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MaDiH (مديح): A Transnational Approach to Building Digital Cultural Heritage Capacity

MaDiH (مديح): A Transnational Approach

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Approaches used to design, build, and maintain digital cultural heritage communities and infrastructure in Europe, North America, and Australasia need to be tailored to regional contexts such as Middle East and North Africa (MENA). Cultural and political differences, inherited issues with technical infrastructure and funding, and the need to build trusting and healthy working relationships across national boundaries makes this challenging. The framework and roadmap used during the MaDiH (مديح): Mapping Digital Cultural Heritage in Jordan project (2019 - 2021) provides one of several possible models for such work, as well as highlighting its myriad challenges and opportunities.

CCS CONCEPTS • Digital libraries and archives • Information lifecycle management • Information integration

Additional Keywords and Phrases: Digital Cultural Heritage, Digital Archaeology, Jordan, Cultural Heritage Management.

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1 INTRODUCTION

The Middle East and North Africa (MENA) region is well-known for its rich tangible and intangible cultural heritage.¹ Because of that heritage, it has been one of the most heavily researched areas globally. Archaeologists and other researchers have entered the region to conduct research, funded by foreign governments and organisations and, especially more recently, local governments. They have produced large volumes of data in the form of, inter alia, site reports, journal articles, monographs, photographs, and datasets describing myriad products of material and cultural history. This vast - initially all analogue but increasingly digital - cultural heritage (DCH) has enormous cultural, research, and economic value but significant effort is needed to realise its potential and correct a profound “lack of knowledge infrastructure” (Wrisley, 2019) across the region (Cantini, 2019). This is a significant challenge, even accepting the known difficulties of developing large-scale digital infrastructures (Warwick et al., 2008). Activities need to be aligned to existing government policies and initiatives, digital infrastructure needs to be assessed and where necessary augmented. The maintainers of datasets in MENA and overseas need to understand research data management (RDM) best practices and the value of open access. Principles of data sovereignty that ensure appropriate local stakeholders are aware of, have access to, and can control the management and use of their data are central to such work (Taylor and Kukutai, 2016; Walter et al., 2020).

Techniques used to design and build DCH capacity in Europe and North America, while useful, need to be tailored to regional contexts such as MENA. This can be a challenging process because of cultural and political differences, and the need to build trust and healthy working relationships before attending to technical issues. The framework and roadmap used during the MaDiH (مدیح): Mapping Digital Cultural Heritage in Jordan project (2019 - 2021) provides one of several possible models for such work. Jordan presents a valuable case study in the development of DCH capability in the region because of its rich archaeological and cultural heritage, proactive national digital strategy, and prioritisation of open access and open data principles. The country has good 4G coverage in the main centres, a fast-developing technology sector, and strong government support for open data (Ministry of Planning and International Cooperation, 2018). The Jordan Open Source Association (JOSA), a MaDiH (مدیح) project partner, symbolises the proactive stance being taken. The university sector has an established software engineering tradition capable of supporting these wider initiatives. With over 15,000 registered archaeological sites, including world-famous tourist attractions like Petra, Jerash, and Madaba, plus many more yet undocumented ones, Jordan has long been a key destination for archaeological researchers

¹ It is worth noting that UNESCO's definition of 'heritage' includes natural as well as tangible and intangible cultural heritage, but the former was beyond the scope of (this phase of) the MaDiH (مدیح) project, which focused on cultural heritage. An overview of definitions can be found in J. Jokilehto, Definition of cultural heritage: References to documents in history (ICCROM Working Group 'Heritage and Society' report, 2005). See also the 1972 UNESCO Convention Concerning the Protection of Cultural and Natural Heritage and the 2003 UNESCO Convention for the Safeguarding of the Intangible Heritage.

(Steinberg, 1996). In many (and probably most) cases the data generated from that research has been taken offshore to repositories in Europe and North America, however, leaving the country's DCH assets scattered around the world with no central digital record. The Department of Antiquities in Jordan requires reports from all foreign and domestic projects on their work, but these are mostly analogue and only include tangible heritage dating to before 1750 AD, with post-1750 AD and intangible heritage falling under different government departments (see below).

The country's DCH information architecture therefore needs significant additional investment: an understandable situation driven by lack of funding, the assumptions of international research teams, and the requirements of funders. The situation is mirrored in many countries across the MENA region. Digital cultural heritage content has traditionally been generated for the benefit of international research teams rather than the development of Jordanian national digital infrastructure. No thought was given to how it might be made readily available to local audiences. It is eminently possible to support the goals of international researchers and local communities at the same time (using data aggregation and federation, for example), but groundwork is needed to make it possible. The economic importance of cultural heritage tourism to (and within) Jordan provides compelling financial reasons to invest in such activity: in an increasingly digital era content from images to VR assets and geo-location coordinates could be leveraged for the development of products and services for the tourism and education sectors as well as research.

