan actually started in 2005. As a result of the comprehensive study of the Convention, appropriate proposals were prepared and submitted to the Oliy Majlis through the Cabinet of Ministers, and as a result, the Convention “Protection of Intangible Cultural Heritage” was ratified in December 2007. After the submission of the ratification documents, that is, from April 29, 2008, the Republic of Uzbekistan became a state party to this Convention. Uzbekistan’s cooperation with UNESCO is especially important in this regard.

3. Results and conclusions

In particular, a lot of work has been done and is being done in cooperation with this organisation regarding the development of artistic crafts and fine arts, the repair of architectural monuments and archeological monuments, their registration and protection, the study and promotion of historical and cultural heritage. In particular, the inclusion of the city of Khiva (1991) in the list of UNESCO’s World Cultural Heritage has become very important. The fact that the documents of Khiva Khanate’s cabinet were included in the list of World Memory is a vivid example of the recognition of the cultural heritage of our country at the world level. Over the next twenty years, large-scale

repair-restoration and beautification works were carried out in many historical objects directly with the participation of UNESCO. With representatives of China, Japan, France, Poland and other countries, research is conducted annually at more than 15 international archaeological heritage sites. In this regard, within the framework of international cooperation, Uzbekistan, in particular Khorezm region, has been continuing cooperation with the International Centre for Information and Cooperation in the Intangible Cultural Heritage of Asia and the Pacific (ICHKAP) established under the leadership of UNESCO in the Republic of Korea, and with the International Institute of Central Asian Studies since 2010. From this point of view, 6 elements of intangible cultural heritage of the Khorezm oasis have been included in the representative list of UNESCO, and in 1991, the “Inner Castle” monument complex in Khiva, the first in Uzbekistan, was included in the list of UNESCO’s World Heritage. After Uzbekistan gained independence, attention to the cultural and historical heritage left by our ancestors increased, they found their true value, historical and cultural monuments were brought under state control, and their repair and restoration became one of the priorities of our state’s policy. Also, laws of the Republic of Uzbekistan on the field, decisions of the Cabinet of Ministers were implemented, a number of international conventions were ratified by our country. Wide-scale efforts to preserve and protect historical and cultural heritage, to develop the field of their protection and use, to restore such objects and to ensure that they are preserved as much as possible are bearing fruit. The fact that the first step in this regard is defined in the Constitution of the Republic of Uzbekistan and other legal documents is a proof of how urgent this topic is. For example, in its article 49: “Citizens are obliged to carefully preserve the historical, spiritual and cultural heritage of the people of Uzbekistan.” “Cultural monuments are under state protection,” it was noted [12].

President of the Republic of Uzbekistan Sh. M. Mirziyoev indicated: “Khorazm oasis is one of the regions of Uzbekistan with high tourist potential due to its unique nature, unique cultural and historical monuments included in the UNESCO list, and infrastructure networks. Further development of the tourism industry in the region will be consistently continued. 22 cultural-historical heritage objects will be repaired and restored,” [13].

Therefore, it is more important in today’s era of globalisation to ensure for the next generation the possibility to enjoy this cultural heritage, to understand who their ancestors are, and to educate the younger generation about how deep-rooted the spiritual roots of this nation are.

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Analysis of the perceptions in the Polish regional online exhibitions in the era of digitalization of cultural heritage

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Abstract

Computer vision techniques have enabled wide access to cultural heritage through the implementation of online exhibitions. Due to this, every person can expand their knowledge by visiting "Museums at home". One of the most important aspects is the development of webservices that will allow one access to the widest possible group of recipients, including people with visual impairments. Thus, the main objectives of the study were to investigate graphical user interfaces (GUI) taking into consideration two online exhibitions presenting Polish cultural heritage. The following research questions were defined: 1) Does the number of evaluation defects of online exhibitions influence on the user's accessibility? 2) Do the visual impairments affect on the GUI perception? 3) Does the contrast influence on the GUI usability? For the purpose to answer the above-mentioned questions, the study was carried out utilizing the WAVE tool to verify inaccuracies regarding GUI accessibility and the eye-tracker tool to analyze the perception of the developed GUI. The obtained results confirmed that online exhibitions with fewer accessibility errors are easier to use and are user-friendly. The appropriate contrast affects ease of use and the time it takes to find a given functionality. While designing the GUI, attention should be paid to adapt it to people with visual impairments by increasing the font size and adding additional functionalities. The obtained results proved that the number of evaluation defects of online exhibitions influences the user's accessibility, at the same time the visual impairments affect the GUI perception and the high contrast improves the GUI usability.

Keywords: cultural heritage, GUI accessibility, eyetracker, online exhibitions

1. Introduction

Cultivating tradition and preserving heritage culture are the foundation of every nation. Past generations have shaped the beliefs, traditions, lifestyle and development of many societies. Valuable elements of both tangible and intangible cultural heritage are passed down from generation to generation so as not to lose the legacy of their ancestors. Museums play a pivotal role in collecting, preserving and disseminating cultural heritage. They are a rich source of both the material and non-material history of regions and countries in the forms of description, identification as well as interpretations. Thus, museums provide cultural awareness of the past heritage, dispense contemporary culture and arrange modern technologies for innovations [1]. In the era of digitalization, it can be increasingly seen the trend of popularizing culture heritage in the way of virtual tours in webservices or applications created in virtual reality [2–7]. They enable the dissemination of culture to people who have difficulty in reaching the museum by themselves. The most important exhibits are highlighted and presented for various types of users in order to provide knowledge to a wide audience [8]. Innovating systems, like digital storytelling platforms, digital archives and libraries, and digital collections are developed in order to improve awareness and enjoyment of cultural heritage [4].

