The Role of Digitization in the Preservation and Study of Movable Archaeological Artifacts: A Case Study of the Islamic Art Museum in Cairo

Ramadan Ahmed Mohammed El-Sayed

Faculty of Tourism and Hotels, October 6 University, Giza, Egypt.

ARTICLE INFO	Abstract
	The Islamic Art Museum in Cairo is regarded as one of the most important and oldest museums specializing in Islamic art worldwide. It houses the largest and most exquisite collection of movable Islamic artifacts, comprising approximately 103,000 artifacts that represent all branches of Islamic art across various Islamic eras. Many scholars have conducted in-depth research on several of the masterpieces within the museum. These diverse artifacts include wooden, glass, ceramic, metal, textile, jewelry, coins, weapons, stone, and marble objects, as well as manuscripts. The museum also contains sections dedicated to astronomy, mathematics, science, and medicine. The significance of this study lies in the use of technology and digitization for the preservation and documentation of both stored and displayed artifacts within the museum and in external exhibitions. The main aim of this paper is to highlight the importance of digitization in inventorying, recording, documenting, identifying, and preserving the masterpieces housed in the Islamic Art Museum situated in Cairo, whether on display or in storage. The study also aims to provide comprehensive sources of information and images for researchers and scholars inside and outside Egypt. Moreover, it aims to protect these movable objects from theft and counterfeiting. The paper depends on a descriptive and analytical approach by detailing the overall state of digitization in museums and specifically in the Islamic Art Museum in Cairo, examining digitization projects, tools, and technologies, and subsequently analyzing their efficacy in preserving, safeguarding, and studying movable archaeological artifacts.

Research Problem

The core issue lies in the lack of an integrated technological infrastructure, the shortage of specialized and well-trained human resources, in addition to the absence of institutional policies that support the digitization of museum collections. Accordingly, the research problem focuses on examining the role of digitization in the preservation and study of movable artifacts, with a particular emphasis on the Islamic Art Museum as a study model. The aim is to assess the extent to which these technologies are utilized, analyze the challenges

and obstacles faced, and propose ways to enhance their application to serve the goals of preservation and academic research of museum artifacts.

The Importance of Research

1. Preservation of movable masterpieces at the Museum of Islamic Art: This paper sheds light on how to protect artistic artifacts from deterioration using modern digital technologies.

2. Study of movable artifacts at the Islamic Art Museum: The research explores the benefits of digitization in providing accurate information about artifacts, thereby facilitating scholarly study and analysis.

3. Public Engagement: The study emphasizes the role of digitization in presenting artifacts through interactive methods, enabling greater public engagement with artistic works.

4. Future Development: The research aims to provide practical recommendations for enhancing the use of digitization in the museum sector.

Research Objectives

1. Defining the importance of using digitization to inventory, record, document, identify, and preserve the artistic collections within the Museum of Islamic Art in Cairo, whether on display or in storage.

2. Providing all appropriate sources of information and images to beneficiaries of researchers and academics inside and outside Egypt.

3. Protecting the movable artifacts from theft and forgery.

Research Hypotheses

1. The research hypothesizes that digitization contributes to the protection of movable artifacts by creating accurate digital replicas of archaeological masterpieces.

2. The research hypothesizes that digitization enhances the study of archaeological artifacts by providing access to accurate and comprehensive data about artistic masterpieces.

3. The research hypothesizes that digitization increases the accessibility of archaeological artifacts to researchers, academics, and a wider audience through the availability of digital information online and the presentation of virtual exhibitions.

Introduction

The world has witnessed a tremendous revolution in the field of information technology, which has had a significant impact on many fields, especially those related to written information through processing, storage, and retrieval.[1] Digitization is a broad field that encompasses all aspects of life, and it is constantly evolving in terms of its tools and methods. While humans once relied on handwriting, they later learned to type using a typewriter, then moved on to using computers. This technology has since advanced to the point where it is now possible to write without even touching the keyboard. By simply opening a specialized speech-to-text program, a person can start dictating the text, which is then automatically transcribed without errors.[2] Therefore, digitization has become one of the standard forms of preservation.[3] In order to preserve and protect museum heritage, technological tools such as

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[1] Abdelrabbo, H., & Boudaoud, I. (2023). Digitization of Manuscripts in Algeria: Reality and Prospects. Journal of Archaeological Heritage Platform, Vol. 25, No. 3, p. 199. Retrieved from: http://search.mandumah.com/Record/1415432

[2] Youssef, S. E. (2021). The Role of Digitization and Modern Technologies in Promoting and Enhancing Cultural Heritage. Journal of Archaeological Heritage Platform, Vol. 10, No. 1, p. 284.

[3] Perry, S., R. (2014). Digitization and Digital Preservation: A review of the literature. School of Information Student Research Journal, Vol. 4, Iss. 1, Art. 4, p.1. https://doi.org/10.31979/2575-2499.040104 Retrieved from https://scholarworks.sjsu.edu/ischoolsrj/vol4/iss1/4

digitization can play a vital role. The digitization of museum artifacts includes documenting and organizing information, preserving it, exploring it, and disseminating knowledge and information.[4] Therefore, digitization is considered an opportunity for countries to rethink the way they deliver services to the public within museums.[5] With the rise of digital technologies, museums and organizations focused on cultural heritage reconstruction and conservation are exploring the use of these technologies for digitizing cultural heritage. Museums are digitizing their objects not just to preserve cultural heritage, but also to make their artifacts appealing and accessible to a wider public through technologies like Virtual Reality (VR), Augmented Reality (AR), and 3D Television. These technologies are incorporated into online platforms tailored for engaging with cultural content.[6] In the late 20th century, art galleries and museums started converting their stored artworks into digital copies. As a result, nearly every major museum today has its own online portal or virtual museum alongside the traditional exhibition. Although the benefits of modern technologies are undeniable, it is essential to study the content of museum and gallery websites in terms of how new forms of information are perceived. This becomes particularly important as mass culture and the digital aggregation of artistic masterpieces online blur the boundaries between authentic art and its digital reproduction.[7]

Islamic Art Museum in Cairo

The museum is a place dedicated to collecting, preserving, and displaying all types of important cultural artifacts.[8] The International Council of Museums (ICOM) defined the museum in its 2022 statement as: "A museum is a permanent, non-profit organization dedicated to serving the society by researching, collecting, preserving, interpreting, and displaying both tangible and intangible heritage. Museums are open to the public, easy to access, and welcoming to all visitors. They promote sustainability and diversity. They act and engage in a manner that is ethical and professional, involving community participation, and providing diverse opportunities for education, enjoyment, contemplation, and sharing of knowledge'.[9] Therefore, museums are considered one of the manifestations of global civilization. Countries around the world are keen to establish more museums, improve their standards, and attract both citizens and tourists to visit them and explore their collections. As such, the museum has become a benchmark of a nation's cultural sophistication and a measure of its progress. Visiting a museum and getting acquainted with its collections is a sign of one's cultural awareness.[10] The functions of museums have significantly expanded; they are no longer limited to preserving and displaying physical artifacts, safeguarding

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[4] Madanan, M., Hussain, N. and Khaliq, A. A. (2018). A Study of the Digitization Process to Preserve the Culture and Heritage of a Civilization Using Natural Language Processing and Its Impact on the Social, Economic and Scientific Aspects, Journal of Theoretical and Applied Information Technology, Vol. 96, No. 16, p. 5550.