It is important to note that Jordanian law divides cultural heritage into tangible and intangible heritage and divides tangible cultural heritage again into the period before 1750 CE ("athar", meaning "archaeology" or "antiquities") and after 1750 CE ("turath", often translated as "heritage"). The resulting three categories are governed by separate government departments and are controlled by different legislation (Al Rabady et al., 2014; the Department of Antiquities in Jordan, 2004; Hayajneh, 2019; see Smithies et al. 2021a) and the distinction has cascading effects on public perception, education, heritage protection, and of course technology and infrastructure. It is an excellent example of local cultural and legal distinctions requiring similarly localised technology responses. In the case of MaDiH (مدىح) this resulted in adaptations to metadata standards to ensure the athar / turath distinction was adequately represented, and analysis could distinguish between them.



Figure 1. Detail of a mosaic in the Chapel of the Priest John (Mount Nebo), Khirbat al-Mukhayyat, Jordan. Christian Sahner/Manar al-Athar, <http://www.manar-al-athar.ox.ac.uk>, see Jordan/Khirbat al-Mukhayyat – Chapel of the Priest John (McKenzie et al. 2013). Manar al-Athar is a photo archive publishing high-resolution photos of archaeology in the Middle East for teaching, research, and educational and academic publications under a CC BY-NC-SA 2.0 license. MaDiH CKAN entry at <https://madih.hu.edu.jo/dataset/manar-al-athar>.

The international context remains important, of course. There is no compelling reason to duplicate platforms and services that exist overseas merely in the interests of Jordanian data sovereignty, which lies in having agency and control over relevant cultural content and clear understanding of copyright and Intellectual Property ownership rather than necessarily having responsibility for maintenance of multiple expensive systems. Projects such as Europeana (Europeana Foundation, 2021) demonstrate the value of transnational content aggregation, and Ariadne Plus (ARIADNE, 2021) is a good example of global infrastructure well suited to Jordanian DCH content. Other European infrastructure projects such as the European Research Infrastructure for Heritage Science (E-RIHS) and the European Open Science Cloud (EOSC) are also relevant, as is the United Kingdom's 'Opportunities to Grow Our Capability' report (2019) which signals many of the same aspirations as MaDiH (مديح). The Endangered Archaeology in the Middle East and North Africa (EAMENA) project, a MaDiH (مديح) project partner, demonstrates how regional DCH projects can benefit local/in-region partners with (potentially, depending on customization requirements) minimal technical investment because of their open-source and web-based management interfaces (eamena.org; Bewley & Bradbury 2017, Harkel et al 2022/in press). The MarEA (Maritime Endangered Archaeology) project also uses the EAMENA database to record their data (<https://marea.soton.ac.uk/>; Andreou et al 2020). MAEASAM (Mapping Africa's Endangered Archaeological Sites and Monuments) and MAHSA (Mapping Archaeological Heritage in South Asia) have similar goals and scholarly values (maeasam.org; <https://www.mahsa.arch.cam.ac.uk>) and use the same Arches open-source software platform for cultural heritage data management (archesproject.org). This use of common tools extends to technical standards such as the CIDOC Conceptual Reference Model (ICOM CIDOC, 2021) and the FISH vocabulary, which inform a wide range of archaeological projects (FISH, 2021; see below).

It is important to be mindful of the difficulties attendant upon large-scale infrastructure projects (Dombrowski, 2014). The MaDiH (مديح) project was conceived as the first of a three-stage process to map, build, and deliver enhanced DCH capability to Jordan, but immediate aspirations were modest. As a pilot project it was assumed work needed to proceed within a large conceptual context that might result in it being scaled (or more likely, merely informing) the development of a national open data repository such as <https://www.data.gov/> or <https://data.gov.uk/>. As it happens, the work might instead form the basis of a future national centre for digital cultural heritage, but that merely strengthens the underlying philosophy of the project: make no assumptions; proceed on the basis of community requirements; align to national and international projects and standards; document and share all stages of the process; and be prepared to change direction if local needs require it. The first, 'mapping' phase of the project sought to map more than the technical terrain, it aimed to understand the current state but also optimal next steps for the enhancement of Jordan's digital cultural heritage infrastructure and associated stakeholders. It remains to be seen whether future phases can be funded. Still, at the time of writing the approach has proven to be productive, with significant increases in understanding and government and stakeholder awareness, and the development of a long-term DCH data repository.

