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A Proposed Study for Applying the QR Code as a Comprehensive Guide to Museums and Archaeological Sites

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Abstract

Advanced technology is used nowadays as an essential instrument in research papers. Scholars strongly seek to use the QR code in the archaeological realm, which is considered a great gateway to reliable resources. Yet, this paper not only depended on applying QR codes in historical places where they are distinguished with artistic and archaeological value but also employed in storing objects and artifacts in museums. Thus, this paper proposed to apply the QR Codes to store and document artifact collections in museums, as well as to present historical sites by expedition giving an example in the Isis temple in the city of Aswan. QR code is distinguished by linking the information about objects in the storage museums to the electronic system of the institution within the QR code. To demonstrate this, the paper reports two experiments using QR codes generated by a free website. One of the best websites is the Me-QR website. The QR codes can be scanned by smartphones, iPads, or tablets using any scanning platform, and they can display different types of documentation, registration, and restoration data. However, this method requires internet access. The paper concludes that this method can save time and enhance the accessibility of information about archaeological objects and sites.

Keywords: *QR Code- Technology- Stored objects- Documentation*

1. Introduction

During the last few decades, information and communications technologies (ICT) have played a significant role in the archaeological field. It applied many tools in order to discover, study, interpret, and present the human heritage in a more complete way than traditional methods. Geophysics, Geo-graphic Information Systems (GIS), electronic databases, multimedia applications, Internet websites, virtual and augmented reality, and 3D are all previous points for serving and fitting in the purpose of an archaeological domain (Tsiafaki & Michailidou, 2015).

The power of technology makes collecting, preserving, and disseminating processes effective and efficient (Tim et al., 2018). Digital interaction plays an essential role in managing and distributing information on a personal and social level. There is consistent information that is digitally born and available in digital format. The digital hermeneutic includes knowledge, which is exchanged through simulation, interaction, interpretation, validation, communication, transmission, data recording, and data processing (Remondino & Campana, 2014). It was defined as “the *digital documentation (meta-documentation functionality)* is defined as a systematically structuring data and meta-data on such intangible aspects as history, anthropology, economics, religion, sociology, psychology, etc. For such a system a vast number of different types of data must be collected and cross-referenced” (styliads,2007. P499).

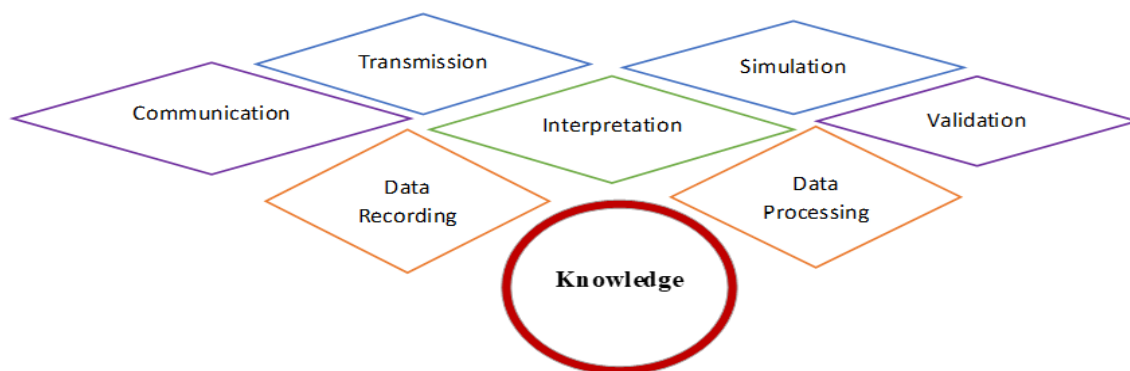


Fig 1. Digital Hermeneutic (Remondino & Campana, 2014)

Moreover, it is necessary for museums to maintain records of all artifacts in their possession. A written collections policy should outline the procedures for accepting, removing, recording, lending, and maintaining artifacts in general. Proper documentation of museum records should include, the date, method, and source of acquisition to establish legal ownership, The date of

accession, the collection it belongs to, and its accession number. A comprehensive catalog entry that includes a full description of the object and a photograph. Any damage to the object. Results of periodic condition reports that help determine deterioration rates, if any and Details of any conservation treatments on the object (Texas Historical Commission, 2013)

McManamon (2014) defined the Digital archaeological data as “documents created as digital files or scanned to create digital versions of documents (e.g., pdf, Word, rtf), data sets sheet (e.g., Excel spreadsheets and Access databases), images (e.g., jpeg, tiff, and other standard image file formats), and other kinds of digital files that result from contemporary archaeological investigations and research”, museums are followed diverse array of electronic information systems that administrated the museum’s business and work procedures. Content management system (CMS) is the primary information system used in the museums and supported the next digital systems. digital assets management (DAM), digital rights management (DRM), and in-house multimedia systems exhibition and education displays. Recently, there are significant development in the digital systems at the museums which digitalize collections, provide search and application services. Dynamic light scattering (DLS) is used in the museum for promoting the museum’s collections (Wu, 2016).