[5] Badr, A. A. G. (2024). Obstacles to Digital Transformation and Their Impact on Sustainable Development in the Arab World. International Journal of Humanities and Social Sciences Research and Studies (IJHS), Vol. 7, No. 14, p. 149.

[6] Belhi, A., Foufou, S., Bouras, A. and Sadka, A. (2017). Digitization and Preservation of Cultural Heritage Products. 14th IFIP International Conference on Product Lifecycle Management (PLM 2017), Seville, Spain. p. 243. 10.1007/978-3-319-72905-3_22 hal-01764208.

[7] Nikonova, A. A. and Biryukova, M. V. (2017). The Role of Digital Technologies in the Preservation of Cultural Heritage, Muzeológia a kultúrne dedičstvo, Vol. 5, No. 1, pp. 169-170.

[8] Zhou et al. (2012). Digital Preservation Technology for Cultural Heritage. Springer, p. 208.

[9] International Council of Museums (ICOM) (2022). ICOM approves a new museum definition. Retrieved from https://icom.museum/en/news/icom-approves-a-new-museum-definition/ (Accessed on 29/5/2025, 7.00 PM.)

[10] Ibrahim, E. (2023). Digital Technology for Museum Display and Its Role in Enriching the Art Criticism Movement. Award-winning research paper in the Art Criticism Competition, Society of Fine Arts Lovers, 8th Edition, Cairo, p. 2.

cultural memory, public education, and dissemination of information. They now also include broader areas such as communication and support for academic research.[11] The concept of foundation a museum for Islamic arts and archaeology started during the era of Khedive Ismail, particularly, in 1869, when the engineer Salzmann presented the proposal to him. Khedive Ismail promptly tasked Franz Pasha, the head of the Art Department in the Ministry of Endowments, with gathering artistic treasures from Islamic structures and storing them in a government facility. This project was executed during Khedive Tawfiq's rule in 1880, when Franz Pasha collected antiquities from Islamic periods and housed them in the eastern Iwan of al-Hakim Mosque on al-Muizz Street[12] It was referred to as the "Museum of Arab Art." [13] In 1899, the Committee for the Preservation of Arab Antiquities-formed in 1881-requested the Egyptian government to build the present museum structure in Bab al-Khalq Square.[14] The museum had its official opening on December 28, 1903, under the rule of Khedive Abbas Helmy II. The artistic pieces were elegantly displayed, a credit to the efforts of Herz Pasha.[15] This structure was referred to as the "House of Arab Antiquities."[16] In 1951, the title "*Dar* of Arab Antiquities" was changed to "Islamic Art Museum" to acknowledge the contributions of non-Arab communities who embraced Islam and helped in shaping Islamic civilization.[17]

The Artistic Collections at the Islamic Art Museum

In 1881, the total of artifacts was about 111 items and steadily grew until it reached nearly seven thousand by the museum's inauguration. Khedive Abbas Helmy II's mother was the initial donor to the museum, contributing a range of precious artifacts that enriched their scale and artistic value. In 1913[18], Prince Youssef Kamal generously donated his complete collection of Islamic artifacts to the museum.[19] His contribution was later followed by that of Prince Mohamed Ali in 1924, and then by Prince Kamal El-Din Hussein in 1933, and later King Fuad, who gifted the museum a precious collection of textiles, scales[20], and seals-most of which were made of glass, though some were crafted from metal or stone.[21] In 1941, King Farouk I contributed his personal collection of ceramics to the museum. The museum's holdings significantly expanded following the acquisition of the renowned collection of merchant Ralph Harari in 1945, and later, the collection of Dr. Ali Pasha Ibrahim in 1949. By 1951, the museum's cataloged collection had grown to approximately 45,000 artifacts.[22]

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[11] Xia, Q., Wang, Q., and Xue, J. (2024). The Process of Museum Digitization Technology: SHS Web of Conferences 190, 93915, p. 1. https://doi.org/10.1051/shsconf/202419003015

[12] Azroudi, N. (2017). The Role of the Museum of Islamic Art in Cairo in Presenting Islamic Scientific Heritage: A Field Study. Historical Issues Journal, 2(3), p. 48. https://asjp.cerist.dz/en/article/37685

[13] O'Kane, B., Abbas, M., and Abdulfattah, I. R. (2012). The illustrated guide to the Museum of Islamic Art in Cairo. The American University in Cairo Press, p. 9.

[14] Ministry of Culture, Egyptian Antiquities Authority. (1982). Guide to the Museum of Islamic Art. Cairo: Egyptian Antiquities Documentation Center Press, p. 7.

[15] Zaki, A. (1949). The Role of Antiques in Egypt and Scientific Societies. Cairo, p. 33.

[16] Azroudi, N. (2017). The Role of the Museum of Islamic Art in Cairo in Presenting Islamic Scientific Heritage, p. 49.

[17] Ministry of Culture, Egyptian Antiquities Authority. Guide to the Museum of Islamic Art, p. 9.

[18] Azroudi, N. (2017). The Role of the Museum of Islamic Art in Cairo in Presenting Islamic Scientific Heritage, p. 48.

[19] Viet, G. (1939). A Brief Guide to the Exhibits of the Arab Antiquities House (Trans. Zaki Muhammad Hassan). Ministry of Public Instruction, Cairo, p. 1.

[20] Azroudi, N. (2017). The Role of the Museum of Islamic Art in Cairo in Presenting Islamic Scientific Heritage, p. 49.

[21] Viet, G. (1939). A Brief Guide to the Exhibits of the Arab Antiquities House, p. 1.