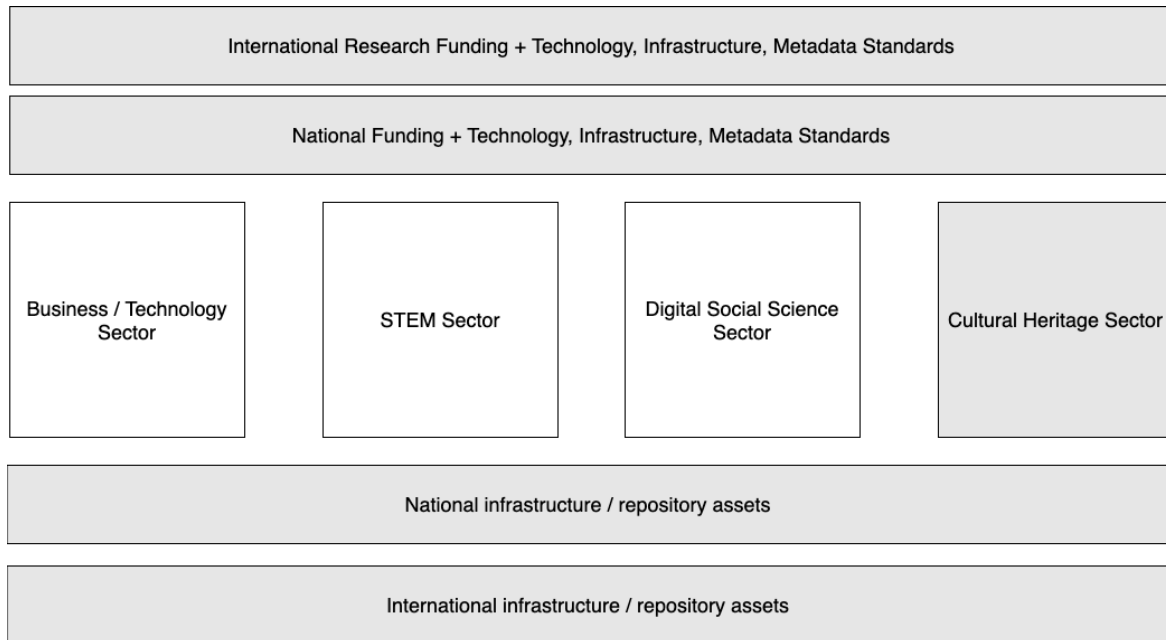


Figure 2. MaDiH (مديح) Project: Operational Context

2 METHOD

Rather than launch directly into the development of local infrastructure, therefore, MaDiH (مديح) was primarily a scoping exercise that aimed to understand the local and international data landscape (identifying cultural heritage datasets of relevance to Jordan whether local or international) as well as the current state architecture supporting DCH within Jordan, and to build a local DCH community (through workshops, training, and a hackathon) invested in a long-term vision. The project ran from February 2019 - April 2021, as a collaboration

between King's Digital Lab (KDL) at King's College London, the Hashemite University, the Council for British Research in the Levant (CBRL), the Department of Antiquities of Jordan (DoA), the Jordan Open Source Association (JOSA), and the Endangered Archaeology in the Middle East and North Africa (EAMENA) project. Funding was modest (£250,000).

The project's primary outputs were policy and technical white papers (Smithies et al., 2021a, 2021b), designed to convey project findings and recommendations to a broad group of Jordanian stakeholders across government, higher education, and the cultural heritage sector. The papers were published in Arabic and English to increase reach, in line with a broader commitment to support both languages as far as possible (including bilingual social media posts on Twitter and Facebook, and bilingual blog posts on the project website). Additional research articles and conferences papers were also produced, but the core of the project's activity related to the development of a CKAN data catalogue (and prototype repository), designed to store metadata describing the 325 datasets identified during the course of the project by a data analysis team comprising a senior consultant from the EAMENA project and research assistants in London and Amman. CKAN was chosen as a widely used and highly scalable open-source tool capable of supporting most project requirements 'out of the box'. It was initially installed at King's Digital Lab (KDL) in London and intended as a short-term tool to facilitate data analysis but proved so valuable that it was migrated to Hashemite University for long-term maintenance and to support the project's data sovereignty goals (madih.hu.edu.jo). A basic WordPress website was hosted on Reclaim Hosting for general project outreach, being converted to a static site following the end of the project to reduce hosting costs to a trivial amount (madih-jordan.org).