Universal design (UD) approach provides standards defining how to create solutions that are accessible for all users, no matter what disabilities they possess [9]. This concept is widely applied for creating webservices [9, 10]. These methods integrate modern technology with knowledge system for cultural heritage. UD provides seven principles: equitable use, flexibility in use, simple and intuitive use, perceptible information, tolerance for error, low physical effort and size and space for approach and use.

The main aims of the study were to investigate graphical user interfaces (GUI) taking into consideration two online exhibitions presenting Polish cultural heritage. The following research questions were defined:

1. Does the number of evaluation defects of online exhibitions influence on the user's accessibility?
2. Do the visual impairments affect on the GUI simplicity?
3. Does the contrast influence on the GUI usability?

For the purpose of the study the museum providing Polish cultural heritage was implemented following the UD principles. The main emphasis was put on page contrast, layout of the given GUI elements as well as the font size. The created online museum was compared with The Florian Ceynowa Museum of the Puck Region [11] utilizing WAVE (Web Accessibility Evaluation) and eye-tracker tools.

2. Related works

Currently, the majority of researchers focus on the possibilities of various applications of new technologies in cultural heritage objects. A particular trend can be observed based on museums. Many of them have applications and virtual interfaces that increase user interaction with exhibits. This section describes committed studies in this area.

Articles [12, 13] present a method for creating a virtual museum interface using a combination of various technologies. The authors aimed to create applications that would reflect real impressions for the user. They tried to optimize the operation of the interface to give users easy access to its usage and at the same time increase the attractiveness of museum exhibitions. A very similar aspect was examined in studies [14, 15]. The authors focused on designing uniform models that could be as close as possible to use behaviour in museums or art galleries. During the experiments, geometric algebra was used to represent the coordinates of the visual focus movement sequence analysed using deep learning methods.

An extremely important aspect was studied in articles [16–18]. Their main goal was to examine the impact of placing specific elements in different places in the interface on the user's perception of the website. For this purpose, the research groups were subjected to eye focus analysis using an eye-tracker tool. Experiments have shown that placing web objects in expected locations and designing their appearance according to user expectations facilitates orientation is beneficial for first impressions and overall user satisfaction with the site.

The aim of the research presented in publications [19–23] was to study how visitors perceive works of art. The authors tried to identify a general pattern of image interpretation. As a result of the experiments, it was shown that despite inevitable variability between subjects, there were common basic patterns of visual fixation, but due to the wide variety of results, the researchers failed to emerge a general pattern in how works of art are perceived.

The authors of the article [24] focused on developing a technology for visualizing cultural resources using virtual reality tools. Their goal was to build three systems that make museum collections available in a creative way that encourages visitors to interact with the museum. The authors tested the created system by making the project public and conducting a survey consisting of two questionnaires. They noticed that the museum's integrated virtualization system had a positive impact on visitors and significantly facilitated getting to know museum exhibits.

In publication [25], the author discusses the importance of using universal design in the process of implementing various solutions. It draws attention to the impact of universal design principles on the accessibility and usability of applications and points to the benefits resulting from their use, such as the ability to operate the application by users from different groups, including disabled people, and the ease of navigation through the interface.

Accessibility in terms of virtual museum environments was discussed in [26] relating Turkish museums websites. However, the accessibility was evaluated in terms of features that enabled different groups of people to perceive the space and artwork better such as architectural plans, information and action buttons or auditory and video support. Then the analysed museums were divided into six groups based on the results from 1 (low access) to 6 (high access) based on the obtained results. It was perceived that nowadays virtual museums have several shortcomings and some changes should be introduced to make websites more generally accessible. Some of the solutions could require providing descriptive floor plans, visual and video support or audio guides. Similarly, the accessibility of museums and their websites were assessed in [27]. The availability of virtual tours was also evaluated. The research examined the museums located in Krakow. It was mainly focused on how these cultural heritage sites were well-adapted to distinct groups such as disabled people, seniors, families with small children, pregnant women and people with dietary restrictions. Conversely, the evaluation was conducted utilizing the TAW Accessibility Checker tool which enabled checking the compatibility with WCAG 2.1. Each report grouped errors into separate groups: errors, warnings and unchecked. The examined websites showed the lowest number of errors regarding compatibility and comprehensibility. Although the greatest number of errors were displayed for perceivability and their functionality. Concerning virtual museums only 7 out of 15 analysed museums provided it. Accessibility of Portugal Museums websites was examined by applying tools based on Web Content Accessibility Guidelines in [28]. The research conducted on almost 600 websites demonstrated that although higher levels of accessibility could be noticed, there were still several issues that should be addressed. An occurrence of other errors associated with principles such as ‘perceivable’ and ‘robust’ were detected and considered fundamental.

Despite an extensive number of publications, there are no direct studies focusing on examining the usability and accessibility of websites presenting online exhibits, which would also examine the impact of factors such as gender or visual impairment of the respondents.

3. Methodology

3.1. Study objects

The main objects of the study were the online museum interfaces, which does not meet the UD rules [11] and newly created application based on the Museum of the History of the Lublin City exhibitions, which was developed in accordance with UD principles. The example views are presented in Fig. 1 and Fig. 2.

The study focused on 3 key UD rules:

- simple and intuitive operation – the design is easy to understand, regardless of the user's experience, knowledge, language skills or current concentration level;
- noticeable information – the design effectively combines the necessary information for the user, regardless of the environmental conditions or the user's sensory abilities;
- low physical effort – designed product is effective, comfortable and requires minimal user effort.