[22] Azroudi, N. (2017). The Role of the Museum of Islamic Art in Cairo in Presenting Islamic Scientific Heritage, p. 49.

Today, the Islamic Art Museum in Cairo includes around 103,000 diverse artifacts[23] representing Islamic arts from India, China, and Iran, extending through the Arabian Peninsula, the Levant region, Egypt, North Africa, and Al-Andalus. These artifacts are distinguished by their comprehensive representation of the branches of Islamic art across various eras, making the museum a lighthouse of Islamic art and civilization throughout the ages.[24]

Sections and Numbers of Artifacts on Display and Stored at the Islamic Art Museum

The Islamic Art Museum is situated in the heart of historic Cairo, in the square of Bab Al-Khalq. It is the world's biggest museum of Islamic art.[25] This building consists of 25 exhibition rooms, beginning with the Hall of the Foundations of Islamic Civilization (Hall 0) located at the entrance.

The right wing of the museum includes Halls 1 to 13, arranged in chronological order according to the Islamic historical periods:

Hall 1: Umayyad and Abbasid eras	**Halls 2, 3, 4:** Fatimid era
Halls 5, 6, 7: Ayyubid era	**Halls 8, 9, 10:** Mamluk era
Halls 11, 12, 13: Ottoman era up to the Muhammad Ali era	

The museum's left wing encompasses Halls 14 to 25, featuring exhibits centered on Islamic arts from the eastern areas of the Islamic world and multiple thematic topics.

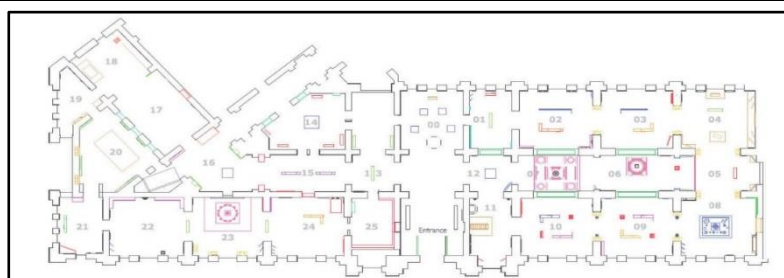|	
Hall 14: Coins and weapons	**Halls 15–16:** Arts of the Islamic World in the East
Halls 17–19: Calligraphy and inscriptions	**Halls 20–21:** Textiles and carpets
Hall 22: Daily life	**Hall 23:** Water and gardens
Hall 24: Sciences	**Hall 25:** Medicine[26]

Figure (1) shows the exhibition halls of the Islamic Art Museum in Cairo

The Islamic Art Museum in Cairo stands as one of the world's most significant and expansive museums globally specializing in Islamic art. It houses over one hundred thousand artistic and archaeological pieces that represent the various branches of Islamic art across successive historical periods. Its collections are distinguished by exceptional richness in both quantity and artistic and historical value, which has earned the museum a prestigious status as a beacon of cultural and artistic heritage reflecting the evolution of Islamic civilization. Thanks to this wealth, the museum has become a significant scholarly and cultural destination for researchers, historians, and enthusiasts from diverse backgrounds. It offers a valuable body of knowledge that highlights the many facets of Islamic civilization, particularly in fields such as

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[23] Abd el-Salam, M. A. M. M. (2023). Collections Management and Use of Object ID at the Carpet Department at the Museum of Islamic Art in Cairo: "A Museological and Practical Study", Bulletin of the Center for Papyrological Studies (BCPS), Faculty of Archaeology, Ain Shams University, Egypt, Vol. 40, pp. 629–630.

[24] https://www.miaegypt.org/ar-eg/museum/home/timeline (accessed on 16 July 2025, 11:30 PM).

[25] Ashour, S. and students, AASTMT. (2017). Museums of Cairo, p. 58.

[26] https://www.miaegypt.org/ar-eg/museum/museum-hall/museum-hall (accessed on 17 July 2025, 12:10 PM).

art, science, medicine, engineering, and astronomy.[27] The Islamic Art Museum comprises 13 specialized sections, categorized according to the types of materials displayed and stored within it. These sections are carpets section, textiles section, metals section, woodwork section, ivory section, coins section, glass and rock crystal section, ceramics section and pottery section, stones section, manuscripts section, jewelry section, weaponry section, and Confiscated and Seized Antiquities section. The number of artifacts in the Islamic Art Museum has increased to a total of 103,000 artistic and archaeological pieces, including 3,886 pieces on display and 99,114 pieces in storage.[28]

The following table represents the number and types of artifacts at the Islamic Art Museum:[29]

No.	Type of Artifact	Number of Artifacts at the Museum of Islamic Art
1	Coins	49030
2	Weights and Measures	7557
3	Medals and Decorations	143
4	Woodwork	4163
5	Ivory and Bone	827
6	Manuscripts	1536
7	Glassware	5715
8	Pottery and Ceramics	19669
9	Metalwork	2747
10	Stones and Marble	5903
11	Carpets	227
12	Saddles for Horses and Animals	23
13	Metal Weapons	334
14	Jewelry and Ornaments	789
15	Textiles	4072

Table (1): Number and Types of Artifacts at the Islamic Art Museum

The table below represents the number and types of artifacts on display in each gallery of the Islamic Art Museum:[30]

Type	H.(00)	H.(1)	H.(2)	H.(3)	H.(4)	H.(5)	H.(6)	H.(7)	H.(8)	H.(9)	H.(10)	H.(11)	H.(12)	H.(13)	H.(14)	H.(15)	H.(16)	H.(17)	H.(18)	H.(19)	H.(20)	H.(21)	H.(22)	H.(23)	H.(24)	H.(25)	Temporary H.	Multimedia H.	VIP	Garden	Total
Wood A	1	29	17	19	23	5	10		5	2	3	7				5	1	9	1	1			2		18						157
Wood B	1	4	1	2					3							1		2				6	7		2						29
Stone	1	10	8	5	6	6	6	1	9	16	11	2	1		8	1		6	1	19			13	21	12			1	1	42	207
Jewelry														4									147								151
Ceramics		23	20	26		8	28		26	21	18		21	6	3	87	48	16	1				2	31	2	6					393
Glass A	1	19	5			1			5		9			1									5		1						47
Glass B				8											9		2								2	28					49
Carpet																	1				12	4									17
Weapons															111																111
Cymbals														5	8										27						40
Ivory		2	10	1	12				4	1	5				1	4	1					12	6		12	1					72
Manuscripts	1													1		4		42					4	2	5						59
Metals	8	1	4	3		3		1	17	34	23					27	10	1					12	5	19	81					250
Textile																	2				42	12			1						57
Coins															2247																2247
Total	13	88	65	64	41	23	44	2	66	77	69	10	22	17	2379	128	75	65	11	20	55	34	198	57	69	150		1	1	42	3886

Table (2): Number and types of artifacts on display in each gallery at the Islamic Art Museum

[27] https://www.miaegypt.org/ar-eg/museum/collection/Collection (accessed on 19 July 2025, 01:00 AM).