Care was taken to ensure data would be identified and described in a structured way, and the project would engage with and enable local stakeholder communities - both to increase awareness of the potential for DCH and to ensure as many datasets were identified as possible. A communications strategy was defined, to ensure a consistent approach with stakeholders who were identified through desk research, workshops, lectures and events, and professional networks. Other sources of information included institutional (e.g. Department of Antiquities, Ministry of Culture) and project websites, publications and reports, such as the 2014 UNESCO report on Jordanian Documentary Heritage, and (online) (meta)data (e.g. on open data repositories like Figshare). Information was elicited using in-person meetings and emails, phone conversations, public events, and social media. A research software engineering (RSE) training session was held in London at KDL to increase awareness of best practices and ensure a common approach to data collection. A series of bi-lingual requirements elicitation and dataset identification workshops in Amman ensured community engagement and commitment to data sovereignty. A total of 50 peak organisations were contacted across local and international government, education, and research sectors. Private initiatives and associations were also involved.

A bi-lingual data collection template was used to record information about individual datasets, recording a range of information aligned to the MaDiH (مدىح) data vocabulary. Information gathered was subject to ethical management in line with UK funding requirements, the European General Data Protection Regulation (GDPR) and, where relevant, King's College London research ethics processes. The vocabulary implemented in the CKAN data catalogue was informed by preliminary analysis of the dataset landscape and based on glossaries developed by heritage institution projects such as Arches and English Heritage's FISH, and the way

these are used in and adapted for the EAMENA (database.eamena.org) and MEGA-Jordan databases (megajordan.org; DoA, GCI, and WMF, 2010). Preferred spellings for geographic locations (governorates, city districts) and cultural / archaeological periods were included, but limitations in CKAN language localisation meant that the resulting data catalogue is not fully bilingual. Contributions were made to the upstream Arabic CKAN project, however, establishing relationships that could be developed over time.

The CKAN data catalogue was therefore basic but implemented according to international standards. It was intended to act as a time-limited pilot project to inform the production of the white papers and research articles as well as to form a prototype Jordanian DCH data repository, but proved valuable enough to merit migration to the Hashemite University in Jordan for long-term support. Methodologically, however, the goal was merely to start identifying datasets (anywhere in the world) relevant to Jordanian cultural heritage, defining appropriate metadata standards, providing a means of storing information about them, and analysing the resulting data catalogue to inform policy and technical decision-making. The catalogue informed data analysis (see below, and Flohr et al., in prep) that in turn informed the MaDiH (مدیح) Policy White Paper (Smithies et al., 2021a) and MaDiH (مدیح) Technical White Paper (Smithies et al., 2021b).

Public workshops comprising key community stakeholders provided essential additional perspectives on the production of the policy white paper and both validation of the identified datasets and angles for further desk research. These were all hosted in Amman, one (pre-COVID) in person at the Council for British Research in the Levant (CBRL), a second (during COVID lockdown) via Zoom. An online hackathon provided the culmination to the project, bringing teams of Jordanian technologists together to produce proof of concept tools from the identified datasets and an updated design for the CKAN data catalogue. Two steering group meetings, chaired by H.R.H. Dana Firas and including government ministers and the Director General of the Department of Antiquities, ensured alignment to national policy objectives. Despite its modest goals the project gained significant community support, including national and regional radio and television coverage.



Figure 3. Qasr Bashir in Jordan (APAAME 2021, APAAME_20211024_RHB-0063, photo by Robert Bewley). Photographed by the Aerial Archaeology in Jordan project, part of the Aerial Photographic Archive for Archaeology in the Middle East (APAAME), who make their (and other) aerial photographs available. Watermarked photos are available on Flickr under a CC-A-NC-ND license, while unmarked photos can be requested. MaDiH CKAN entry at <https://madih.hu.edu.jo/dataset/apaame>.

3 ANALYSIS

3.1 Technical Landscape

Drzewiecki and Arinat (2017) provide an important overview of Jordan's data landscape. The country has known a number of core national repositories related to pre-1750 CE tangible heritage. In the 1990s the Jordan Antiquities Database and Information System (JADIS) was developed and existed in both book and database form (Palumbo, 1994). JADIS content was transferred to the MEGA-Jordan spatial (GIS) database in 2010 (Myers and Dalgity, 2012), which since then has been the DoA's well-used heritage management system (www.megajordan.org). The underlying system evolved into the Getty Conservation Institute's Arches platform, now for example used by the EAMENA project across the region (and in turn including significant Jordanian content) (database.eamena.org). Data related to movable tangible (archaeological finds and objects) heritage was until recently far less supported, largely because such data are often held offline whether in digital or analogue form. There has been considerable improvement in this space in recent years, with the development of the DOJAM database prototype, now to be implemented across museums in Jordan (GPJA Amman, 2021). The situation is more problematic for tangible heritage after 1750 CE because, although many projects are documenting this content, they are dispersed (there is scope for the Municipality of Amman's and/or EAMENA database to bring these together in future, see also Mubaideen et al., in prep.). Intangible heritage is another

area with solid foundations and potential. The Ministry of Culture's National Project for the Documentation of Intangible Heritage inventories five governates (Arabic only), and the Ministry of Culture's Memory of Jordan project will collect audio-visual and historical documents when it is delivered as part of UNESCO's Memory of the World project.