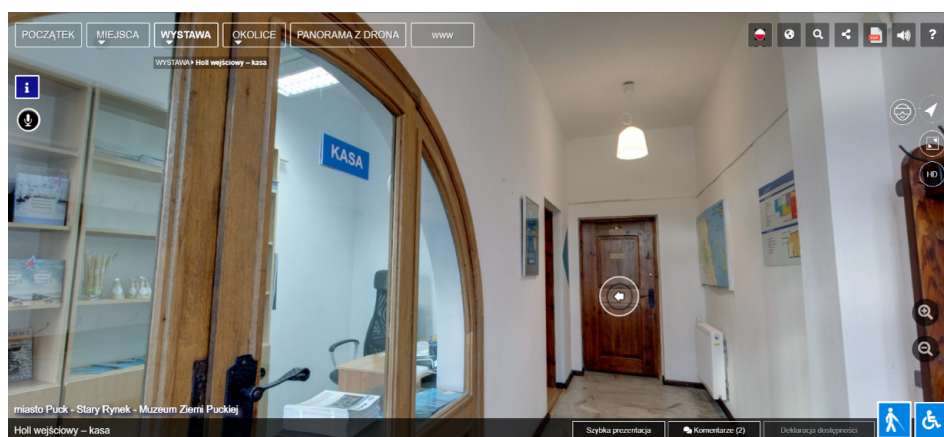


Figure 1. Interface without applied UD principles – website of the Florian Ceynowa Museum of the Puck Region

(source: <https://muzeumpuck.pl>)

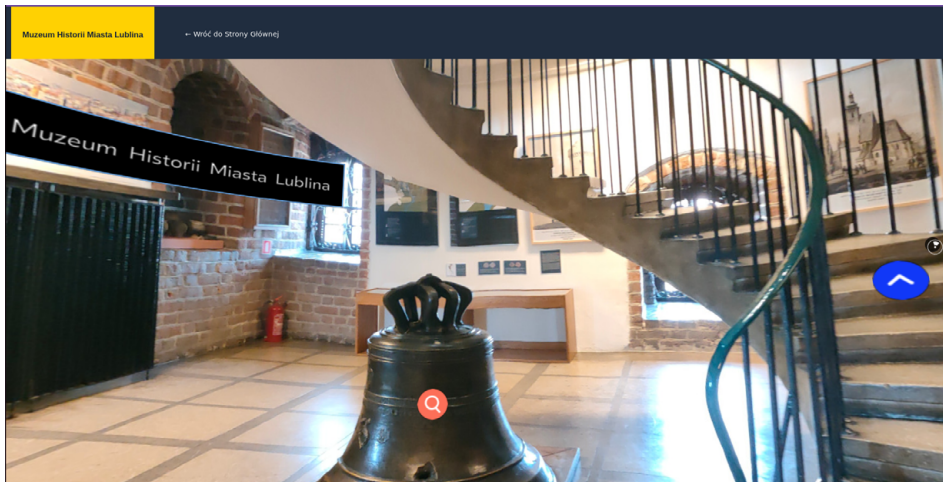


Figure 2. Interface with applied UD principles – website of the Museum of the History of the Lublin City (own source)

3.2. Participants

Thirty-four participants (20 men and 14 women) with high-level of experience in using websites took part in the study (Table 1). They were asked to complete the given tasks according to the scenarios in the eye-tracker study. They all signed the consent for the study.

Participants were divided into two separate groups, containing 22 and 12 people, respectively.

Table 1. Research groups division

	Women	Men	People without visual impairments	People with visual impairments
First research group	7	15	10	12
Second research group	7	5	3	9

3.3. Research stand

The experiment was performed in the laboratory of the Department of Computer Science at Lublin University of Technology. During the study, each participant sat on an adjustable chair, which ensured the correct positioning of the research participant. Each study was supervised.

The study stand (Fig. 3) consisted of a laptop and a stationary eye-tracking device attached to it with the specifications specified in Table 2.

Table 2. Eye-tracker specification

Parameter name	Parameter value
Accuracy of the viewing angle	0.5–1.0 degrees
Sampling rate	150 Hz
Calibration	9-point
Permissible head movement	35 cm (horizontal) x 22 cm (vertical)
Depth of head movement	±15 cm
Physical parameters (dimensions)	235 x 45 x 47 mm



Figure 3. Research stand
(photo by the authors)

3.4. Eye-tracker study

Each research group completed an individual scenario. The participants of the first group were asked to perform actions on the user interface of the created webservice to check the impact of various contrast settings. This stage was evaluated using nine views for one interface option. The second group was involved in the study on two webservices, with and without universal design principles. The study consisted of eight views of each application. The participants were asked to locate the given element of the GUI. The scenarios for the first and the second groups are presented in Table 3 and Table 4.

Table 3. Eye-tracker scenario for contrast study

Study elements	Study details
Name	Contrast study
Aim of the research	Verifying the impact of the applied contrast on user interface usability
Initial conditions	Presenting the user with successive views
Postconditions	The data collected from the eye-tracker was saved after the completion of the scenario
Study participants	22
No.	Description
1	Locate the button that takes you to the virtual museum page
2	Locate the button that presents information about the historic bell
3	Locate the information about the year the bell was made
4	Locate the button to enter the upper floor
5	Locate the button to enter the upper floor in the second view
6	Locate the button that presents the view from the window
7	Locate the information about which building is visible from the window
8	Locate the information about the main exhibit of the museum
9	Locate the button to return to the museum's homepage

Table 4. Eye-tracker scenario for universal design study

Study elements	Study details
Name	Universal design study
Aim of the research	Verifying the impact of universal design principles on user interface usability
Initial conditions	Presenting the user with successive views
Postconditions	The data collected from the eye-tracker was saved after the completion of the scenario
Study participants	12

No.	Description
1	Locate the button to switch to the virtual museum view
2	Locate the arrow to navigate through the virtual museum
3	Locate the icon that allows you to check details about the exhibits
4	Locate the pots in the museum display
5	Locate the button to enter the upper floor
6	Locate the information board on the wall
7	Locate the year the historic bell was made
8	Locate the button to exit the museum

Before each study, the eye-tracker device was calibrated. Then the user performed the command according to the instructions provided.