[28] Ahmed, M. (2024). Applying of Object ID Stander on the Carpets Collection at the Museum of Islamic Art, Cairo, Iran. Historia i Świat, 13, pp. 301–302. https://doi.org/10.34739/his.2024.13.18

[29] Al-Rifai, F. A. S., Aboul-Enein, R. A. and Abouzeid, R. S. (2022). The Development of Museum Collections at the Museum of Islamic Art in Cairo, The Scientific Journal of the Faculty of Arts, Tanta Univ., No. 46, p. 6.

[30] Abd el-Salam, M. A. M. M. (2023), Collections Management and Use of Object ID at the Carpet Department at the Museum of Islamic Art in Cairo: "A Museological and Practical Study", p. 659.

Digitization Concept

Digitization is a form of electronic documentation[31] and refers to the process of converting data into digital format, allowing it to be processed by a computer using various types of digital file formats.[32] According to the Encyclopedic Dictionary of Information and Documentation, digitization is defined as "an electronic process that generates electronic or digital codes, either from a physical document or object, or from analog electronic signals. Through this process, information is transformed from its original state into a digital format-whether it be images, textual data, audio files, or any other form. The use of digitization technology plays a vital role in maintaining and enhancing cultural heritage.[33] In the field of information systems, digitization specifically refers to the conversion of printed texts or images into binary signals using a scanner, allowing the results to be displayed on a computer screen.[34]Digitization involves the establishment of a database to provide information through bibliographic and textual data, consisting of a collection of texts stored on high-capacity devices connected to a computer. These systems are capable of delivering various types of content, including text, images, decorative elements, or data transferred to compact discs.[35] Despite the variety of definitions and interpretations of the term digitization, they all converge on the core idea: the process involves converting an available source of information-whether it be an artifact or an archaeological site-into an electronic form that can be accessed via modern digital technologies, such as computers and various digital media.[36] In the context of cultural heritage, digitization refers to the transformation of heritage materials from their traditional physical form into digital formats-whether stored on discs or electronic media-regardless of the method of conversion, be it through photography, scanning, or manual re-entry. This process is essential in the preservation and protection of heritage.[37]

The Objective of Digitizing the Artifacts of the Islamic Art Museum

Digitizing paper documents (such as the records preserved in the Islamic Art Museum) represents the most one modern approaches to enhancing the efficiency of museum operations and facilitating access to data. Converting paper-based content into digital formats enables researchers and academics to access information without temporal or geographical constraints, thereby increasing its effectiveness in scientific research. Moreover, digitization is an effective tool for improving administrative performance within museums, as it significantly reduces the time and effort required for data storage, retrieval, and the execution of daily procedures in an organized and swift manner. Another essential aspect is

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[31] Youssef, S. E. (2021). The Role of Digitization and Modern Technologies in Promoting and Enhancing Cultural Heritage, p. 285.

[32] El-Wafi, A. and Abir, S. (2023). Digitization and Its Impact on Library Service Development - A Study from the Perspective of Employees at the Central Library of Martyr Sheikh al-Arabi Tebessi University – Tebessa. Master's Thesis, Faculty of Humanities and Social Sciences, Department of Library and Information Science (Specialization: Data Management and Processing), Algeria, p. 12.

[33] Farrah, R. and Fadel, I. (2021). Cultural Heritage between the Necessities of Digitization and the Absence of Legislation, Annals of Qalama Journal of Social and Human Sciences, Vol. 15, No. 2, p. 175.

[34] Zouhir , H. and Rachid, M. (2010). Digitization as a Modern Technical Means to Preserve Arabic Manuscripts: The Manuscripts of the University of Emir Abdelkader for Islamic Sciences - Constantine, Algeria - as a Model. 21st Conference: The Arab Digital Library: Arabi Ana — Necessity, Opportunities, and Challenges, Vol. 1, Beirut: Arab Federation for Libraries and Information (AFLI), Lebanese Ministry of Culture, and the Library Association of Lebanon, p. 775. Retrieved from: http://search.mandumah.com/Record/125097

[35] Abdelrabou, H. and Boudaoud, I. (2023). Digitization of Manuscripts in Algeria: Reality and Prospects, p. 200.

[36] Idris, Y. S. (2021). The Role of Digitization and Modern Technologies in Promoting and Enhancing Cultural Heritage, p. 285.

[37] Bakr, E. (2022). The Role of Cultural Media in Algeria in Promoting and Preserving Tangible and Intangible Heritage, Al-Hikma Journal for Media and Communication Studies, Vol. 10, No. 3, p. 142.

digitization's role in ensuring the continuity of data by preserving it in secure digital formats, reducing the risk of damage or loss, and enabling long-term retention. Digital systems provide advanced mechanisms for data retrieval, even in cases of technical malfunctions or operational errors, thereby ensuring the integrity of information. In addition, digitization allows for the organization of diverse documents (texts, images, videos) into unified files named according to their content, which facilitates search operations and quick access to information, enhancing the efficiency of using these documents for scientific and research purposes.[38]

Digitizing museum exhibits is also an effective scientific method for improving the preservation of collections, as it reduces the risks of damage and theft by minimizing direct handling of original pieces, and provides accurate digital alternatives for study and display. Moreover, 3D models enable the precise documentation of the physical condition of artifacts, contributing to the development of well-planned restoration and protection strategies. Digitization also helps provide high-quality knowledge resources that support educational and research processes, especially in interactive learning environments. Additionally, it enhances the efficiency of museum collection management by facilitating data access, speeding up search and documentation processes, and strengthening institutional cooperation both internally and externally.[39]

The Importance of Digitization in the Preservation of Movable Artifacts at the Islamic Art Museum

Museums play a fundamental role in preserving heritage in all its components.[40] Consequently, the digitization of museums, which utilize digital technology to document, organize, and exhibit museum collections, signifies a crucial change in the ways of conservation of cultural and historical heritage.[41] Museum digitization entails establishing a complete database of all cultural artifacts.[42] Moreover, digitization serves as the channel that transfers heritage from the past, through archives, to the present via modern technological tools for preservation and storage, and to the future via the internet and other advanced technologies in the field of digitization and innovations.[43] Digital documentation has become the most effective method for preserving movable artifacts by using digital technology to preserve and document heritage and make it easily accessible to the public and researchers.[44]

Digitization helps preserve rare and fragile documents, such as manuscripts, without restricting researchers' access or complicating their academic work, as traditional technical cards might do. Moreover, digitizing cultural heritage within museums ensures effective information preservation, facilitates research, and improves understanding of artifacts and their conservation status. It also limits the physical handling and transfer of artifacts by researchers. Additionally, digitization promotes the dissemination of information, the exchange of expertise, and saves both time and resources. It also enhances the management of

[38] https://bakkah.com/ar/knowledge-center/digitization (accessed on 15 June 2025, 12:30 AM).