This core infrastructure provides a solid basis for future development, including content aggregation, but indicates the pressing need for a sector wide DCH strategy too. The potential is significant with, besides the archaeological site databases described above, a large amount of valuable content being held or described in other online initiatives such as the DAAHL archaeological site database (<https://daahl.ucsd.edu/>), the APAAME (<http://www.apaame.org/>), ACOR (<https://acorjordan.org/>), and Manar al-Athar (McKenzie et al.) photo archives, and other digitization initiatives such as the DoA's digitized journals. The DoA and Royal Jordanian Geographic Centre plan to digitize maps too. Other initiatives include photogrammetry and 3D modelling, and a range of websites contain research data and content from other sources.



Figure 4. A general view of Jerash archaeological site, Jerash, Jordan. Shatha Mubaideen, 2020.

3.2 DATA LANDSCAPE

We believe the MaDiH (مديح) project identified a representative subset of data related to Jordanian DCH inside and outside the country, but it is important to understand the limitations of the data identification and

collection process.² Firstly, the project had -deliberately- a limited time to identify and curate datasets. A reliance on desk research for overseas datasets biased collection towards online (therefore digital) sources, while data identified in Jordan resulted from a mixture of visits to museums and archives combined with desk research and word of mouth. Moreover, the data collection team had backgrounds in archaeology (humanities side) and architecture and naturally gravitated towards datasets with those characteristics. These biases were considered and corrected for throughout the data collection process but are undoubtedly nonetheless reflected in the resulting CKAN data catalogue. The project was positioned as a first start at a long-term process, combining preliminary data analysis with consideration of policy, cultural, and technological issues. The resulting data analysis provides a valuable and actionable start to national capacity building in DCH, but it needs to continue and evolve in its methods and scope over time.

Many questions remain, including fundamental issues about the extent and dimensionality of existing Jordanian DCH content. It is impossible to tell, for example, if the 325 identified datasets comprise 10% or 90% of the existing datasets, and equally impossible to know -without significantly more input of time- whether the identified datasets contain 100,000 items of content and information or 10 million, or if they reference 50 or 500 metadata fields. These issues of scope and dimensionality are profound but reinforce the need for future work: in order to safeguard cultural heritage data and make it accessible, the Jordanian governmental and research heritage sector need much better understanding of and control over its associated data. Given that MaDiH (مدىح) was conceived as a national-scale project it is perhaps understandable only a small start was made, but the potential that has been identified is impressive.

Information about datasets related to Jordanian cultural heritage was sought by the data collection team, limiting their searches to the geographical area limited by the current political boundaries of the Hashemite Kingdom of Jordan. UNESCO's broad definition of 'cultural heritage' was used, including both tangible and intangible heritage.³ One hundred eighty-eight distinct organisations were recorded, 46 inside and 142 outside Jordan with universities being most common (26%), followed by research projects (12%) and research centres/institutes (11%). Museums accounted for 11% of organisations. Both "archaeology" / "athar" (dating to before 1750 CE) and "heritage" / "turath" (dating to after 1750 CE) are represented: 45% of the datasets record only post-1750 'heritage', 38% record pre-1750 'archaeology', and 17% record both. This is perhaps unexpected, considering the period before 1750 CE is far longer in duration and heritage specialists and policy makers emphasise the protection of archaeological assets more than contemporary ones. It results mostly from the extensive inclusion of Jordanian organisations, in which post-1750 CE tangible heritage as well as intangible heritage were much more represented than in non-Jordanian-held datasets, and it reflects the increasing recognition of this essential part of cultural heritage (see for example the 2003 UNESCO Convention for the Safeguarding of Intangible Heritage and Hayajneh, 2019).

² For more detail on this section, including methods used for dataset identification and description and analysis of the CKAN data catalogue, refer to the MaDiH (مدىح) Policy White Paper, Esposito et al., 2020, and Flohr et al., (in prep).

³ See introduction; J. Jokilehto/ICCROM Working Group Heritage and Society. "Definitions of cultural heritage: references to documents in history", (2005). http://cif.icomos.org/pdf_docs/Documents%20on%20line/Heritage%20definitions.pdf; 1972 UNESCO Convention Concerning the Protection of Cultural and Natural Heritage; 2003 UNESCO Convention for the Safeguarding of the Intangible Heritage.

