

DIVE INTO HERITAGE: A DIGITAL DOCUMENTATION PLATFORM OF WORLD HERITAGE PROPERTIES IN THE ARAB STATES REGION

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ABSTRACT:

The world celebrated the 50 years of the World Heritage Convention. With more than 1000 cultural and natural sites, the 1972 World Heritage Convention is the most widely recognized. It has provided a framework for identifying, documenting, protecting, and managing the world's cultural and natural heritage with Outstanding Universal Value (OUV). The theme to mark this anniversary is: "The Next 50: World Heritage as a Source of Resilience, Humanity and Innovation". These are the topics that have inspired the World Heritage Centre to develop, together with the Member States in the Arab Region, an online platform that leverages digital technologies to safeguard and promote the UNESCO World Heritage sites and its related intangible heritage, and transmit them to future generations. This paper discusses the current state of digital documentation of cultural heritage and the related projects/initiatives in the Arab States region. It presents the UNESCO Dive into Heritage initiative and its first outcomes. It concludes with lessons learned and future steps for the next phases of the project. First outcomes have revealed the big challenge of 3D data integration and the need to accompany the implementation stages of the project with capacity building.

1. INTRODUCTION

More than 1000 cultural and natural World Heritage sites in 167 countries have been protected and promoted during the last 50 years under the 1972 World Heritage Convention. The theme to mark this anniversary is: "The Next 50: World Heritage as a Source of Resilience, Humanity and Innovation". These are the topics that have inspired the World Heritage Centre to develop an online platform that leverages digital technologies to safeguard and promote the United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage sites and its related intangible heritage and transmit them to future generations.

The adoption of information technologies and digital recording tools in documenting sites for risk preparedness, digital storytelling, World Heritage nominations, developing conservation and other important heritage activities are increasingly used by many heritage organizations worldwide. Digital tools have proven to be instrumental in the documentation, conservation, management, and research of World Heritage. However, their impact extends far beyond these areas. Digital technology provides advanced ways to interpret and present World Heritage sites, educate and engage a diverse range of audiences, and promote recognition and utilization of the various capacities cultural and natural heritage. As digital tools continue to become ubiquitous in modern society, there is a growing need for more sophisticated and creative planning to introduce, educate, protect and promote World Heritage.

The 1972 World Heritage Convention, the most widely recognized UNESCO convention, has provided a framework for

identifying, documenting, protecting, and managing the world's cultural and natural heritage with Outstanding Universal Value (OUV). UNESCO has also prioritized intangible heritage over the past few decades, with the 2003 Convention providing a global foundation for the recognition and protection of this category of heritage.

Despite significant academic and technical efforts and international discussions, there remains a gap between the identification, introduction, and protection of cultural and natural heritage on the one hand and tangible and intangible aspects of heritage on the other. Information and Communication Technology (ICT), which cultural heritage specialists have long used for protection and management, have the potential to bridge this gap by facilitating communication between different elements of World Heritage, including cultural and natural heritage and their intangible features.

The use of digital storytelling tools and communication strategies can help establish a more intimate connection with audiences of different ages, genders, cultural backgrounds, and languages. By leveraging digital technology, it is possible to create a more engaging and interactive experience for audiences, providing them with greater familiarity with local, national, and transnational heritage in different parts of the world.

Therefore, the Dive into Heritage project was recently launched by UNESCO thanks to the generous support and collaboration of the Ministry of Culture of the Kingdom of Saudi Arabia. The main objective of this ambitious project is to make the world's cultural and natural, and its associated intangible heritage, discoverable, accessible, explorable, usable and enjoyable for

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various groups of users through digital technologies. During the Pilot Phase (2022-2024), the project focuses on the Arab States region, with the aim to extend the platform to additional regions in future project phases.

There are 19 States Parties signatory of the 1972 World Heritage Convention and 18 of the 2003 Intangible Convention in the Arab States region. The earlier counts with 90 World Heritage properties and the latter with 56 elements from which 43 are national and 13 are multinational. 12 Elements of the 2003 Convention are potentially directly linked to a listed World Heritage property in the region.