This study aims to use the QR code to record archaeological data and information for artifacts stored in museum stores as a digital means to document museum collections in the archaeological store instead of traditional documentation methods. This scientific paper also aims to use the QR code to record all data related to the ongoing archaeological site in Exploration in the field to the rapid response code, where everything discovered is entered into the rapid response code by the mission responsible for the archaeological discovery. Moreover, the QR codes illustrates several advantages, such as secrecy, safety, high data storage capacity, fast scanning, fix mistakes any time, Customizable, offer more for less, Mobile-friendly and easy return to data by only scanning the encoded QR code labels.

In terms of the previously conducted studies, Marakos (2015) was a qualitative study that intended to scan the printed QR code on the paper next to the displayed objects/ building labels in the museums or archeological sites. Pérez-Sanagustín et al. (2016) conducted two different controlled experiments in order to examine the effects of QR codes on visitor engagement in museum-like spaces. Mogali et al. (2019) deliberated that Scan and Learn: Quick Response Code Enabled Museum for Mobile Learning of Anatomy and Pathology. Rongbuttsri et al. (2017) stated

that the Information on the mobile application can be fetched by scanning QR code and Users can walk within the area and scan a QR code on a tree to get a specific information in the jubilee Museum of Agriculture Office. Jorge Martínez-Moreno et al. (2010) stated that Data matrix code has been used in digital documentation at archeological fieldwork throughout stick a little encoded data matrix on excavated artifacts. Forssman et al. (2016) illustrated that applied the quick response (QR) codes at Telperion Shelter in South Africa. Francis (2014) demonstrated that documenting archaeological data throughout using automat methods such as created digital files or scanned to create digital versions of documents. Furthermore, to the authors' knowledge, none of the previously mentioned studies investigated the role of the QR code in documentation of the stored objects in the museum's storages and illustrate the role of QR code to the expedition mission in the discovery site with an implementation the QR code in the ISIS temple that located in the center of Aswan city as an instance. Therefore, the principal aim of the study is to procedure the QR code in registration and documentation on stored objects in the storages of the museums. Additionally, demonstrate the way of utilization of QR code in expedition missions at the field work to append recent information at the speed response code.

To fulfill the purpose of the paper, it is required to answer the main questions: How can QR codes be used in the documentation of archaeological objects in museum's storage areas? And following by the next one is how can QR codes be used for expedition missions in archaeological buildings?

2. Literature Review

The literature review part presents some information on QR codes. This information includes the first version of the QR code, the definition, the types, the structure and finally the utilization of QR Code.

2.1 First Version of QR Code

The QR code is a two-dimensional symbol, and it was invented in 1994 by Denso, one of the major Toyota group companies, and approved as an ISO international standard (ISO/IEC 18004) in June 2000 and, it was two-dimensional symbol (Soon, 2008).

2.2 Definition of QR Code

There are a number of definitions for QR codes coined by several scholars, Thus, QR Code is "In 1994, the two-dimensional symbol of QR codes was Invented by one of the major Toyota groups named "Denso" and in June 2000 it became the ISO international standard

(ISO/IEC18004). Initially, the goal of the QR code creation was to control the production of automotive parts, but suddenly, it has become widespread in other fields. Recently, QR Code is seen and used every day everywhere (Soon, 2008). Also, another definition " Quick Response code is a 2D matrix code that is designed by keeping two points under consideration, i.e. Although the QR code is a small code, it is capable of storing a large amount of data as compared to 1D barcodes, which provides high data storage capacity, fast scanning, omnidirectional readability, and many other advantages including error-correction (so that damaged code can also be read successfully) and different type of versions. (Tiwari,2016). The colored QR code is increased the capacity of storing data which means the techniques of storing data rely on many colors include red, green, blue, black and white (Tank et al., 2016).

There are two ways for obtaining information via QR code. Firstly, through the scanning by the mobile phon. Secondly during the URL of the QR code around the artifacts. Moreover, museums and locations dedicated to cultural heritage provide tourists with internet connection so they can learn more using their own mobile devices. This benefit expanded throughout Spain, as seen by the Fadrique Book Museum in Basel, Burgos, or the Blbilis Deposit in Calatayud (Rivero & López Benito, 2013).

2.3 Characteristics of QR code

QR code has several of Characteristics which made people used and applied it in the foundations. this feature helps foundations to store a numerous data in a small symbol. This characteristic can be followed (Singh, 2016):

- ***High Storage Capacity***

The QR codes can store about 7,089 letters of information and it's a huge number compared with barcode.

- ***Encodable Character Set***

It can store numeric data such as numbers from 0-9 and alphanumeric data (letter: A-z, digit 0-9, space: %+/_*).

- ***Small Printout Size***

The data in QR code is saved in two directions horizontal and vertical. Due to this feature, the QR code store lots of information.

- ***360 Degree Reading***

The QR code is read from any direction. This feature is provided by finder pattern, which exist in the three corners of the QR code.

- ***Capability of Restoring and Error Correction***

Data can be recovered, if any part of QR code suffer from damage or dirty, the area containing the right information can be the focus of the error detecting process.