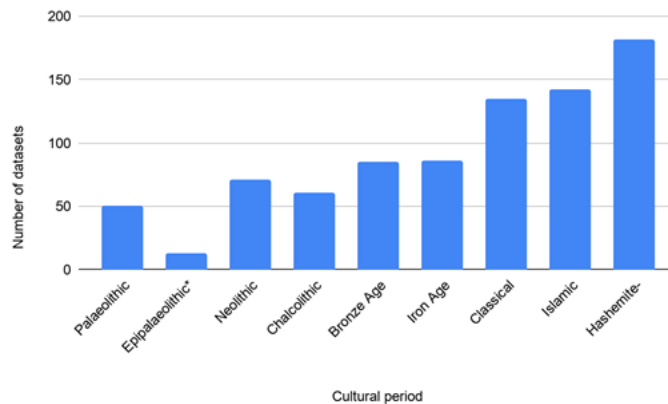


Figure 5: Major cultural periods represented in the datasets (number of datasets for each cultural period). The Epipalaeolithic is probably underrepresented as it was often not 'tagged' for multi-period datasets. Note that a dataset can, and often does, contain information on multiple periods.

It is less surprising that most of the datasets relate to tangible heritage (82%), but the team did not expect to find a substantial subset (40%) related to intangible heritage. This again suggests that Jordan has considerable digital assets related to its non-physical heritage. Another surprising find was that the MaDiH (مديح) datasets are almost equally divided between North, Central, and South Jordan despite archaeological research being traditionally focussed on North and Central parts of the country. It might be that the identification of offline analogue datasets (less discoverable using desk research) would change that balance considerably, suggesting the need for targeted digitisation activity to ensure the digital record is proportional to the analogue record.

This speaks to the prevalent types of data identified by MaDiH (مديح). Most of the datasets (67%) are of, or contain, a text data type. Images comprise 61%, databases 31%, and tabular data 13%. All the categories include a mixture of data depicting or describing heritage and data that can be considered heritage itself, and were catalogued according to their technical type. The majority were from the 19th and 20th centuries, so included modern as well as historic photos. This, again, reflects the nature of DCH and perhaps even a hint of technological determinism skewing the contents of the MaDiH (مديح) data catalogue: the World Wide Web is awash in images and it is one of the easiest and most engaging formats to make available online.

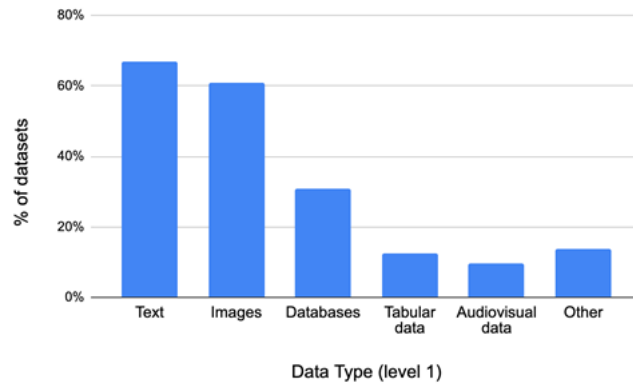


Figure 6: Percentage of datasets containing each of the major data type categories.

A very important statistic deriving from the MaDiH (مديح) catalogue is the proportion of local and international datasets. It can be viewed as a crude proxy for the level of data sovereignty enjoyed by Jordanian cultural heritage and management professionals, an indication of the attitudes and research practices of professional archaeologists and funding bodies over the years, and an index of how much work is required to properly 'localise' Jordanian DCH data (see discussion, below). The majority (65%) of the identified datasets are located outside Jordan, with 35% within Jordan. Of the datasets outside Jordan, the majority are located in Europe (34%), especially in the United Kingdom (11% of the total datasets), Germany (6%), the Netherlands (4%), and France (4%). Most of the remaining datasets are located in the USA (22%). Only 4% are held in the Middle East and 5% in other parts of the world.

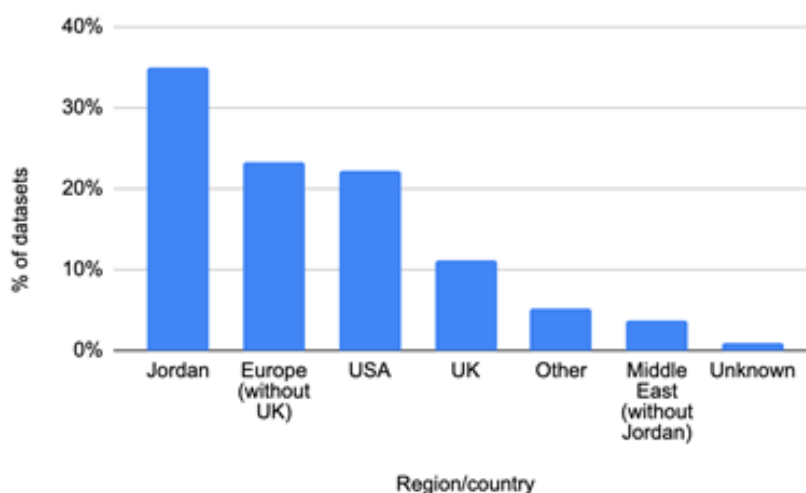


Figure 7: Dataset (maintainer) location.