This paper discusses the current state of digital documentation of cultural heritage and the related projects/initiatives in the Arab States region. It presents the Dive into Heritage initiative and its first outcomes. It concludes with lessons learned and future steps for the next phases of the project.

1.1 Documenting Cultural Heritage

Documenting is the first step towards understanding cultural heritage. It is the base for decision making and the protection of cultural heritage. Appropriate decisions in heritage conservation are based on timely, relevant, standard and accurate information about the conditions, materials and evolution of heritage buildings, sites, and landscapes (Clark, 2007). Therefore, documenting, recording and analysis of heritage places is an essential part of their conservation, management and monitoring.

Aside from the World Heritage Convention (UNESCO, 1972a), there are other conventions and internationally recognized charters for cultural heritage and documentation standards that aim to guide stakeholders and site managers to improve its documentation and interpretation (UNESCO, 1972b). Nowadays, platforms for heritage inventories are popular, together with Geographic Information System (GIS) platforms. One example is the Getty Conservation Institute (GCI) and the World Monuments Fund Arches Heritage Inventory and Management System, a generic open-source platform launched in 2013. A great advantage of this system is its functionality as open source, and no license fee is required. However, its main aim is to support inventories, although new implementations are appearing related to storytelling such as the 12 Sunsets from the Getty Research Institute (2022). GIS platforms for storytelling are also an opportunity to digitally link spatial data with stories. ESRI, for example, has a storytelling solution with an immersive content to take the readers on a visual story map (ESRI, 2023). In order to be compatible all these systems need to follow international standards such as open data standards published by the Open Geospatial Consortium (OGC) making it compatible with desktop GIS applications (Carlisle *et al.*, 2014) or the ICOM CIDOC International Core Data Standard for Archaeological and Architectural Heritage, and the semantic framework based on the CIDOC-CRM (ISO 2006).

Heritage documentation standards are needed to improve, harmonise, clarify and integrate the information in use in the key areas of conservation practice, technical standards and information management (Getty, 2007). Already in the 90s, the ICOMOS Sofia Principles also highlight the need of standards: "The format of the records should be standardised, and records should be indexed wherever possible to facilitate the exchange and retrieval of information at a local, national or international level" (ICOMOS, 1996).

Increasing understanding of heritage documentation and establishing standards for the UNESCO project Dive into Heritage, enables strengthening the protection of cultural heritage, improves the workflow and facilitates the exchange of data. This will ultimately benefit the experts in cultural heritage of the Arab States Region as well as the wider group of stakeholders involved and engaged in the conservation of the cultural heritage. Digital Technologies for Development also highlights the relevance to digital technologies and their impact on the Sustainable Development Goals (SDG) for the Arab region (ESCWA, 2019). The United Nations (2015) recognizes with their SDG that the world should "Strengthen efforts to protect and safeguard the world's cultural and natural heritage" (Goal 11.4) to "make cities and human settlements inclusive, safe, resilient and sustainable" (Goal 11). For this reason, identification and documentation of cultural heritage is a key component in the development of mankind (UNESCO, 2022).

1.2 Dive into Heritage Initiative

With Dive into Heritage, UNESCO aims to create an innovative online platform that leverages digital technologies to safeguard and promote World Heritage sites and its related intangible heritage and transmit it to future generations. The project will contribute to the implementation of UNESCO's Output 5.CL1. Member States' capacities strengthened to identify, protect and manage tangible heritage; and Output 5. CLT.4 "Member States capacities strengthened to identify, protect and manage tangible heritage"; and Output 5.CL4 "Member States and communities capacities strengthened to identify, safeguard and promote living heritage", as well as to the following UN SDGs and targets, i.e. SDG 4 Target 4.7; SDG 11 Target 11.4; and SDG 17 Target 17.9. The report Arab Horizon 2030. Digital Technologies for Development also highlights the relevance to digital technologies and their impact on development goals for the Arab region (ESCWA, 2019). This unprecedented initiative will make available different types of digital data on an accessible web platform, including 3D models, interactive maps, geolocated narratives, Virtual Reality (VR), Augmented Reality (AR) and Mixed Reality (MR).