2.3 Types of QR Code

- ***Barcode***

The barcode was used significantly in the society because of its efficiency and characteristics. The barcode stored different data whether the characters or information and printed in a small storage symbol. Therefore, the barcode in one direction and there are two types of barcodes the first one is type 39 and the second one is type 128 (Ali & Farhan, 2019)

- ***Micro QR code***

For defining the micro QR code as “the micro QR code is a two-dimensional barcode feature similarity to QR Code, but reduces in composition to make QR Code less complex Therefore, the size of barcode become small and could store up to 35 characters. The size of Micro QR Code version M4 is equivalent to 17 modules x 17modules.” (Wiputtikul and Vongpradhip, 2013)

- ***Dot code***

Whilst the Dot code is one of the matrix symbology barcodes family and this pattern is identified the mapping of modules in some type's matrix pattern or grid pattern. In addition, Dot code allows to the foundations and companies putting up unique, serialized machine-readable codes onto products (Berisso, 2018)

- ***Data Matrix***

the Data Matrix codes are part of the 2-D barcode group, which is extensively used for product marking in storage, production, distribution, and sales processes. Their compact matrix structure allows for storing a large amount of information in a small area compared to conventional 1-D barcodes (Karrach & Pivarčiová, 2018). interpreted that the QR code is A 2-D barcode is a symbol that can store large amounts of information. It consists of white and black geometric modules that are arranged alternately in the vertical and horizontal directions according to certain rules. The data matrix code is the smallest 2-D barcode in the world and is widely used in electronic product components (Huang et al., 2012). 2-D barcode recognition technology has great

commercial value, and most commercial recognition algorithms are proprietary and protected by patents (Xiao et al., 2008).

- ***Aztec Code***

The Aztec Code is a 2D barcode invented by Andrew Longacre, Jr. in 1995, is designed for **ease-of-printing** and **ease-of-decoding**. The symbols are square overall on a square grid with a square central bullseye finder. The smallest Aztec Code symbol is 15x15 modules square, while the largest is 151x151. The smallest symbol can encode 13 numeric or 12 alphabetic characters, whereas the largest symbol can encode 3832 numeric or 3067 alphabetic characters or 1914 bytes of data. No quiet zone is required outside the bounds of the symbol (Zhang & Ke, 2010).

2.4 QR Code Structure

The QR code structure is a matrix organized in a square that holds encoded data using three parts (Fig2). Firstly, Patterns parts involve finder pattern, alignment pattern and timing patterns. Secondly, a quiet zone. A quiet zone is a free space around the boundary of a label. Thirdly, the encoded data, which are encoded in binary, is represented by black and white cells (Sendino, 2013).

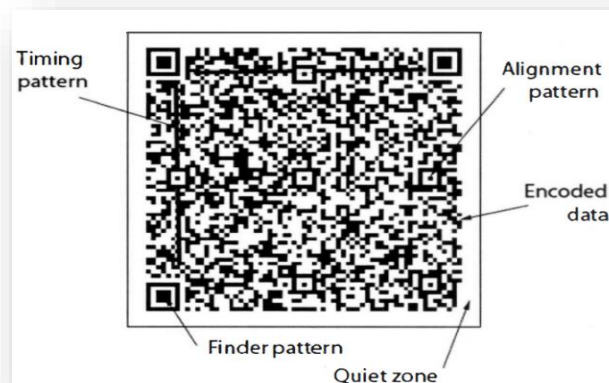


Fig 2. QR code structure, After (Sendino, 2013)

2.5 The Structure of QR code

Chen and Lei (2012) described the patterns as follows:

- ***Finder pattern***

This pattern is existed in the three corners on the symbol of the QR code in includes the size, the position and the angle on the symbol. The patten's job is detecting the of the QR code symbol.

- ***Alignment pattern***

The alignment is the coordination in the center of the QR symbol and the job of the alignment pattern on the QR code is correcting the distortion of the QR code's symbols and making the detection of central coordinate easier on encoded QR code.

- ***Timing Pattern***

The Timing pattern is selecting the central coordinates in each cell on the QR code in the back and white patterns which arranged alternately. The arrangement of the cells is in both vertical and horizontal directions.

- ***Quiet Zone***

The Quiet zone is the space part around the QR code cells and it is necessary for reading the QR code. Moreover, the quiet zone makes the symbol easier to detect from among. Additionally, four cells are necessary for the Quiet zone on symbol.

- ***Data Area***

The data field will include the encoded data from the QR Code. The information will be transformed to binary numbers of '0' and '1', which will then be arranged into black and white cells in accordance with the encoding rule. Reed-Solomon codes will be inserted into the data area for the purpose of the error repair feature.

2.4 Utilization of QR Code

The archaeological field was not overlooked by the QR code in the museum, which provides accessibility to countless information about objects. Labels provide brief material about artifacts. Therefore, museums use QR codes to grant visitors more knowledge by scanning them with their iPad or mobile phone (Haworth & Williams, 2012). Ceipidor et al. (2009) stated that Edu-games used in museums require graphics and interaction to get information about objects in an enthusiastic way. Thus, they provide students and tourists with an enjoyable experience and a desire to visit museums regularly by using 2D QR codes, mobile phones, and a built-in camera.

Kan et al. (2009) specified that numerous details and 3D representations of images and objects can be found in QR codes. Therefore, it is not essential to directly scan a camera facing a QR code to access information. The simplest way to obtain information is to download the 3D

models for QR codes from the internet using their URLs. This suggests that we can alter the content while maintaining the integrity of the QR Code.