It is important, once again, to recognise that the characteristics of the data catalogue reflect practical choices made by the MaDiH (مديح) data identification team as well as reality. Researchers and cultural heritage professionals associated with the project felt the composition of the data catalogue, from the type and extent of data to the balance between data held in Jordan and offshore, reflected their intuitive understanding of the situation (for example, the distribution of datasets inside and outside Jordan appears to reflect volumes of funding and applications to undertake research in Jordan through the Department of Antiquities), but no definitive conclusions can be drawn.⁴ Nonetheless, the project offers a baseline for further analysis. More importantly, it provides a relatively balanced corpus of cultural heritage datasets gathered using transparent methodologies, standards, and vocabularies, that can prompt further development of DCH as a field. It is this aspect of the project - the production of a 'seed' for future DCH activity - that is most important rather than the production of an authoritative inventory of cultural heritage datasets.

This is demonstrated in relation to data licensing, an issue of some complexity for the project, and of central importance for future DCH activity in Jordan. The MaDiH (مديح) data catalogue applies a Creative Commons Attribution 4.0 Generic Non-Commercial (CC BY-NC 4.0) license to the metadata entered into the catalogue by the project team. Although it was not immediately apparent, after careful analysis, many of the identified datasets either used similar licenses or provided bespoke Terms of Use. Many dataset owners chose not to apply any kind of license, however, making it difficult to know what can or cannot be done with the content. Intellectual ownership is often implied through the grant that funded a research project or by a website owner, but it is unsustainable and impractical for potential users to contact and request permission to use data.

⁴ See the MaDiH (مديح) Policy White Paper, and Flohr et al. in prep. for detailed analysis of dataset characteristics and methodological assumptions.

This had practical effects even over the brief duration of the MaDiH (مديح) project itself: one of the final hackathon teams needed to use dummy data for a prototype augmented reality mobile app because data ownership was unclear. This topic is covered in more detail below; the point here is that although the MaDiH (مديح) data catalogue can function as the 'seed' for a future national cultural heritage data catalogue, its more immediate purpose was as the basis for preliminary data and requirements analysis and scoping of priorities for future work. The fact that it was deemed valuable enough to be migrated to Jordan for long-term management is a pleasing outcome but incidental to its initial purpose.

4 DISCUSSION

4.1 Policy and Capability Enhancement

It would be a fallacy to suggest that Jordan should aim for complete data sovereignty, repatriating datasets from abroad into a massive local repository; aside from being prohibitively expensive and technically complex it would not be architecturally sound or build on the many opportunities that exist for regional and international collaboration in research and systems development. In many ways, the MaDiH (مديح) data catalogue implies an existing but previously hidden international data architecture for Jordan, one that already spans the country itself, the region, North America, and Europe, and is supported by robust national and trans-national infrastructure in the form of university and institutional repositories. As with all national DCH architectures there is considerable variability, and at some points robust storage and quality description and curation gives way to lower quality or amateur efforts. Still, even this can be viewed as a feature rather than a flaw: healthy ecosystems need variety to flourish.

The next phase of development is crucial. Work is needed to increase Jordanian alignment to DCH policies and standards and contribute to international initiatives such as ARIADNE Plus. The nascent DCH community established by MaDiH (مديح) needs to be fostered, and a cohort of Jordanian RSEs focused on/aware of cultural heritage will ideally be produced from university computer science programmes. Technical ties between cultural heritage institutions, government and the commercial and higher education sectors should be strengthened, with the support of the Jordan Open Source Association, so that government goals for enhancement of open data infrastructure and sharing are supported. Attention should be given to the development of bi-lingual English-Arabic software and standards. Gaps in coverage of international charters signed by Jordan should be attended to and adherence to existing ones strengthened, and collaboration across government ministries and departments and other cultural heritage institutions should be strengthened, including through policies that promote (digitally) connected data collection and storage between athar, turath, and intangible cultural heritage.