The platform will serve as both an educational tool for the public and a resource for experts, academics, and governments in their research and preservation efforts. Through this, it will:

- ensure digital preservation of heritage sites in case of damage or destruction
- highlight living cultural expressions and practices to safeguard and ensure their transmission to future generations
- promote effective management and safeguarding practices through research and international cooperation
- raise awareness among the general public about the importance of heritage preservation
- create a new visitor experience for people worldwide to increase the appeal of heritage sites.

During its Pilot Phase (2022-2024), the project focuses on the general public as the main target audience, offering a user-friendly and interactive User Interface (UI) to guide users through digital narratives to increase public engagement, enhance heritage appreciation and strengthen understanding of World Heritage and its OUV.

The main objective of the pilot phase of the project is to develop a prototype of the platform that will enable users to virtually explore a curated selection of 10 World Heritage sites in the Arab States region. The selected pilot sites have been carefully chosen based on their representativeness within the region and the

availability of digital data that can be utilised to enhance the experience of the users.

In addition, field missions are organised to digitally document missing World Heritage site data and capacity building activities focusing on increasing regional capacities in recording and the use of digital cultural heritage, targeting youth.

To optimise the user-experience on the platform and facilitate the creation, retrieval and exchange of this digital data, the project developed tailor-made standards and guidelines for the platform, the data collected, and the onsite data recorded. These standards will depend on the requirements of the rightsholders, and stakeholders, quality and accuracy required for users, the complexity of the platform, types of digital media and assets, and the typology of the World Heritage property.

While the project currently targets a wide audience, it will eventually also offer digital analytical, research and management tools to heritage professionals, researchers, and governments.

2. METHODS

This research involves two phases and a capacity building programme:

1) Reflection Phase

- Desk review with an extensive internet search, webinars, online videos and literature review of scientific publications
- Distribution online of a survey to the States Parties in the Arab States region
- Discussion and feedback from UNESCO
- Attendance of relevant conferences, webinars and participation in the UNESCO Dive into Heritage meetings and workshops

2) Implementation Phase

- Workshops and Technical Meetings (online) with international experts
- Digital data collection, documentation and processing
- Mock-up of the Platform based on user requirements
- Development of prototype version of the platform

3) Capacity Building

- Contact with actors in the Arab States region
- Workshop on Heritage Documentation with representatives of the States Parties

3. FIRST OUTCOMES

3.1 Reflection Phase

In 2022, a comprehensive research was carried out to map the digital documentation initiatives in the Arab States region (Santana Quintero and Vileikis, 2022c). It included a detailed list of projects on digital heritage documentation conducted after 2012, but excluding national inventories. A list of academic or small projects in digital heritage was also provided as additional references for the sites that are on the World Heritage list.

Fiches were produced for each project/initiative with additional information including timing, level of scale, geographical coverage, technologies used, activities implemented, amount of funding, target, and institutions involved. Overall, the report revealed that there are 83 digital heritage projects and initiatives

in the Arab States region covering all States Parties, from which 73 are localized national projects. The initiatives on mixed cultural and natural (3) and natural (5) World Heritage properties are limited.

The level of scale and type of digital technologies vary depending on the aim of the project, but all digital documentation scales – site, attribute, features – and techniques – such as terrestrial and aerial photogrammetry, 3D scanning, VR – are covered. The level of detail and quality of the recording will be only identified when there is access to the data. However, it is foreseen that data will be heterogeneous project by project and country based. The assessment also identified several main actors and partners who have been part of the initiatives listed. These actors are mainly governmental agencies, universities and non-profit organizations that usually work in partnership.