3.5. WCAG study

The WAVE browser-based validator was used to conduct the study [29]. A report of errors in the source code that have a real impact on perception, and consequently on the usability of the page was generated. A quick and automated examination of the service for compliance with the WCAG standard [30] was also enabled. The report generated by the tool includes information on errors, alerts, the structure of the page, contrast errors, accessibility features, as well as ARIA elements.

The first step of the study involved checking an existing website that does not comply with UD principles. The next step was to evaluate a website created in accordance with UD principles. Separate reports were generated from both stages.

4. Results

4.1. Eye-tracking study

As part of the study, participants were asked to perform tasks specified in the research scenarios. These tasks consisted of searching for information on the screen or clicking on a specified interface element. Study was divided into two parts. The first part was performing a scenario on a website where the contrast settings were set in two different ways: insufficient for quick orientation and second one with higher contrast ratio. The second part consisted

of performing scenario consisted of views from two interfaces – with UD and without UD principles.

4.2. Study I (contrast effect)

It can be observed by analysing the results presented in Fig. 4 that average task completion times on the low-contrast interface are significantly longer compared to the high-contrast views. Task number 1 showed the largest difference, with the average completion time being 3.25 times longer for the low-contrast page. Furthermore, for task 5, this difference took about 30% of the time. However, for each task analysed, it can be perceived that for the high-contrast page the completion time is noticeably low.

Additionally, the average task completion times for the low-contrast website study were presented in the Fig. 5 considering the gender of participants and the presence of visual impairments. The red dot represents the mean, while the horizontal line represents the median. Table 5 presents key statistics from this study, such as the maximum total scenario completion time, minimum total time, average time, standard deviation, and median.

Analysing the Fig. 5 and Table 5, it can be observed that women exhibited greater variability in task completion times than men. The average task completion time for women was over 2 seconds longer than for men. The standard deviation for women was about 3.6 seconds higher than for men, indicating much greater variation among women. This could also be perceived in the boxplot (Fig. 5), where the “box” area for women is significantly larger than for men. However, it should be noted that the median completion time for women is lower than for men. This means that many women could complete tasks in shorter time than men. Nevertheless, there were individual cases among women where task times significantly exceeded the average, which contributed to the higher overall average completion time.

Analysing impact of impairments on perception of the interfaces, it can be observed that the average task completion time for participants without visual impairments was significantly lower than for those with vision defect (Fig. 5, Table 5). The difference was over 3 seconds. The results also showed minimal variation in task completion times for individuals without visual impairments, suggesting that the task times were very similar for each person. Moreover, the median completion time was also lower for participants without visual impairments. Summarily the participants without visual impairments had a distinct advantage compared to those with impairments. Their

average task completion time was significantly shorter indicating that they completed tasks faster. The minimal variation in task completion times and the lower median in the group without visual impairments implied a higher consistency in task completion times within this group compared to participants with visual impairments.

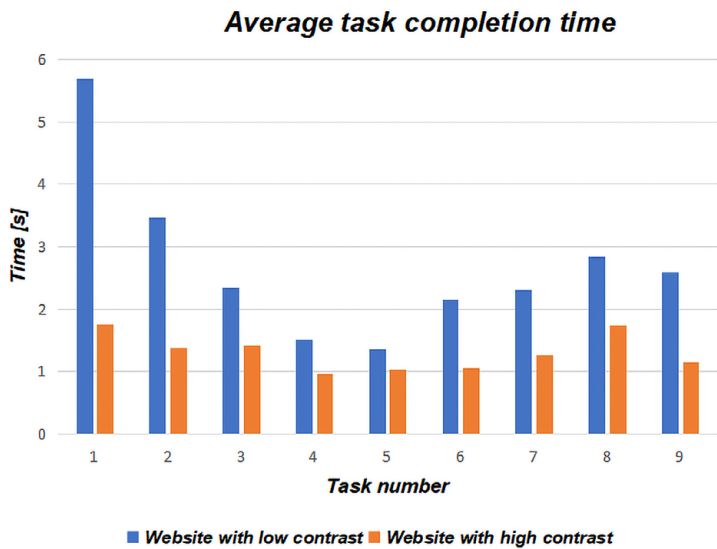


Figure 4. Average time of task completion

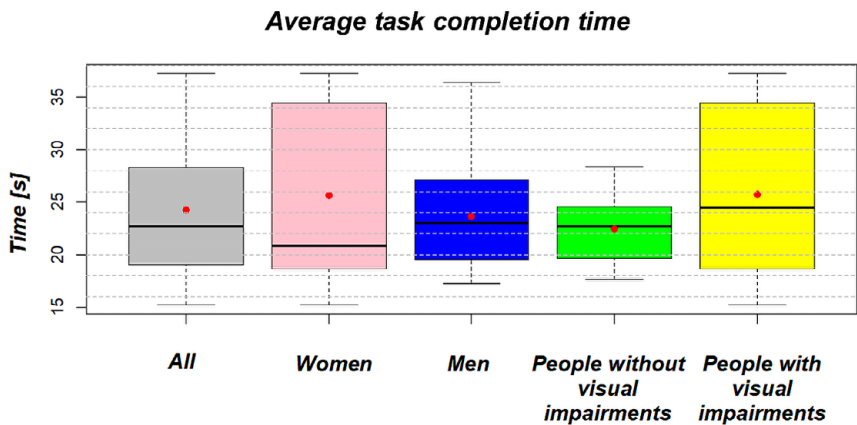


Figure 5. The average time of task completion in terms of the characteristics of the respondents in the interface with low-contrast