[39] Xia, Q., Wang, Q., and Xue, J. (2024). The Process of Museum Digitization Technology, pp. 1-2

[40] Rashid, M. G. (2021). "Types of Museums and the Criteria for Their Classification." Journal of the General Union of Arab Archaeologists, Vol. 22, No. 1, p. 740.

[41] Xia, Q., Wang, Q., and Xue, J. (2024). The Process of Museum Digitization Technology, p. 1.

[42] Kordha, E., Gorica, K., & Sevrani, K. (2017). The Importance of Digitalization for Sustainable Cultural Heritage Sites in Albania, A Selection of Research Papers from IEREK Conference on Cultural Sustainable Tourism (CST), Greece, p. 96.

[43] Youssef, S. E. (2021). The Role of Digitization and Modern Technologies in Promoting and Enhancing Cultural Heritage, p. 286.

[44] Attiya, A. A. (2022). "Virtual Museums Between Digital Marketing and Heritage Digitization." Journal of Tourism, Hospitality and Heritage, Vol. 5, No. 3, p. 250.

museum collections and all heritage-related activities.[45] Therefore, the digitization of movable archaeological artifacts holds significant importance for museums in terms of protecting their resources and collections. It also ensures that information related to cultural heritage is digitally accessible to the public.[46] Digitization offers the major advantage of enabling virtual tours of exhibitions and museums for individuals who are unable to travel, allowing them to explore preserved collections abroad and to gain insights in preparation for potential future visits.[47]

Benefits of Executing Digitization of the artifacts of the Islamic Art Museum

In order to digitize the Islamic Art Museum's masterpieces, the following must be provided:

1. Material Resources: These primarily include computer systems, scanners, digital cameras, and other related hardware.

2. Software Tools: This refers to the collection, processing, and operation of data through both hardware and software systems. An automated information system is one that processes raw data and transforms it into usable information.[48]

3. Data: This includes written texts, tables, images, audio clips, video recordings, or historical sites, among others.[49] These may be referred to as the "raw materials" or "original sources" necessary for the successful digitization of the museum's artistic collections.[50]

Advantages of Implementing Digitization for the artifacts of the Islamic Art Museum

1. Preservation of Original and Rare Collections: Digitization serves as an effective tool for preserving rare and valuable information sources, especially those in fragile physical condition, which often prevents their direct accessibility. It minimizes or even eliminates the need for handling original copies by offering digital alternatives that are easily accessible to researchers and academics.

2. Resource and Collection Sharing: The ability to provide digital access to a single source by multiple users simultaneously is a key advantage of digitization. This approach overcomes the limitations of traditional collections, where access is often restricted by the limited number of physical copies available.

3. Remote Access via Information Networks: One of the defining features of digital collections is the ability to provide and exchange information remotely. Digitization facilitates online access to resources via information networks, allowing users from different locations to benefit from the collections without geographical constraints.

4. Preservation of Rare Documents and Manuscripts within the Museum: Digitization plays a crucial role in preserving rare and fragile documents and manuscripts housed in the museum, ensuring their longevity while making them accessible to researchers and academics for study.[51] This includes valuable manuscripts in fields such as medicine,

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[45] Youssef, S. E. (2021). The Role of Digitization and Modern Technologies in Promoting and Enhancing Cultural Heritage, pp. 293-295.

[46] Attiya, A. A. (2022). Virtual Museums Between Digital Marketing and Heritage Digitization, p. 251.

[47] Qoumid, F. (2024). The Importance of Preserving Digital Heritage and Its Challenges. Al-Kalim Journal, Vol. 9, No. 1, p. 297.   https://asjp.cerist.dz/en/article/245181

[48] Farrah, R. and Fadel, I. (2021). Cultural Heritage between the Necessities of Digitization and the Absence of Legislation, p. 178.

[49] Abdelhamid, M. M. (2023). Digital Transformation in Tourism and Its Role in Heritage Preservation. Journal of Tourism, Hospitality and Heritage (JTHH), Vol. 7, No. 1, p. 47.
https://doi.org/10.21608/SIS.2023.220830.1147

[50] Farrah, R. and Fadel, I. (2021). Cultural Heritage between the Necessities of Digitization and the Absence of Legislation, p. 179.

[51] Farrah, R. and Fadel, I. (2021). Cultural Heritage between the Necessities of Digitization and the Absence of Legislation, p. 178.

astronomy, and mathematics.[52] Consequently, digitization contributes to the sustainable preservation of the museum's artistic and cultural collections.[53]

5. Global Digital Promotion of the Museum's Artistic and Archaeological Artifacts: The digitization of cultural heritage represents a successful step toward expanding beyond the local framework into the realm of global tourism promotion.[54] By browsing the museum's website and viewing images of its artistic and archaeological treasures, online visitors may be inspired to experience the museum in person.[55]

6. Studying the Benefits of Digitizing the Museum's Artistic and Archaeological Collections: Exploring the advantages of digitizing the artistic and archaeological collections of the Islamic Art Museum represents a promising area for future research. Museum curators increasingly employ modern technologies to enhance the promotion of exhibitions, aiming to present the museum's content in a more engaging and impactful manner, while also broadening public access to reach a wider audience.[56]

7. Digitization as a Promotional Tool: Digitization can serve as an effective promotional tool by reducing the gap between the public and historically significant artifacts. Moreover, digital content can be presented through various technological platforms. Digitization enables the museum's cultural heritage to be continuously, simultaneously, and globally accessible, including items not typically displayed to the public due to limited exhibition space or the fragile condition of the objects.[57]