As shown in Figure 1, results of the regional survey conducted as part of this research revealed that more than half (54%) of the States Parties have an institution responsible for digital technologies. However, almost half of them do not count with standards on documentation (46%) (see Figure 2).

In addition, the assessment identified five main issues to be addressed for the technical implementation of the Dive into Heritage platform. The main topics included 1) Fragmentation of digital data; 2) Data Standards and Quality; 3) Digital maturity; 4) Issues of heritage information longevity and 5) Estimation of the Cost.

3. Do you have a specific department in your Institution/ Ministry responsible for digital technologies or any other national partners working on digital technologies, for/in World Heritage sites?

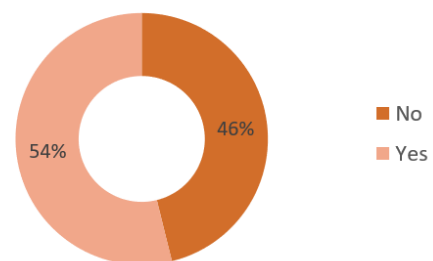


Figure 1. Q3 Survey to States Parties in the Arab States region. Source: Santana Quintero, Vileikis (2022c)

16. Does your Institution/Ministry have standards for documentation? Please tick one or more answers.

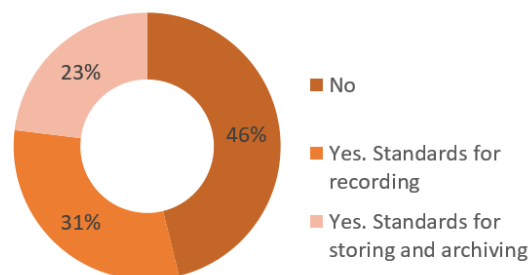


Figure 2. Q16 Survey to States Parties in the Arab States region. Source: Santana Quintero, Vileikis (2022c)

3.2 Implementation Phase

3.2.1 Workshops & Technical meetings: To discuss the type, quality, and volume of information that can be presented on the Dive into Heritage platform, as well as its technical specifications, UNESCO organized two online workshops in July and September 2022. Over 60 experts attended the workshops, including international and regional experts in digital cultural heritage, World Heritage experts and Advisory Bodies of the World Heritage Convention (ICOMOS, ICCROM, IUCN), digital documentation and data management institutions, and representatives from UNESCO and the Ministry of Culture and Heritage Commission of the Kingdom of Saudi Arabia.

During the expert workshop in July, where the results of the assessment reports were also presented, it was recommended that the primary target audience for the project's first phase should be the general public, and a collaborative approach should be taken to avoid duplication of efforts. It was suggested to start a pilot phase with a limited number of sites, between 5 to 10. The use of digital storytelling tools to bridge the gap between culture and nature and link intangible aspects to tangible heritage was advised. The workshop participants recommended setting standards for data quality and adopting an open-access strategy. The experts acknowledged the value of having diverse data standards and suggested that the criteria for selecting them should consider the specific needs of stakeholders, as well as factors such as data complexity, available human resources, time constraints, and available tools. The standards should incorporate considerations such as data integrity, high level of recording that will allow the preservation for the future, and the ease of access and interpretation of data by future users.

The platform should be user-friendly, interoperable, and the data should serve users in a meaningful way. A robust, reliable, secure, sustainable, and cost-effective hosting solution is needed, and a capacity-building programme should be included in the project.

The technical meeting in September followed-up on the recommendations of the previous workshop, centred around five thematic sessions that focused on key technical aspects of the future platform, such as User Interface (UI) and User Experience (UX) design, data standards, platform architecture and system, hosting and data space, and FAIR principles (Findability, Accessibility, Interoperability, and Reuse).