2.5 QR code error correction

Dheyab et al. (2023) illustrated that The QR codes exposure to damage such as dirty or cutting Then the content of QR code could be missed by the damage. Therefore, the QR code error correction is used for extracting the content of QR code without error and this is achieved by adding error corrections samples to the data code word sequentially. According to Tan et al. (2018) the QR code error correction is divided into four categories L 7%, M 15%, Q 25% and H 30% then level L is the weakest damage while the level H is the strongest error correction. Additionally, Dheyab et al. (2023) demonstrated that the Reed-Solomon method is a mathematical method to correct the error data in transmission process. Yu et al. (2019) stated that the Hamming code also is used to correct the unclear pixels on QR code which promoted the efficiency of the pixels. There were several studies about the utilization of QR codes in the museums.

3. Methodology

The methodology part presents the study's research design, stages and procedures. It also presents experimental study steps and the examples upon which the study was applied.

3.1 Research Design

This paper is a proposed study that consists of two parts; the first part is theoretical, and the second part is experimental. The foundational philosophy is interpretivist because the study is on qualitative basis that explains the utilization of the QR code in archaeological documentation.

3.2 Samples of the study

This study used two samples to illustrate the importance of the QR code. The first sample are collection of forms which utilize in storing museums' collections of artifacts at the storing areas. These forms are for documentation, registration and application for registration of antiquities in excavation sites. These forms were obtained from trusted sources such as the Ministry of Tourism and Antiquities website, books, articles and published papers.

The second sample is a detailed description about playing role of the QR code in the ongoing expedition missions with an example in ISIS temple in Aswan, it was discovered recently, and the expeditions have been working on it to explore all the paintings and designs on the walls as well

as the directions of texts and interpret the symbols. The temple is missing the guidelines that supply visitors with information, except for an informative board that describes the design of the temple. It has been noted that QR codes play a significant role in Egypt, particularly in Aswan Governorate because this temple lacks information and descriptions.

4. Research Stages and Procedures

The study is divided into two parts starting with the theoretical part, which includes an introduction, a literature review, a description of samples, types of samples, and ways to collect samples. The other part is a practical experiment on applying the QR code in an ISIS temple and on a few stored forms for describing artifacts. The QR code application was used to record and preserve information with pictures by following a multitude of steps.

- 4.1 The literature was reviewed with regard to the role of technology and the traditional way of documenting and storing the object until the gap of study about using one of the applications, the QR code for documentation and storage.
- 4.2 The literature review demonstrates the value of QR codes as a contemporary way to save data about objects and provides plenty of distinguishing features like secrecy, safety, long-storage data, insert modifications, easy downloadability and review only by those responsible for objects in the foundation.
- 4.3 Collect data about the stored artifacts forms obtained from trusted sources with explanations for the forms and ISIS temple in Aswan.
- 4.4 Open the QR code and register an email with it. Then, fill out the form on the website.
- 4.5 Use the QR code application, follow many steps to insert information and pictures that relate to the artifacts.
- 4.6 After finishing all of the stages, the QR code creator had the encoded code for the objects. On top of that, the QR code could be printed and put on unharmed paper to stick it on the informative board at the temple, or it could be stuck on a storage place beside the artifacts or on objects. Then, visitors or the man in charge of the artifacts could have an easy way to reach to detailed data about objects.
- 4.7 Collect data to reach to the findings of the study.
- 4.8 Finally, discuss the results of the experiment concerning the QR code in ISIS temple and the stored artifacts.

5. Data Collection

Collecting a bunch of information about stored artifacts, criteria for storing objects, and methods of storing objects in museums to provide protection to the stored collection of artifacts in a controlled environment. Else, collecting data about the Isis temple in Aswan, which encompasses various titles, even if headings or subheadings about the location, history of the temple, discovery time, external description, and internal description.

5.1 Isis Temple

The ISIS temple is one of the most significant temples in Aswan that added to the ancient Egyptian civilization. This section describes the ISIS temple, including the date it was discovered, its structural layout, its map, and the internal and external forms. Additionally, it relates to the stored objects and how to apply the QR Code on them.

5.1.1 Location

The temple of ISIS is located on the eastern bank of the Aswan Governorate, next to the city's eastern boundary. Part of the temple was constructed during the reigns of Ptolemy III and Ptolemy IV, but it was afterwards turned into a church. The temple is one of the most significant archaeological discoveries since it has been preserved in an excellent form since its discovery in 1871. The temple still stands tall with its four majestic walls and characteristic stone panels on the dome (Ministry of Tourism and Antiquities).



Fig 3. Isis temple in Aswan, After (Dijkstra & van Loon, 2013)

Based on Dijkstra and Van Loon (2013) the temple of ISIS dates back to the Ptolemaic era; it was discovered by the rail road's engineers in 1871 from Aswan to Shellal. It lies buried deep in the middle of ancient houses. There are several reliefs and hieroglyphic text on the walls of the temple. Many plans and copies were published at the end of the nineteenth century. In 1971, the Italian expedition made a significant difference in Isis's temple. They release lots of graffiti from the walls of the temple, including text and symbols. In addition, they did some editing on hieroglyphic text and decorated blocks spread around the building.

5.1.2 Description of ISIS Temple

On the western side, there are two entrances to the temple, one in the middle of the facade and the other to the far left of the main entrance. The beautiful pictures representing the king making offerings to the gods (State - Anket - Khnum), known as the Aswan trinity, can be seen on the back wall of the temple's main hall. Several Coptic inscriptions were discovered during the Italian expedition's restoration work, as well as a rare architectural sketch depicting the original plan of the temple on the walls. All of this, as well as the ruins of Roman and Islamic brick buildings, may be seen.