Table 5. Chosen statistics for the website with low contrast for examined respondents' characteristics

	Maximum total time [s]	Minimum total time[s]	Average time[s]	Standard deviation [s]	Median [s]
All subjects	37.23	15.25	24.27	6.51	22.73
Women	37.23	15.25	25.65	8.68	20.81
Men	36.39	17.23	23.62	5.07	23.05
People without visual impairments	28.36	17.67	22.47	3.3	22.73
People with visual impairments	37.23	15.25	25.76	7.99	24.52

The same scenarios were conducted on a website where contrast was increased, making interface elements more visible. Fig. 6 and Table 6 showed the results. It can be concluded that women, on average, completed the scenarios slightly slower than men, with the difference being only about 0.1 seconds. Women had more values below the average completion time relating to the median. Similar to the previous results, the average time for women was skewed by a few individuals who recorded higher completion times, which is also reflected in a slightly higher standard deviation for women. It can be observed that participants without visual impairments completed tasks faster than those with impairments (Fig. 6 and Table 6). The results for individuals without impairments were more consistent, as confirmed by a lower standard deviation in this group. Both the average task completion time and the median were lower for participants without visual impairments.

Comparing the gathered results, it could be stated there are significant differences in task completion times between the low-contrast and high-contrast website. The average total task completion time for the low-contrast website was notably longer than for the high-contrast interface. These results indicate that the low-contrast interface posed more difficulties and made it more challenging for participants to complete the scenarios.

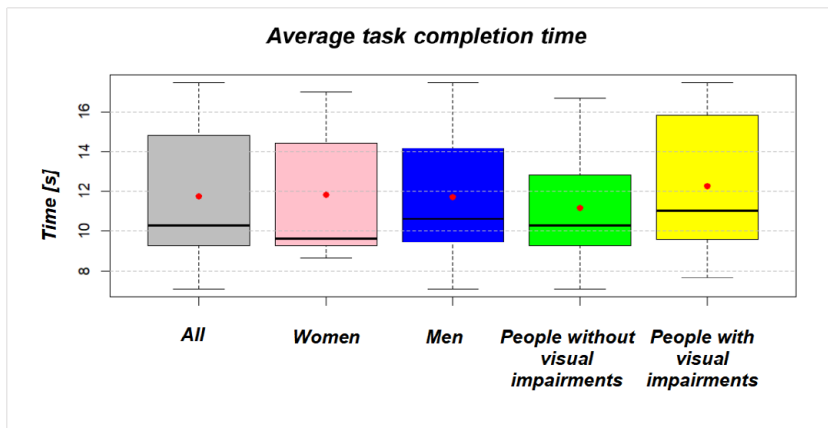


Figure 6. Average task completion time for website with low and high contrast divided by each task

Table 6. Chosen statistics for the website with high contrast for examined respondents' characteristics

	Maximum total time [s]	Minimum total time[s]	Average time [s]	Standard deviation [s]	Median [s]
All examined	17.44	7.14	11.76	3.21	10.32
Women	16.98	8.68	11.82	3.36	9.64
Men	17.44	7.14	11.73	3.14	10.64
People without visual impairments	16.67	7.14	11.17	2.91	10.32
People with visual impairments	17.44	7.68	12.26	3.36	11.03

Table 7 presents the values of time to first fixation in milliseconds for various research tasks. The table contains the results of two studies: one for a page with lower contrast and one for a page with higher contrast. The time to first fixation was measured for each participant in each task. It is easy to observe that in the case of all tasks, this time is shorter for the page with higher contrast, which clearly indicates the impact of contrast on the visibility of interface elements. Similar conclusions can be drawn from Tables 8 and 9. They show the time to first fixation for the same tasks, but divided by gender, for women and men respectively.

Based on the analysis of Tables 8 and 9, it can be concluded that women exhibited shorter times to first fixation than men did. This is observed in the results of both studies, which may suggest that women are quicker at orienting themselves in website interfaces.

Table 7. Time to first fixation for the first study

Number of the task	Website with low contrast [ms]	Website with high contrast [ms]
Task 1	1868.57	612.87
Task 2	1664.6	301.83
Task 3	528.38	452.63
Task 4	394.35	183.67
Task 5	342.47	331.9
Task 6	777.46	302.14
Task 7	896.47	362.3
Task 8	1196.84	764.33
Task 9	1246.5	316.28

Table 8. Time to first fixation concerning examined women for the first study

Number of the task	Website with low contrast [ms]	Website with high contrast [ms]
Task 1	1575.16	569.26
Task 2	1893.23	353.61
Task 3	349.98	252.12
Task 4	354	142.45
Task 5	308.11	286.25
Task 6	630.69	319.27
Task 7	1073.16	284.89
Task 8	822.91	532.82
Task 9	1112.24	350.93

Table 9. Time to first fixation concerning examined men for the first study

Number of the task	Website with low contrast [ms]	Website with high contrast [ms]
Task 1	1967.7	631.56
Task 2	1557.91	277.67
Task 3	611.63	552.89
Task 4	413.18	202.9
Task 5	358.5	353.21
Task 6	845.95	294.15
Task 7	793.4	411.55
Task 8	1340.66	880.08
Task 9	1309.16	298.95

An analysis of time to first fixation was also conducted for individuals without visual impairments and for those with visual impairments, as presented

in Tables 10 and 11. The results confirm the advantage of the higher contrast page in all aspects. However, in the case of the study involving participants without visual impairments, it can be observed that in Task 3, time needed to find the information about the year of the production of a bell was shorter for the page with lower contrast than for the page with higher contrast.