The meeting discussed the user interface and user experience (UI/UX) design of the platform, which should guide the user through multi-level interactions, including digital storytelling, hinting at complete freedom, and choosing points of interest, and engaging the user for limitless exploration. The platform architecture should be open, scalable, and easy to manage. Compatibility is a critical aspect of the platform, as it needs to be available on all devices and navigators. It was concluded that it is crucial to start the conversation with the States Parties and data stakeholders from the beginning regarding standards and vocabulary to make the platform more compatible with FAIR data principles, the CARE (Collective, Authority Control, Responsibility, and Ethics) Principles for Indigenous Data Governance, while supporting the Sustainable Development

Goals (SDGs) and following internationally recognized standards in documentation.

The overarching vision of the project is the result of collaboration among renowned experts in World Heritage, digital documentation, IT professionals, and web developers who have provided valuable insights into the approach and specifications of the Dive into Heritage platform. In addition to the perspectives mentioned above, the project vision also recognizes the importance of tailoring the information accessible on the platform to meet the diverse needs of its users. The integration of digital storytelling tools, interactive maps, geolocated narratives, Virtual Reality (VR), Augmented Reality (AR), Mixed Reality (MR), 3Ds, and panoramas aims to enhance public engagement and facilitate educational exploration. These features are designed to offer the general public a new, immersive experience of World Heritage and its intangible aspects, enabling better comprehension, interpretation, and appreciation of our shared cultural and natural heritage.

3.2.2 Guidelines and Standards: A first version of the Dive into Heritage Guidelines and Standards for Documenting Cultural Heritage was drafted and presented at the Second Technical Meeting on the development of the Dive into Heritage digital platform in 2022 and implemented during the first Workshop on Heritage Documentation in Oman (Santana Quintero and Vileikis, 2022b). The document has been conceived to guide the States Parties in the recording of cultural heritage with high international standards, while some of the data collected will be shared in the Dive into Heritage platform. In addition, the document of Data Acquisition Methodologies for Cultural Heritage was developed to support the site work and know-how (Santana Quintero and Vileikis, 2022a).

The Guidelines and Standards address seven critical issues: 1) rightsholders/stakeholders, 2) quality, 3) complexity, 4) UX & UI, 5) digital database and storage, and 6) perpetual access and are divided into seven main areas: 1) Platform Key Functionalities and Characteristics, 2) Heritage Types and Levels of Detail, 3) Types of Digital Assets and Digital Tools, 4) Data Deliverables, 5) Storytelling, 6) Shared Ownership and Preservation, and 7) Fair and Care Principles, and SDGs. The Dive into Heritage standards are a first step towards a common understanding of the different scales and types of cultural heritage in the Arab States region and its interpretation to the public through a digital environment. An updated version of the document is under development based on the feedback of the experts and its site implementation. The report also gave a set of recommendation for the next steps. This included the location of standards, adapting the context of each country.

3.2.3 Platform Mock-up and Prototype: For the development of the prototype version of the Dive into Heritage platform, UNESCO has partnered with UNOSAT (United Nations Satellite Centre) part of the United Nations Institute for Training and Research (UNITAR). UNOSAT has extensive experience in satellite imagery analysis and capacity development in geospatial information technologies, and possesses highly secure infrastructure for hosting large datasets. Through this partnership, UNESCO will benefit from UNOSAT's expertise and resources in developing a robust platform based on international standards.

A first mockup of the platform was developed based on the users' requirements. Currently, the platform is the stage of prototype

stage, accessible in English and French with the possibility to be extended to Arabic and other languages in the future. The platform will feature digital content for 10 selected pilot World Heritage sites in the Arab States region and will function as a springboard to encourage UNESCO Member States and other stakeholders to support the initiative. It aims to offer an engaging and captivating experience, inviting users to discover the unique features of World Heritage sites and their exceptional values made possible through the latest digital technologies. The user will be able to both freely explore detailed 3D models of World Heritage sites, but can also follow a curated narrative story path, which highlights the OUV of the sites through a variety of digital media such as 3D models, interactive maps, images, and audio-visual content.

Information will be available on a particular desired site or element, but also searchable and analysable on various axes across multiple elements, such as location or heritage type. The most suitable formats and types of content will be reviewed, based upon desired functionality and the types of existing data available. The platform will be developed to allow specific content to be shared easily by the public through social media and other channels.