Obstacles of Digitizing the Masterpieces of the Islamic Art Museum

The digitization field faces various obstacles that impede the full digitization of both displayed and preserved artifacts in the museum, such as:

1. Funding and Costs: One of the primary obstacles is the lack of robust and extensive financial support to establish a comprehensive digital database. Many heritage institutions often rely on temporary project-based funding, which is insufficient for long-term digital archiving. Sustainable funding is closely tied to the availability of qualified personnel who can be employed on a long-term basis, rather than only for the duration of a project.[58]

2. The inability to find trained and specialized human resources capable of handling, developing, maintaining, and securing digitization software and data poses a significant challenge. National-level digitization requires a sufficient number of information technology specialists and proficient users of such software. Moreover, these personnel

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[52]Abo Agila, H. M., and Salama, A. A. (2024). Digitization in Conservation and Sustainability of Antiquities: Applying to the two witnesses, Zepa's Kadeen and Duran Hanim's in the mother's grave of Prince Muhammad Ali in the cemetery of Al-Imam Al-Shafi'i, Cairo. The International Journal of Tourism, Hospitality and Heritage Studies (IJTHS), 7(1), p. 75. 10.21608/ijthsx.2024.288490.1093

[53] Abdelhamid, M. M. (2023). Digital Transformation in Tourism and Its Role in Heritage Preservation, p. 47.

[54] Farrah, R. and Fadel, I. (2021). Cultural Heritage between the Necessities of Digitization and the Absence of Legislation, p. 180.

[55] Abdelhamid, M. M. (2023). Digital Transformation in Tourism and Its Role in Heritage Preservation, p. 48.

[56] Kamariotou, V., Kamariotou, M., Champipi, E., and Kitsios, F. (2021). Moving towards Museum Digital Strategy: A Transformational Framework. In: Sakas, D. P., Nasiopoulos, D. K., Taratuhina, Y. (Eds.), Business Intelligence and Modelling. Springer Proceedings in Business and Economics. Springer International Publishing, Switzerland, p. 401.

[57] Madanan, M., Hussain, N. and Khaliq, A. A. (2018). A Study of the Digitization Process to Preserve the Culture and Heritage of a Civilization Using Natural Language Processing and Its Impact on the Social, Economic and Scientific, p. 5552.

[58] Qoumid, F. (2024). The Importance of Preserving Digital Heritage and Its Challenges, p. 309.

require continuous training, as the tools and software associated with digitization evolve rapidly.[59]

3. The lack of Advanced Technological Infrastructure in addition to the shortage of essential hardware and software required to organize, preserve, and retrieve digital information efficiently. The high cost of specialized equipment, such as 3D scanning technologies, also represents a significant barrier to the widespread implementation of digitization processes.[60]

4. The lack of copyright protection for the museum's artistic and archaeological collections, such as photographs, publications, and digital content, represents a significant challenge to the digitization process.[61]

The Implementation of Digitization in Museums of World

The digitization process started in the 1970s, alongside the emergence of the technological revolution. However, the integration of technology into the museum field actually started slightly earlier, in the late 1960s, and was initially limited to the internal recording, organization, and management of collections.[62] In 1975, the initial digital databases for museum collections were created on computers, particularly the Joconde database[63] - a unified catalog of French museum collections. This database comprises more than 600,000 digital records of various artifacts, including antiquities, fine arts, ethnological items, and more. Most of the records are accompanied by illustrative images and are accessible online.[64]

This initiative was succeeded by the launch of the Mérimée database,[65] established in 1978 and released online in 1995. It is a specialized database focusing on French archaeological and architectural heritage, from prehistoric times to the modern era, including religious, domestic, agricultural, educational, military, and industrial architecture. As of October 2020, the database contained over 320,000 digital records.[66]These pioneering initiatives significantly contributed to advancing the digitization of cultural heritage, not only in France but also across museum institutions worldwide, laying the groundwork for global digitization programs within the museum sector.[67]

In Germany, between October 2012 and mid-2017, approximately 11,000 masterpieces from the Islamic Art Museum in Berlin were documented and digitized under the "Digitization Project of Yousef Jameel". The project team collected comprehensive information on the artifacts, including their historical background, provenance, materials, and manufacturing techniques. Additionally, numerous high-resolution and detailed images of the objects were captured. The primary goal of this project was to make a large portion of the museum's rich

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[59] Badr, A. A. G. (2024). Obstacles to Digital Transformation and Their Impact on Sustainable Development in the Arab World, p. 152.

[60] Abdelhamid, M. M. (2023). Digital Transformation in Tourism and Its Role in Heritage Preservation, p. 54.

[61] Mohammed, S. N. and Metwaly, H. K. (2023). Digitization and the Collection Sustainability: Report on the Grand Egyptian Museum Project, Egypt. Studies in Digital Heritage, Vol. 7, No. 2, pp. 164. http://Doi: 10.14434/sdh.v7i2.36417

[62] Yap, J. Q. H., Kamble, Z., Kuah, A. T. H. and Tolkach, D. (2024). The impact of digitalisation and digitisation in museums on memory-making, Current Issues in Tourism, Routledge, Vol. 27, No. 16, pp. 2549. DOI:10.1080/13683500.2024.2317912 (https://doi.org/10.1080/13683500.2024.2317912).

[63] Qoumid, F. (2024). The Importance of Preserving Digital Heritage and Its Challenges, p. 297.

[64]https://www.culture.gouv.fr/espace-documentation/bases-de-donnees/Fiches-bases-de-donnees/Joconde-catalogue-collectif-des-collections-des-musees-de-France (accessed on 19 July 2025, 6:00 PM).

[65] Qoumid, F. (2024). The Importance of Preserving Digital Heritage and Its Challenges, p. 297.

[66]https://www.culture.gouv.fr/espace-documentation/bases-de-donnees/Fiches-bases-de-donnees/merimee-une-base-de-donnees-du-patrimoine-monumental-francais-de-la-prehistoire-a-nos-jours (accessed on 19 July 2025, 6:20 PM).