Table 10. Time to first fixation concerning people without visual impairment for the first study

Number of the task	Website with low contrast [ms]	Website with high contrast [ms]
Task 1	1210.06	634.54
Task 2	1276.37	286.97
Task 3	502.78	511.25
Task 4	377.95	196.97
Task 5	285	272.26
Task 6	734.74	342.9
Task 7	986.73	514.28
Task 8	1296.2	627.9
Task 9	1038.98	469.98

Table 11. Time to first fixation concerning people with visual impairment for the first study

Number of the task	Website with low contrast [ms]	Website with high contrast [ms]
Task 1	2529.08	591.2
Task 2	1988.12	314.22
Task 3	549.71	399.34
Task 4	408.02	172.58
Task 5	390.36	381.61
Task 6	813.06	268.17
Task 7	830.83	265.58
Task 8	1133.61	855.28
Task 9	1419.43	176.54

It is important to emphasize that this is an isolated case, and this result may have been affected by a decrease in concentration among some participants. The remaining results indicate that improving the contrast in the virtual museum website enhances the speed of using the user interface for all participant groups, regardless of gender or visual impairment.

4.3. Study II (impact of UD on interface operation)

Participants were asked to complete a scenario consisting of eight tasks in the second study. Fig. 7 presented the completion time for each task as well as the average times for each task, depending on the website. A noticeably longer task completion time is observed for each task in the scenario on the website that does not meet universal design principles. The smallest difference in task completion times was 35% for task 3, while the largest difference occurred in task 8, which involved finding the exit button from a virtual museum website. This task took users over five times longer on the website that did not meet universal design principles compared to the website that did.

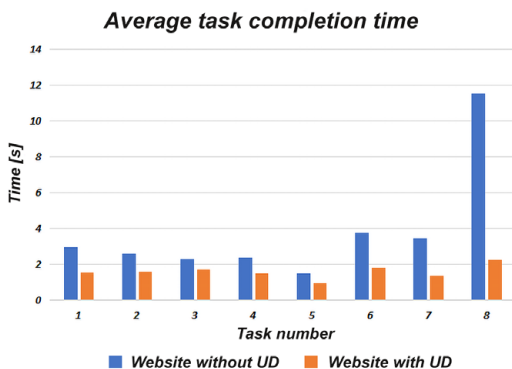


Figure 7. Average task completion time for the websites that is consistent and inconsistent of the assumptions of UD

It can be observed that for the website where universal design principles were applied, women completed the task scenario slightly slower than men (Fig. 8, Table 12). The average task completion time for women was slightly longer than for men similar to the first study. Once again, the standard deviation for women was larger, indicating greater variability in the results achieved by women compared to men.

The participants without visual impairments completed the tasks significantly faster than those with visual impairments. The average difference in completion time between these two groups was about 0.8 seconds per person. Furthermore, the standard deviation for participants without visual impairments was much lower, indicating less variability in task completion time in this group compared to participants with visual impairments. The medians of completion times were nearly identical for both groups, with a slight advantage for participants without visual impairments.

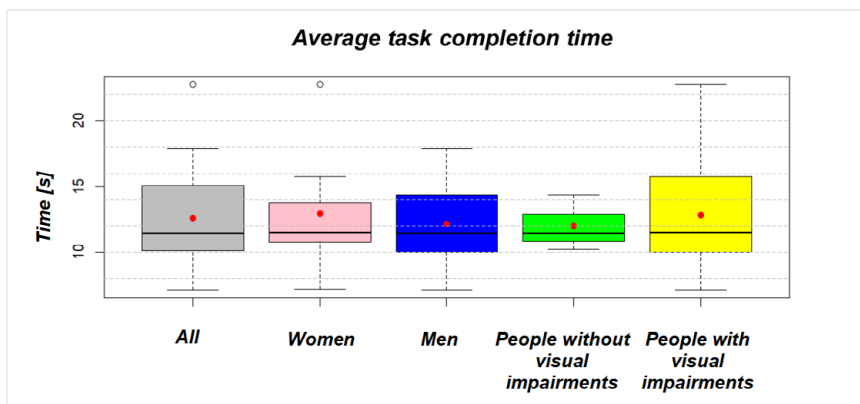


Figure 8. Task completion time for testing an interface that meets the principles of UD, divided by gender and the presence of a visual impairment

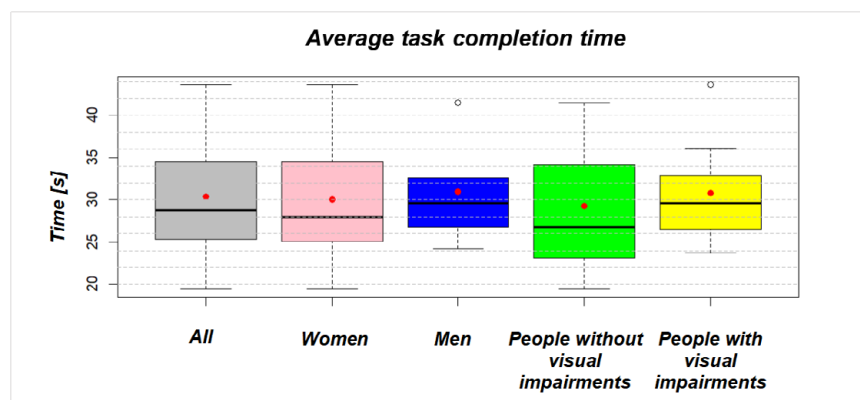


Figure 9. Task completion time for testing an interface that does not meet the principles of UD, divided by gender and the presence of a visual impairment