The platform will include significant amounts of, often sensitive, data, and therefore must be safely hosted somewhere with sufficient bandwidth and storage space. Working with another UN agency will ensure that voluminous digital data such as 3D models and satellite imagery, collected in the framework of the Dive into Heritage project, is stored and processed securely.

The project has established a specialised Expert Working Groups to advise UNESCO and its partners on the scientific and technical development of the Dive into Heritage platform. The working groups are composed of experts from different fields, including cultural heritage, digital documentation, storytelling, and IT development. Expert Working Group meetings are organised periodically to guide the development of the prototype across a range of themes such as UI and UX Design, System Architecture, Hosting and Data Space and Copyright and Data Ownership. The first prototype of the platform is scheduled to be launched by the end of 2023.

3.3 Capacity Building and Data Acquisition

3.3.1 First Workshop on Heritage Documentation in Oman: During the Reflection Phase of the project, the need to enhance capacities of youth and regional experts in the field of digital cultural heritage was highlighted by the different Expert Working Groups. To respond to this need, the Dive into Heritage project has committed to including an international programme to build regional capacities in heritage documentation, digital workflows and data processing.

In this regard, UNESCO collaborated with the UNESCO Chair for World Heritage Management and Sustainable Tourism at the German University of Technology (GUTech) in Muscat, Oman, the Arab Regional Centre for World Heritage (ARC-WH), and the Ministry of Heritage in Oman to organise the First Workshop on Digital Documentation for World Heritage in Oman (11-17 March 2023). As the first in a series of capacity building workshop planned in the framework of the Dive into Heritage project, it also served as an opportunity to strengthen ties with site managers and other regional stakeholders in support of the project, regarding digital World Heritage site data sharing.



Figure 3. Workshop on Heritage Documentation at Bahla Fort, Oman. Understanding the site (upper), photogrammetry (middle) and 3D scanner (bottom) (2023).

The workshop invited site managers, emerging heritage professionals and students to learn more about digital tools to document and 3D model World Heritage sites in the Arab States region. Participants learned the basics in surveying and data acquisition as well as data processing methods for 3D models of cultural heritage sites.



Figure 4. Processing session at GUTech using Agisoft Metashape (2023).

As shown in Figure 3, the training included theoretical lectures on 3D surveying, photogrammetry, laser scanning together with practical work in the field at the UNESCO World Heritage property of Bahla Fort (Nizwa, Oman). To support the processing, partnerships also included Agisoft, who gave free licences of Metashape for the capacity building workshops (see Figure 4).



Figure 5. Participants and trainers' group at Bahla Fort. 360 degrees photo (2023).

3.3.2 Data Acquisition of Bahla Fort: The first capacity building workshop has also been an excellent opportunity to digitally document a UNESCO World Heritage site in the region, using the preliminary Guidelines, Criteria and Standards for Dive into Heritage, with the aim of later including this data on the platform.

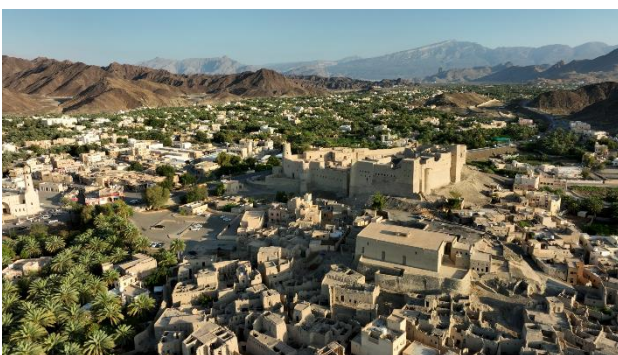


Figure 6. Drone photo of Bahla Fort World Heritage property, Oman during documentation mission (2023).