MaDiH (مديح) has demonstrated the wealth of DCH content at Jordan's disposal and the excellent foundation of repositories already in existence. Modest additional investment, guided by short, medium, and long-term goals, could leverage these assets for the benefit of the country and the broader MENA region. It is important that the collation and editing of archaeological sites in MEGA-Jordan continues, the development of DOJAM for archaeological objects continues, an online database for post-1750 CE heritage is established (and ideally

compatible with MEGA-Jordan), and the database for intangible cultural heritage further developed and made available online. The country's wider leadership in open data could inform a focused DCH agenda, aligning government digital strategy with a commitment to the development of local research infrastructures and open science. More boldly, increased collaboration between Jordan and international research funding agencies could enable rationalisation and additional investment in the 'data landscape' mapped by MaDiH (مدىح), ideally anchored by a national centre for digital cultural heritage tasked with strategically and holistically building capability over time.



Figure 8: The Archaeological Museum of Umm Qais, Irbid, Jordan. Colossal statue of Tyche in the background. Shatha Mubaideen, 2019.

4.2 Technical Opportunities

The MaDiH (مدىح) policy and technical white papers have a degree of natural overlap, although the emphasis, because of the preliminary and holistic goals of the project, was on the former. The project identified many technical opportunities for the development of DCH in Jordan too, however. Some of these are policy-related, such as building awareness of the value of open licensing, and FAIR data principles and their relationship to open science and open publishing. Others have already been implemented, such as the migration of the project's CKAN data catalogue to Jordan for data sovereignty purposes. Jordanians with knowledge of cultural heritage could also be encouraged to contribute to geodata in projects such as WikiData and contribute to Wikipedia.⁵

⁵ For example through the Jordan Open Source Association Wikipedia initiatives.

Other, more specific initiatives are possible, many of them building on the contribution of the MaDiH (مديح) project, such as initiating a user feedback and design process to expand the existing data catalogue into a cross-disciplinary or even national open data catalogue or (more modestly) using the processes and vocabulary developed by MaDiH (مديح) for future data identification and collection activities in Jordan. The project team contributed Arabic translations to the CKAN open source project. This would ideally continue: despite aiming for thorough bilingualism it was not possible to offer the data repository in Arabic beyond basic metadata.

Other opportunities exist to undertake targeted digitisation activities to fill in gaps in the Jordanian DCH data landscape identified, in partnership with existing initiatives such as the Jordanian Documentation Centre who have considerable capabilities. Community and crowd-sourced initiatives could identify popular datasets in the MaDiH (مديح) data catalogue and either complete or undertake digitisation activities, building RSE and DCH capability in the process. It might be prudent to build a bespoke repository to hold a range of content unsuitable for existing repositories, as was implemented for the seismic.org.nz earthquake archive project in New Zealand (Smithies et al., 2015) and select digital but currently offline content (such as FileMaker databases and Excel spreadsheets) for storage in it. Other work is needed to identify existing archives and repositories holding content amendable to aggregation or (in the best circumstances) federation, to enhance national DCH search capacity in the way europeana.eu and digitalnz.org do, and to identify existing data sources that would benefit from the addition of Application Programming Interface (API) access.

5 CONCLUSION

There is good alignment between Jordanian government policy and best practices in DCH, particularly in relation to open data. Jordan's Fourth National Action Plan 2018 - 2020 under the Open Government Partnership Initiative (OGP) (2018) commits to the development and enhancement of open data, grounded in efforts to increase the volume and accuracy of published data. Because of the importance of cultural heritage to the economy, this can be expected to benefit DCH practices, but the MaDiH (مديح) project has demonstrated the combination of detail and strategy that will be required to produce genuine alignment and synergy between the two policy areas. Development of human capability is the key to enabling this and the central lesson learned from the project. The Jordanian cultural heritage community is rich and diverse in its knowledge and extremely well integrated into government and higher education sectors. Similarly, the Jordanian (commercial) IT sector has a wealth of relevant expertise. More could be done to bring the two (cultural heritage and IT professionals) together, however, and investment in human capital is certainly as important as investment in physical or technical infrastructure.

If there is a 'MaDiH (مديح) method', it is grounded in the realisation that DCH is difficult, and that all countries struggle with technical standards and infrastructure and suffer from investment in point solutions at the expense of truly national long-term strategy. By taking a modest approach to a potentially "wicked" problem (Churchman, 1967) and focussing on mapping and analysing the current state rather than developing yet another solution, local stakeholders and user communities gain an overview of the situation and opportunities to discuss problems and share ideas without the burden of completion. The fact that the MaDiH (مديح) project catalogue has changed

status from a proof of concept to an important additional Jordanian DCH asset speaks volumes to the unexpected benefits such an approach can bring. The project may well look different in a decade if its mapping and recommendations have not led to more substantive results, but even in that scenario it could be said that little was invested and much gained.

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