Table 12. Chosen statistics for the website that is consistent with the assumptions of UD for examined groups

	Maximum total time [s]	Minimum total time[s]	Average time [s]	Standard deviation [s]	Median [s]
All examined	22.77	7.14	12.63	4.29	11.46
Women	22.77	7.21	12.95	4.64	11.49
Men	17.94	7.14	12.18	3.7	11.43
People without visual impairments	14.37	10.24	12.01	1.74	11.43
People with visual impairments	22.77	7.14	12.84	4.83	11.49

Based on results gathered in Fig. 9 and Table 13, it can be noticed that men completed tasks slightly slower than women, with a difference of 0.9 seconds. However, the median showed a slight advantage in task completion time for women. The standard deviation, as in previous studies, was higher for women. This means that task completion time varied more among women than among men. Participants without visual impairments completed tasks significantly faster than those with visual impairments. Their average task completion time was lower, and the median also indicated shorter task times. These differences highlight the advantage of participants without visual impairments in terms of task efficiency.

Table 13. Chosen statistics for the website that is inconsistent with the assumptions of UD for examined groups

	Maximum total time [s]	Minimum total time[s]	Average time [s]	Standard deviation [s]	Median [s]
All examined	43.61	19.44	30.41	6.95	28.77
Women	43.61	19.44	30.03	7.54	27.98
Men	41.51	24.2	30.93	5.99	29.57
People without visual impairments	41.51	19.44	29.24	9.18	26.76
People with visual impairments	43.61	23.69	30.8	5.98	29.57

Based on the obtained results, significant differences in task completion time can be observed between the website that did not follow universal design principles and the one that did. The average total task completion time for the non-compliant with UD principles website was significantly longer than for the compliant website. These results suggest that the website that did not applied UD principles posed greater challenges and made participants completing the scenarios less efficiently.

In summary, the results of task completion times from all conducted studies allow for several significant conclusions. Participants without visual impairments clearly completed their assigned tasks faster than those with visual impairments. Regardless of the specifics of the study, participants without visual impairments achieved lower average completion times, suggesting more efficiency in task execution.

It should also be noted that the standard deviation for women was consistently higher than that for men. This indicates greater variability in task completion times among the female participants. The median completion

times were generally similar for both women and men, although there was often a slight advantage for women. This suggests that many women were able to complete tasks in shorter time than average, but individual cases of longer completion times could influence the higher overall average.

Table 14. Time to first fixation for the second study

Number of the task	Website with UD [ms]	Website without UD [ms]
Task 1	435.11	1188.07
Task 2	303.87	799.61
Task 3	785.67	588.91
Task 4	541.22	672.26
Task 5	218.85	535.29
Task 6	248.04	1466.38
Task 7	332.17	1841.66
Task 8	1063.29	5277.28

All tasks, except for the third, once again indicate a significant advantage of the website following the principles of UD (Table 14, Table 16). However, for the third task, the average time to first fixation on the website meeting the principles of universal design for women is lower than for the website that does not meet these principles (Table 15). This exception is due to men achieving the first fixation very quickly in Task 3 on the other design website. It was the shortest time to first fixation among all tasks. Conversely, women took almost the longest time to achieve the first fixation on the website that followed the UD principles, resulting in a worse outcome for the designed site.

Table 15. Time to first fixation concerning examined women for the second study

Number of the task	Website with UD [ms]	Website without UD [ms]
Task 1	469.64	1197.94
Task 2	329.21	714.45
Task 3	786.4	835.2
Task 4	615.91	792.53
Task 5	230.93	612.52
Task 6	285.53	1826.8
Task 7	304.86	2055.04
Task 8	837.19	4493.06

Table 16. Time to first fixation concerning examined men for the second study

Number of the task	Website with UD [ms]	Website without UD [ms]
Task 1	400.59	1174.9
Task 2	268.39	918.82
Task 3	784.65	244.1
Task 4	436.65	503.89
Task 5	201.93	442.6
Task 6	195.57	961.8
Task 7	370.42	1585.61
Task 8	1379.82	6061.5

As in the first study, the times to first fixation were also compared for individuals with and without visual impairments. The same situation is observed with the entire group, both individuals with and without visual impairments performed worse on the website that followed the Universal Design principles only in Task 3. All other results confirm the superiority of the website that follows these design principles (Table 17, Table 18).

Table 17. Time to first fixation concerning people without visual impairment for the second study

Number of the task	Website with UD [ms]	Website without UD [ms]
Task 1	584.04	960.58
Task 2	212.88	660.41
Task 3	657.5	321.82
Task 4	447.64	506.83
Task 5	226.84	485.67
Task 6	223.76	1117.94
Task 7	563.35	1688.28
Task 8	1573.55	4878.75

However, there is a noticeable significant difference between the average time for people with visual impairment on the website with UD and the other website. This difference is even fourfold in a favour of the website that follows universal design principles. Such results clearly confirm the superiority of the website created in accordance with the principles of universal design, especially in the terms of people with visual impairments.