[67] Qoumid, F. (2024). The Importance of Preserving Digital Heritage and Its Challenges, p. 297.

and diverse Islamic art collection accessible to the public, researchers, and scholars worldwide.[68]

Implementing the Digitization for the Artifacts at the Museum of Islamic Art

Digitization facilitates access to cultural heritage for both the public and researchers by enabling the integration of all digital data related to the artworks housed in the museum, making them accessible through online platforms.[69] Thus, the use of digital tools aids experts and professionals in structuring information and data concerning scientific research and the recording of history. They also have the ability to make this information more accessible to a wider audience.[70] The digitization process involves handling documents, creating and managing metadata, and utilizing various software and hardware tools. It requires programs for scanning and image processing, as well as for indexing and capturing photographs of the museum's archaeological artifacts.[71] The major progress in 3D imaging technologies has positively influenced digital heritage. The use of 3D techniques has become crucial, particularly because many artifacts are extremely delicate and require special handling. Today, with the progress in image capturing and technologies for processing, high-quality data acquisition is possible with portable equipment and applications such as SELVA 3D, Smoothie 3D, and Autodesk 12 3D. These programs are capable of convert a two-dimensional static image into a three-dimensional digital representation by processing multiple images taken from various angles to generate an accurate three-dimensional representation.[72]

Using high-resolution scanning and 3D modeling techniques, digital replicas of museum exhibits can be created, significantly reducing the need for direct handling or physical display. This, in turn, helps extend the artifacts lifespan by minimizing exposure to environmental and human-related risks.[73] Given the widespread use of digital technologies in capturing and storing artistic artifacts, the importance of preserving this data for the future has become increasingly critical. Digital conservation is more dependable than tangible conservation, due to ongoing improvements in processing system performance and the declining cost of archival media.[74]

The digitization of artifacts will undoubtedly enhance accessibility and efficiency, but the information contained within must be completely unlocked and easily searchable There is no doubt that the digitization of archaeological artistic artifacts (within the Islamic Art Museum) enhances their accessibility and efficiency. However, it is essential that the associated information be fully available, and easy to search, navigate, and query.[75]

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[68]https://www.smb.museum/en/museums-institutions/museum-fuer-islamische-kunst/collection-research/research-cooperation/yousef-jameel-digitalization-project/?utm_source=chatgpt.com (accessed on 19 July 2025, 7:15 PM).

[69] Qoumid, F. (2024). The Importance of Preserving Digital Heritage and Its Challenges, p. 296.

[70] Economou, M. (2015). Heritage in the Digital Age. In book: A Companion to Heritage Studies, p.217. https://doi.org/10.1002/9781118486634.ch15

[71] Madanan, M., Hussain, N. and Khaliq, A. A. (2018). A Study of the Digitization Process to Preserve the Culture and Heritage of a Civilization Using Natural Language Processing and Its Impact on the Social, p. 5552, 5556

[72] Belhi, A., Foufou, S., Bouras, A. and Sadka, A. (2017). Digitization and Preservation of Cultural Heritage Products, p. 246.

[73] Xia, Q., Wang, Q., and Xue, J. (2024). The Process of Museum Digitization Technology, p. 1.

[74] Belhi, A., Foufou, S., Bouras, A. and Sadka, A. (2017). Digitization and Preservation of Cultural Heritage Products, p. 248.

[75] Madanan, M., Hussain, N. and Khaliq, A. A. (2018). A Study of the Digitization Process to Preserve the Culture and Heritage of a Civilization Using Natural Language Processing and Its Impact on the Social, p. 5554.

In light of the above, the researcher proposes that, in order to implement and utilize digitization for the preservation and documentation of both stored and displayed artifacts at the Islamic Art Museum situated in Cairo, as well as in external exhibitions, it is essential to establish a digital register on computer systems. This process, known as the digitization of archaeological artistic artifacts, should include all data and information related to the artifact, according to the model developed by the researcher, as outlined below:

Essential data for digitizing an archaeological artifact within the Museum of Islamic Art in Cairo	
1. Descriptive Metadata	
Elements	**Identification**
Object Name / Title	Known or Official Name
Description	Detailed textual description of the shape, function, characteristics, and decorative elements, supported by references and sources, as provided by specialists in the relevant field
Inscriptions	Type of Inscription Script on the Object
Material	e.g., wood, stone, bronze, etc.
Dimensions	Length, width, height.
Weight	If available
Types of Decoration	Geometric decorations, vegetal motifs, representations of living beings
Current Condition	Is it complete, broken, or restored?
Original Function of the Object	The function of the archaeological artistic object.
Ruler / Sultan	Name of the ruler or sultan who commissioned the artifact or during whose reign it was produced
Artist	Name of the artist who created the object
2. Historical and Geographical Data	
Period/Historical Era	Umayyad Period, Abbasid Period, Tulunid Period, etc.
Approximate Dating	Indicated in Hijri and Gregorian years and centuries.
Place of Discovery	The original site or archaeological excavation location.
Current Location	The artifact's location within the museum (e.g., gallery or exhibition hall No.) or in storage area
3. Digital Data (Pertaining to the Digitization Process)	
Photographic Images	High-quality images from multiple angles are used to document the current condition of the artifact.
Scanner	-If the object is flat, a high-resolution 2D scanner is employed. -If the object is three-dimensional, a 3D scanner is used, such as: Laser Scanner, Structured Light Scanner, or Photogrammetry technique, which relies on merging multiple images to produce a 3D model.
Type of Digitization	Types of digital outputs may include images, videos, 3D models, X-ray scans, or spectral imaging.
File Format	File formats used JPEG, OBJ, STL, TIFF, PNG, among others.
Digitization Resolution	It refers to the scan quality, point density in the model, and spatial accuracy.
4. Documentation and Ownership Data	
Registration Number	Registration code or object ID used by the museum to catalog the artifact.
Excavating Mission	The mission that discovered the artifact and when it started and ended
Current Owner	The museum or institution that currently owns the artifact, or information on whether it was acquired through purchase, donation, or transfer from another entity.
Copyrights	Details on whether there are any copyright, intellectual property, or

	institutional restrictions on the digital reproduction, sharing, or online publication of the artifact's images or data.
5. Supplementary Data	
Scientific References	In which the artifact is mentioned, such as books, journals, and academic thesis manuscripts.
Comparative Analysis	It includes similarities and differences with other objects.
Related Documents	They include excavation reports, restoration reports, etc.
Scholarly Dissemination	Published Studies and research conducted on the masterpieces of the Islamic Art Museum situated in Cairo.*

Conclusion

It is clear from this study that digitization serves as a pivotal tool in the preservation and study of movable archaeological artifacts, with a focus on the Islamic Art Museum situated in Cairo as an applied model. Digitization offers advanced technical capabilities that contribute to the accurate documentation of artistic collections, their protection from deterioration, and enhanced accessibility for researchers, academics, and interested audiences without the need for direct contact with the original objects. Despite these advantages, several challenges persist, most notably the weakness of technological infrastructure, the shortage of specialized personnel, and the high cost of digital equipment and tools.