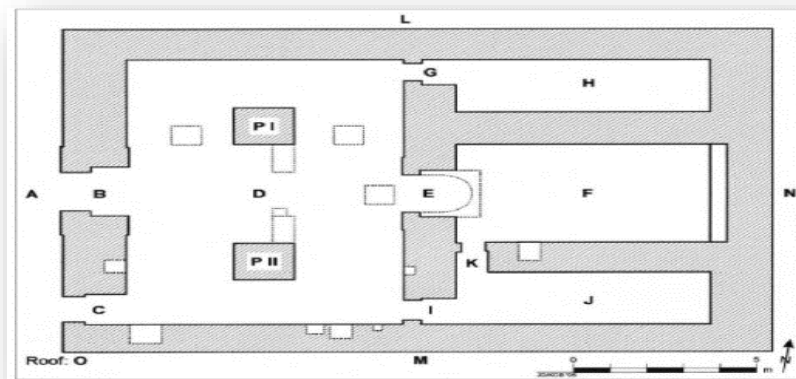


Fig 4. The Key Map of Isis Temple, After (Dijkstra & van Loon, 2013)

Based on the description of the Egyptian *Ministry of Tourism and Antiquities* (2023), the grand main gate, at the center of the temple's facade, is painted with colorful scenery and writings, and above it is the winged sun disc. The entry leads to a transverse hall with three separate rooms in the midst of the Holy of Holies Hall. The Holy of Holies chamber is placed in the center of the temple and is accessed by an entrance capped by the winged sun disc. It is also embellished with a number of amazing sceneries, some of which feature beer being served to ISIS, another depicting the goddess Maat being presented to the god Khnum, and yet another picture depicting pure water being poured on the goddess ISIS (Egyptian Ministry of Tourism and Antiquities, 2023).

5.2 Storing objects

The main mission of museums is to preserve and conserve their collections, in addition to reducing environmental deterioration and risks. Therefore, the museums committee should create a set of definition cards for all collections, whether they are displaying or storing objects of cultural heritage by applying appropriate measures and actions for registration, storage, handling, packing and transportation, security, environmental management, emergency planning, staff and public awareness and legal compliance by controlling humidity, temperature, light, pollution and pests (Leskard, 2015).

Storing museum collection depends on physical space and is a continuous process according to NPS Museum Handbook (2001):

- It is a special storage area for museum objects, natural history specimens, and archival materials. This area has been created or modified to satisfy standards and requirements for the collection's preservation, protection, and accessibility.
- It is the continual process of enclosing, organizing, and caring for the collection while it is in storage. This includes assessing and adopting ideas and approaches to improve the collection's condition and long-term preservation.

All storage options should consider the consequences of the decision for the protection and preservation of collections.

5.2.1 Museum Stores Design Standards

Museum functions include customizing a part for storing objects as one of the strands of a structural building. Storage facilities require special design depending on many reasons, including protecting the museum's collections. The storage area is usually located inside the museum, and it is normal to access the internal storage through secure corridors. The storage domain is designed with insulating walls and floors to protect objects from environmental factors such as humidity, light and temperature. In respect of storage, there should be stability and control on environmental changes by some devices to measure temperature, humidity, light and finally pollution. There are specific spaces in order to save the antiquities (Ahmed Ali Mustafa, 2022).

5.2.2 Monitoring Instruments

There are some instruments used at museums for monitoring the internal environments and selecting the phases of Relative Humidity (RH) and temperature at cabinets, such as 12 Elsec 764 C data loggers that were employed at the Smithsonian's Museum conservation institute. Moreover, there are small, long battery life, high quality and reliable monitoring parameters placed in cabinets to measure the potential variation of environmental changes. In addition, the parameters connect to the computer through the port to transmit the recorded measurements. Then, the results could be compared with museum conservation conditions standards and export the excel data files for further analysis (Szczepanowska et al., 2013).

5.2.3 Storage Cabinets

Most of museums have conservation criteria for preserving and storing objects. The average RH levels remain within a range of 37.6–44.8% with a relatively low standard deviation. Museums provide computer-aided software to track storage spaces, modern technology, equipment for moving artifacts, and the use of archival material in the organizations (Sharma, 2021).

5.2.4 Applying Data Matrix as A Documentation Method

An experiment was conducted at the La Roca dels Bous site in the city of Sant Llorenç de Montgai, Spain, to apply modern documentation to the discovered antiquities by pasting a sheet of polyethylene containing a data matrix code to store all the data and information about the artifact, such as the code and number of the artifact, the location of the find, and then pasting the data code. matrix on archaeological artifacts using an adhesive that does not harm the antiquities of paraloid B72. The data matrix is characterized by its small size and the entry of a large number of information, as its storage space ranges from 1 byte to 1556 bytes (Martínez-Moreno et al., 2011).