Table 18. Time to first fixation concerning people with visual impairment for the second study

Number of the task	Website with UD [ms]	Website without UD [ms]
Task 1	371.29	1279.06
Task 2	334.2	846.01
Task 3	828.39	677.94
Task 4	572.41	727.41
Task 5	216.18	553.89
Task 6	256.14	1582.53
Task 7	255.12	1899.18
Task 8	893.2	5448.08

4.4. WAVE results

Both tested websites were evaluated using the WAVE validator. Fig. 10 presented obtained results for a website that followed the UD principles (a) and for the website that was inconsistent with it (b). Table 19 presented the detailed evaluation from the WAVE validator for each examined website. On the website adhering to universal design principles, no errors were found, including issues with contrast and only 2 alerts. On the other hand, the non-compliant website revealed as many as 44 errors. These errors involved various elements, such as missing alternative text, which is crucial for visually impaired users, missing form labels, which are helpful for users with disabilities, incorrect language usage, or empty headings, which can complicate navigation and comprehension for users utilizing screen readers.

Additionally, 252 alerts were identified on the website that do not follow Universal Design principles. These alerts were related to different aspects, such as a missing fieldset in a form, which may complicate or prevent proper form completion, unlabeled form controls with titles, missing page regions (header, footer, etc.), and missing heading levels, which can affect content organization and navigation for assistive technology users. This site also contained numerous redundant links, instances of very small text, unjustified text, and unnecessary title text. These factors can create difficulties for users with disabilities who rely on assistive tools. Furthermore, three occurrences of video or audio content in HTML5 format were detected, which may require additional alternative descriptions for users with disabilities.

Apart from the absence of any errors or alerts, the UD website stood out for offering more alternative text and properly labelled page regions. These elements further enhance accessibility and content comprehension for individuals with various disabilities.

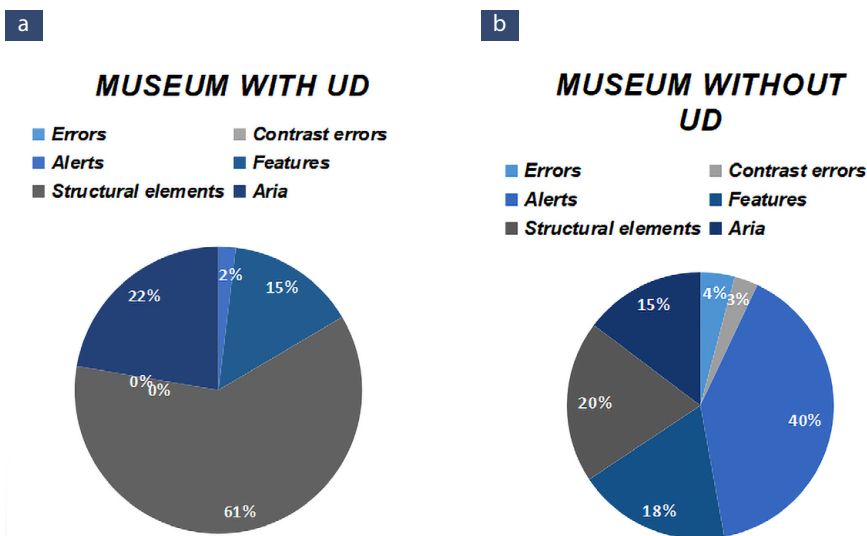


Figure 10. Number of events for for each website: a) consistent with the assumptions of UD
b) inconsistent with the assumptions of UD

Table 19. Report from the WAVE tool for both assessed websites

	Museum with UD	Museum without UD
Errors	0	26
Contrast errors	0	18
Alerts	2	251
Features	15	116
Structural elements	63	123
Air	23	92
Irregularities	2	295
Guidelines	101	331
Ratio of guidelines to irregularities	0.0198	0.8912
Contribution of abnormalities in all elements	1.94%	47.12%

5. Conclusions

The conducted study facilitated examining the accessibility and perception of online exhibition interfaces by using the eye-tracker and WAVE evaluation tool. It emphasized significant differences regarding gender and the presence of visual impairments in the context of task completion time.

In response to the first research question, the interfaces were verified using the WAVE tool, and then both, with high and low contrast, were evaluated by the eye-tracker. It was presented that the page with a higher number of evaluation defects causes longer task completion time, which directly indicates accessibility problems of the online exhibition page.

Referring to the second research question participants without visual impairments achieved better results than those with visual impairments proving that the presence of visual impairments affects the perception of the GUI. Both of the studies, the first one based on contrast and the second one evaluating the impact of UD rules on interface accessibility, showed significant differences in the perception of people with visual impairments, which were mainly characterized by a longer time to execute commands and a longer time needed for the first fixation.

The third research question concerned the impact of the used contrast on the GUI usability. All participants completed the research scenarios about twice as fast on the high-contrast webpage compared to the low-contrast webpage. When analysing the times to the first fixation, it was observed that the average time was several times longer on the low-contrast page compared to the high-contrast version. The average task execution time was also significantly better in the case of the higher-contrast interface. It could be concluded that the increased contrast on the page simplifies its usability.

Additionally, the study provided indications about the perception of online exhibition interfaces depending on the gender of the respondents. Women showed greater variability in completion times compared to men.

The page compliant with the Universal Design principles showed no errors or alerts in the WAVE validator, while the non-compliant page revealed a much higher number of errors and alerts. The obtained results indicate significant differences in the quality and accessibility of webpages that applied UD principles compared to those that do not meet these requirements.

In conclusion, the study results indicate that factors such as gender and the presence of visual impairments significantly impact task completion times. Webpages' compliance with UD principles plays a crucial role in quality, accessibility, and usability.

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