Study Results

1. The study concluded that digitization is an effective means for preserving and maintaining museum collections through documentation, organization, exploration, and dissemination, which facilitates protection from deterioration or loss and ensures preservation for future generations.

2. The study found that digitization has become a modern method for preserving information and data about artifacts in museums.

3. The study concluded that digitization makes museum collections accessible to all audiences, whether they are visitors or researchers. Individuals who are unable to physically visit the museum can explore its collections through virtual tours, 3D models, and digital archives.

4. The study found that digitization aims to build digital databases containing bibliographic information, texts, images, and artifact-related data, stored on high-capacity media and offering diverse content services.

5. The study concluded that the success of digitizing the collections of the Islamic Art Museum requires the availability of physical resources, software, and data to achieve its goals of preservation, documentation, and dissemination.

6. The first digital museum databases were established in France, represented by the "Joconde" database, followed by the "Mérimée" database.

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* Numerous studies and research papers have been conducted on specific museum objects by researchers and archaeologists working either at the Museum of Islamic Art or in academic departments related to Islamic arts and archaeology in various universities. Copies of these studies are preserved in the museum's library. These documents are considered distinctive assets of the institution, as they contribute significantly to enabling the museum to fulfill its role in research and academic inquiry. Such studies are directly connected to the museum's collections and must comply with all legal and ethical standards. They should be carried out using academic methodologies that support the museum's mission and reinforce its scientific and cultural objectives. (Source: Mohamed, N. K. (2020), *The Functions of the Museum and Its Archive*, The Scientific Journal for Libraries, Documents, and Information, Vol. 2, Issue 4, p. 363).

7. The study found that digital records help preserve rare or fragile artifacts. High-resolution images, 3D scanning, and digital replicas ensure the preservation of artifact details.

8. The study identified that the main challenges facing the digitization of the Islamic Art Museum situated in Cairo include funding and costs, weak technological infrastructure, a lack of qualified personnel, and insufficient intellectual property protection.

9. The study found that digital exhibitions can be enhanced using Augmented Reality (AR), Virtual Reality (VR), and responsive displays, allowing visitors to interact with the exhibits in innovative and enjoyable ways.

10. The study concluded that digitization supports scientific and academic research by enabling researchers and scholars to access detailed data and comprehensive information without temporal or spatial limitations. It also makes digital content more accessible, thereby enhancing the museum's role in supporting academic inquiry.

11. The digitization of museum exhibits represents a scientific method for protecting original artifacts from damage and theft by minimizing direct contact and providing accurate digital alternatives.

12. Digital tools enable the museum to tell richer stories. Exhibits can be accompanied by audio guides, videos, and interactive storytelling that explain the historical context, background, and personal narratives from various Islamic periods.

13. The study concluded that digitization is a powerful means of preserving a country's identity and historical memory, ensuring that tangible cultural heritage is not lost over time.

14. The study demonstrated that digitization significantly aids in the recovery of stolen or forged archaeological artifacts by providing detailed digital records, including high-resolution images and comprehensive metadata for each artifact.

15. The study found that digitization is an effective way to connect the past with the present and future, by transferring heritage from paper archives to advanced digital media via the internet and modern technologies.

Recommendations

1. The website of the Islamic Art Museum situated in Cairo should be updated to include comprehensive digital information derived from the digitization and documentation of both displayed and stored artifacts, so that they can be easily viewed, studied, and utilized in scientific and academic research.

2. The procedures for obtaining the necessary information and data about both displayed and stored archaeological artifacts should be simplified and facilitated for researchers and academics, in order to enhance their use in scientific and academic studies.

3. The study recommends the implementation of a comprehensive and accurate digitization project for all archaeological artworks in the Islamic Art Museum situated in Cairo, including both exhibited and objects in storage. This should be carried out using the latest scanning technologies, photogrammetry, and 3D modeling techniques to ensure the creation of high-fidelity digital replicas. These digital copies will preserve precise artistic and technical details and contribute to preserving cultural heritage from deterioration or loss.

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دور الرقمنة في حفظ ودراسة التحف الآثرية المنقولة: متحف الفن الإسلامي بالقاهرة إنموذجا

رمضان أحمد محمد السيد

كلية السياحة والفنادق، جامعة 6 أكتوبر، الجيزة، جمهورية مصر العربية.

الملخص باللغة العربية:

يعد متحف الفن الإسلامي بالقاهرة من أهم وأقدم المتاحف المتخصصة في الفن الإسلامي على مستوى العالم، حيث يضم أكبر وأروع مجموعة مكتملة من الآثار الإسلامية المنقولة، تقدر بحوالي مائة وثلاثة آلاف تحفة أثرية تشمل جميع فروع الفن الإسلامي في مختلف العصور الإسلامية. وقد قام عدد كبير من الباحثين بإجراء أبحاث عديدة على معظم التحف الفنية داخل المتحف. وتتنوع هذه المجموعة ما بين تحف خشبية، وزجاجية، وخزفية، ومعادن، ونسيج، وحُليٍّ، ومسكوكات، وأسلحة، وأحجار، ورخام، ومخطوطات. ويضم المتحف أقسام للفلك, والرياضيات، والعلوم، والطب. وتكمن أهمية هذه الدراسة في استخدام التكنولوجيا والرقمنة في حفظ وتوثيق القطع المخزونة والمعروضة داخل المتحف وفي المعارض الخارجية. والهدف من هذه الدراسة هو التعريف بأهمية استخدام الرقمنة في حصر وتسجيل وتوثيق وتعريف وحفظ التحف الفنية داخل متحف الفن الإسلامي بالقاهرة سواء المعروضة أو المخزونة. كما تهدف أيضاً الدراسة إلى توفير كل مصادر المعلومات المناسبة والصور للمستفيدين من الباحثين والدارسين داخل وخارج مصر. كذلك أيضا حماية هذه التحف المنقولة من التعرض للسرقة والتزوير. ويعتمد البحث على المنهج الوصفي التحليلي حيث يصف واقع الرقمنة في المتاحف عامة، وفي متحف الفن الإسلامي بالقاهرة خاصة، من خلال دراسة مشروعات الرقمنة، وأدواتها، وتقنياتها. ثم تحليل مدى فاعليتها في حفظ وصون ودراسة التحف الآثرية المنقولة.

الكلمات الدالة: الرقمنة، تكنولوجيا، التحف المنقولة، حفظ، متحف الفن الإسلامي بالقاهرة.