6. Proposed experiments

In renowned foundations or museums, there are two types of processes for preserving and storing objects: the traditional way by writing the whole data in notebooks and the electronic way, which are both relevant to the administrative system of the foundation. Unfortunately, they do not utilize QR codes in documentation. Information is supposed to be added regularly on these systems and the person who is in charge of the artifacts should add the newly obtained data about the artifacts and he/she is the only one who can add, edit or delete the information of the objects. Other people could only read the data by scanning without editions. Additionally, this person is informed with any new information discovered by scholars following conducting any new studies on the stored objects.

The Me QR website is the latest version released by (ME TEAM LTD) company. It was established in 2021. Although it was released recently, it has made significant progress compared to other competitor's websites for QR codes. There are four million users who utilize the website monthly to accomplish their tasks and aims by using QR codes. Users have to create an email on the website to log in. Additionally, there is an easier registration process on the website using a Google account. Moreover, at the top of the page, the website provides some suggestions to help users know information about website such as why ME-QR, QR scanner, pricing, FAQ, support, and language selection and the website displays the number of QR codes, users, and scans. The first page of the website contains various objects that can be created using word code symbols such as PDFs, links or URLs, Wi-Fi, images, audio files, and social websites.

The experiment started by applying QR codes on stored objects and explaining the ISIS temple in Aswan (Appendix F). This process was implemented by following several steps. First, logging onto one of the QR code-free websites. ME QR (<https://me-qr.com/>) is one of the websites that allows the researcher to select the sort of QR code and describe the data. There are several types of options on the ME QR website that make the QR code easier to use than other websites to create QR codes for pictures, PDFs, links or URLs, texts, audios, Google Maps, and social media websites. The second step was to register an email on this website. Then it could be followed by choosing one option label depending on the research. The paper used PDF QR code to insert information on the ISIS temple and the stored forms of the artifacts. The third step was preparing the PDF file through the integration of texts and pictures. Finally, the PDF was saved on the device (a Laptop).

Moreover, the page asks for three steps: first, upload the PDF; secondly, name the QR code; and thirdly, select one of the suggested options in the category. The website includes plenty of specified options such as education, pets, books, business, etc. customize or download a QR code. Finally, save the symbol as a picture. This site explains a number of things about QR codes. Moreover, the QR code is preserved in the user's account on the website. Throughout the QR code scanner application people scan the encoded QR code by mobile phones or iPads to demonstrate data on mobile phone and save it at the device.

Numerous documentation forms related to archaeological objects are concerned with registration, documentation, and restoration, whether in a museum or a discovery site (see Appendices A, B, C, D, E). These forms contain similar and different information on registration number, description, dimension, classification, discovery time, discovery site, discovery team, and the era of the object. Moreover, each form titled with a specific name depends on the condition of the object, such as registration at the museum card, restoration card, documentation card, and application for registration of antiquities.

All of the forms will be preserved as QR codes that may be read by the foundation's electronic system. In consideration of the location and state of the monument, it will be then essential to select one of these models. It will then take less time to record data in notebooks, and going back to QR Code forms will be too simple. In addition, there is a QR Code that contains all the information pertinent to each collection of objects.

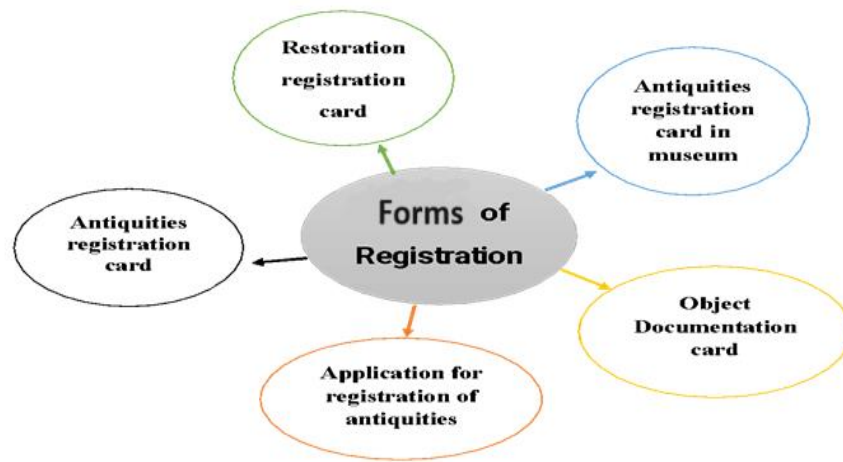


Fig 7. Forms of antiquities Registration (by the author)

These forms were designed and prepared by the General director of the Department of Registration and Archaeological Committees, and follow-up on registration and documentation work in the Central Administration of Registration and Documentation in the Museums Sector.

According to Gilabert et al. (2018) continue the steps of creating encoded code as follows:

- **Printing:** The printed labels are made of polypropylene, which offers high durability and makes them suitable for digital printing, as they are stable under variable temperature and humidity conditions. They are printed in thermal ink with a resolution of 300 dpi.
- **Adhesion:** The labels are fixed on the pieces using Paraloid B72. This acrylic resin, commonly used in restoration, offers excellent fixation and conservation of the encoded codes, and offers chemical stability and resistance to discoloration. The acrylic resin is dissolved in volatile components (acetone or alcohol), which facilitates application and quick drying. Two layers are applied, one directly on the piece and then another on the code, encoded code, which allows the fixation and sealing of the label. After numerous

tests, we have established that a 20% paraloid solution offers optimal drying conditions to speed up the process.