The project team focused on 3D laser scanning and aerial and terrestrial photogrammetry to digitally document the Bahla Fort, focusing on those attributes that convey the OUV of the UNESCO site. The methodology of the project consists of documenting the World Heritage site in the highest detail possible given the available time and resources, and to optimise the data during the processing phase so that it can be used in a web environment without sacrificing quality and internet access speed.

The Bahla Fort was recorded as an example of the implementation of the Dive into Heritage standards. Bahla is a World Heritage property listed since 1987, a remarkable example of this type of fortification. The OUV highlights the importance of its context and strategic location as illustrated in Figure 6. The data was processed using Agisoft Metashape for the aerial photogrammetry and FARO SCENE for the 3D scans acquired. Results of both techniques are shown in Figure 7. Aside from the Fort, the 3D scanner also captured the farms and vernacular architecture in the oasis that reflect the OUV of the World Heritage property. As shown in Figure 8, due to time limitations, interior detailed data, with high resolution, was recorded with the 3D scanner only in selected buildings.

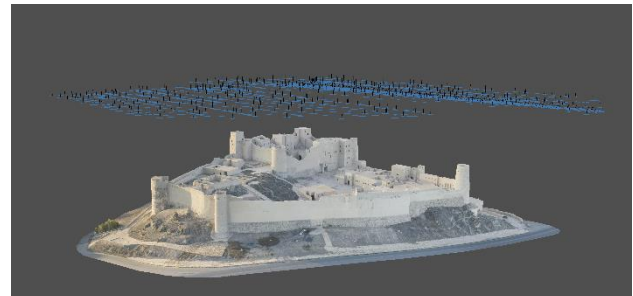


Figure 7. Processed data of Bahla Fort: 3D model from drone photogrammetry showing cameras (upper), orthophoto from drone photogrammetry (middle) and point cloud from 3D scanning (bottom) (2023).



Figure 8. Point cloud of building interior taken with 3D scanner (2023).

4. LESSONS LEARNED

The Dive into Heritage project is ongoing, but the team and the project has already identified a number of lessons learned:

One of the main challenges during the first year of the project has been collecting digital World Heritage site data, such as GIS and 360° panoramic images, and in particular 3D models. The explosion of data gathering has produced a highly fragmented amount of heritage information available on the web and elsewhere. Information is usually disconnected between users and providers; digital assets of the Arab Region are mostly spread over institutions inside and outside the Member States.

UNESCO has reached out to UNESCO Member States in the region and other data owners and stakeholders involved in the recording of the 10 Pilot World Heritage sites. Due to the various stakeholders involved, ownership and usage rights, multiple technologies applied, and different objectives set, the data has been shared in a variety of file formats, sizes and levels of quality. While reviewing the existing data, it became apparent that not all digital World Heritage data can be used for inclusion on the online platform, and that a sound optimisation workflow was necessary.

Continuous development of the Standards, Guidelines and Criteria for the Dive into Heritage platform and data acquisition protocols will ensure that the digital data is collected, processed and shared in a standardised way improve digital workflows and to guarantee a consistent level of quality on the online platform. After data acquisition during the first workshop on heritage documentation there is still the challenge of data integration recorded by the different techniques.

5. CONCLUSION

The paper presented and discussed the Dive into Heritage UNESCO initiative in the Arab States region. The initiative answers to the 50th UNESCO World Heritage anniversary theme: "The Next 50: World Heritage as a Source of Resilience, Humanity and Innovation". The project is still ongoing, but it has already reflected the high need and interest of the States Parties to use advance digital technologies for the presentation, interpretation and management of their World Heritage sites.

The project has included a large range of stakeholders and experts in the field of heritage documentation, international agencies and the private sector to build a strong network and create a platform accessible to the world. Guidelines and Standards for Dive into Heritage are under development, and a first version has been tested during the first capacity building workshop on heritage

documentation in Oman in March 2023. The workshop gathered national and international participants and local students, and trained, and carried out field work and data processing. The project is currently collecting data from the States Parties to showcase their World Heritage sites to the public using the platform. 3D data integration of each World Heritage site still remains a big challenge for the project.

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