- Reading: The most common reading method is a laser reader that directly transfers the code data to the computer. This is not the only system, as they can be captured through other digital media, such as video and photographic cameras, or even through mobile phone cameras that have an application that facilitates reading.

Findings

Based on previous studies, technology has advanced in various fields, including archaeology. Some subspecialty departments of archaeology have applied technology to their work. One of the new applications used in these diverse domains is QR codes, which play a significant role in documenting general historical places and stored objects at museums. Additionally, there are several free websites that can be used to create encoded QR codes. The **ME QR** website is one of the most popular websites used by a huge number of people for fulfilling their aims via QR codes. This website allows users to choose the type of QR code, specify the language, shape, and saving format of the QR code.

This study has been applied QR codes in two experiments. The first experiment was conducted at the ISIS Temple as an instance; that experiment aimed to append each piece of discovered data to the QR code at the site throughout the implemented missions in the fieldwork. Moreover, still now there are more discoveries clarified and explained as texts, figures, and any restoration works. The Isis temple was located in the center of Aswan city. This temple was recently discovered by a rail station worker. The experiment at the ISIS Temple provided detailed information about the temple, starting from the time of excavation to the present day and the recent studies conducted in the ISIS temple by Italian expeditions. The QR code of ISIS Temple provides more information than labels, which only provide brief information about the monument. Moreover, visitors can obtain trusted data about ISIS Temple by scanning the QR code that is affixed to an informative board. To obtain information from the encoded QR code, people need to download a scanning application. Realistically, this process requires network and electronic devices such as smartphones or iPads. It was significant to point out that, for the tour guide, notwithstanding his knowledge of the area, the tour guide is not able to be familiar with every

fieldwork mission. As a result, the mission of the expedition has been demonstrated by adding brand new information to the QR code for both visitors and tour guides

The second QR code experiment focused on using QR codes in museum documentation to register and document stored collections. The experiment was such a proposed study for implementing the QR code as a modern case in the documentation besides the traditional, which means writing information about stored objects in the notebooks at the museums. Thus, the experiment relied on applying the QR code in the documentation for stored objects. Each collection in the stored area in the museums had the QR that saved the form of documentation and registration. Therefore, the person who is in charge of artifacts ought to select the required form and then write information about the object. Additionally, the QR code forms conserve data about collection, including discovery date, discovery site, discovery team, type of collection, maintenance conditions, manifestation of damage, previous restoration, current restoration, dimension, date of the display, date of store, and person in charge of artifacts. Moreover, this study is not limited to using the QR code only for conserving one object of stored collection at the museums but preserving the whole group by loading data on the encoded code. The sort of QR code that is distinguished by storage space reaches out to three kilobytes. Additionally, the QR code is distinguished by connecting with different electronic devices in the foundation or in the cell phone of the man who was in charge of the artifacts. Therefore, archeologists can convert the data uploaded on the encoded QR code from the discovery site to the archeological foundations or the responsible objects. The foundations can keep the first version of excavations and save it in the electronic system.

Discussion

As mentioned in the literature review, technology is playing a crucial role nowadays which deals with the archaeological domain. Using technology in each stage of antiquities started from selecting the discovery area until displaying or storing objects in museums. the first version of QR Code was in 1994 then it was developed to become indispensable in lots of fields such as medicine, industry, agriculture and archaeology. It was considered a turning point in the archeological domain that is used in displaying artifacts at museums. The QR code structure consists of five key elements including finder pattern, alignment pattern, timing structure, quiet zone and data area.

The QR code has many uses in the archaeological field, especially in museum display and easy access to detailed information Whether through the scan or URL. Continuing across the QR code avenues, As QR code technology advanced, various types emerged such as: Barcode, micro QR code, Aztec code, dot code and data matrix. Furthermore, QR code error correction through determining the damage specifically as well as the proportion of the deterioration will assist selecting the efficient and effective method of correction.

By keeping records and registration forms on the QR code at the museum's storage, the current study discovered the value of utilizing QR codes in things that are kept in storage. This procedure sets itself apart by storing vast amounts of data related to the speed response code gathering. Additionally, information from the accountable institutions can be sent to other organizations using QR codes. Additionally, depending on the condition of the monuments, prepare the space area to conserve the things. Additionally, keeping all original information regarding objects and. Data storage in institutions during electronic systems is made fascinating by QR codes.

The finding further supports the idea of displaying the huge place concerning the Isis temple and stored objects. Regarding to the uses of QR code displaying nominate the Isis temple in the middle of Aswan as instance to apply in. ISIS temple was discovered recently and there was not enough data to express about it for visitors, it was only an Informative board for showing the directions and describing ISIS temple. From this part, this study led to use QR code for giving detailed information about ISIS temple. The second part of QR code is using it in storing collection artifacts at the museum's storage. Putting up QR code which includes all forms of preserving artifacts beside collections. Saving all data and increasing more data in case we discover contemporary information about the artifact through the person is in charge of objects such as modern studies or new restorations...etc.

Conclusion

This study has shown that Technology is necessary in this modern era. People cannot Dispense the technology in daily life. Thus, scientists have been applying it in multiple fields like industry, medicine, archaeology..., etc. first time the QR code was used was in 1994. Then, it plays

a significant role in other domains. So, this paper has revealed, the main role of QR codes in the archeological field. So, This suggested study of the QR code in the Isis temple is interesting for describing the temple and adding the last work carried out on the temple. The importance of the QR Code lies in being capable of adding new data about the temple by the designer. Moreover, it makes reading documents about the temple easier for tourists than researching about it on the Internet. Relying on continuously discovering information about and around the Isis temple in the center of Aswan have to construct the encoded code type of QR code, which distinguishes storage space by reaching out to three kilobytes related to the responsible expedition of the area; therefore, each new piece of data about the place the mission could add to the encoded code. It is important to point out that whatever the tour guide has information about the place, he cannot know what every mission has been added to fieldwork. Thus, the role of the expedition has been illustrated by appending whole new data to the QR code for both tour guides and tourists. Moreover, the process of using a QR Code requires a mobile phone or iPad, the internet, and a scanning application. Ultimately, this paper illustrated the proposed study of using QR codes in the collection of artifacts at museum storage and historical places such as the Isis temple and other places related to archaeological sites.

It is employed in museums to present knowledge about displaying artifacts. Nonetheless, based on the previous study, the role of QR codes is to apply them in museums' storage to save the collection of artifacts in electronic systems. By using QR codes throughout all the forms of data sheet registration are saved in the QR code for each collection in the save area. In continuation of the previous explanation, it must be carefully printed on tolerable sheets such as polypropylene or polyethylene sheets, then stuck in the storage place at the museums beside every collection by using one of the good adhesives mentioned, paraloid. For instance, if one of the shelves at the storage of museums preserves metal artifacts, the archeologists, if they follow the study method, have to record entire sheets of documentation and registration in the encoded code with the data of metal collection on the stands.

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Appendices

These forms were designed and prepared by the General director of the Department of Registration and Archaeological Committees, and follow-up on registration and documentation work in the Central Administration of Registration and Documentation in the Museums Sector.

Appendix A

Antiquities registration card in museum					
Registration number					
Location in the museum					
floor		room		corridor	
Classification					
Dimenasion					
Length		Width		Height	
size		Diameter		Depth	
Material					

Appendix B

Restoration registration card							
Registration number							
Classification							
Description							
Dimenasion							
Length		Width		weight		material	
Object Techniques							
Discovery site							
Discovery team							
Discovery time							
Circumstances of discovery							
Distinctive signs of object							
Manifestations of damage							
Methods of examination							
Eye examination				Microscope examination			
Radiation examination and type of rays				Inspection methods applied to detect damage			
Treatment stages							
Previous restorations							
Type of restoration							
Pre-restoration and post-restoration documentation							

Appendix C

Object Documentation card	
Discovery site	
Discovery team	
Discovery time	
Material	
Object condition	
Dimenasion	
Object Techniques	
Object's location	
Inscriptions	
Color	
Era of object	
Beginning of restoration	
End of restoration	
Publishing	

Appendix D

Antiquities registration card							
Registration number							
Classification							
Description							
Dimension							
Length		Width		weight		material	
Object Techniques							
Discovery site							
Discovery team							
Discovery time							
Circumstances of discovery							
Distinctive signs of object							
other information							

Appendix E

APPLICATION FOR REGISTRATION OF ANTIQUITIES	
Name of the applicant (person or firm)	
Address of the applicant (person or firm)	
Identification and description of object with three copies of photographs in postcard size or quarter size	
Material	
Size	
Approximate date	
Source of acquisition	
Where the applicant has come into Ownership, control or possession of any antiquity which is already registered under the Act, registration number of such antiquity and the name of registering officer, who had registered it.	
Date of acquisition	
Mode of acquisition	
(a) Present Location, and : (b) Condition or preservation and security	
If the antiquity is already registered under the Act, whether its registration certificate has been attached	

I declare that the above information is correct and complete to the best of my knowledge and belief. I also undertake to observe the provisions of the Antiquities and Art Treasure Act, 1972, and the rules made thereunder.

Seal of the Organization

Place

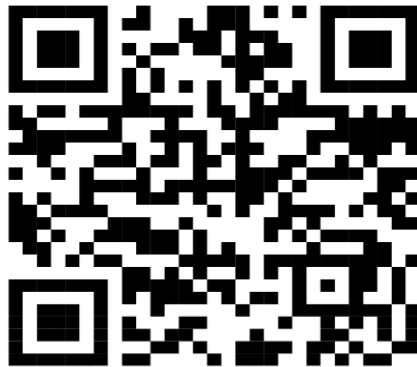
Date:

Signature

Name of the Applicant

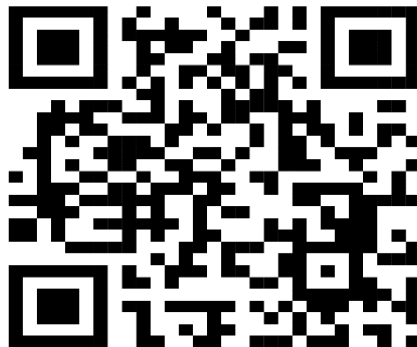
-
1. If the application is on behalf of an organization the name thereof should be given.
 2. If the application is on behalf of an organization on the signature should be that of the head of that organization.

Appendix F



QR code of Isis temple, After created by the author

URL: <https://me-qr.com/VCGEcXTe>



code of documentation model, After created by the author

URL: <https://me-qr.com/eWBwOFSI>