

## Chapter 3

# A Case Study: Integration of Scientific Examinations and Digital Precise Documentation in the Preservation of Historical Textiles

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### ABSTRACT

*Scientific examinations, digital technologies, and virtual heritage applications have the potential to save endangered and vulnerable heritage objects through early-stage detection and analysis of structural failures. This study provides a practical model for the use of scientific examinations and accurate documentation and its role in preserving and studying the historical textiles from different eras. First to provide historical information on the industrial materials that help in determining the origin and historical pieces, as well as in the dating of these historical pieces. Then to identify the manifestations of damage and their impact on the historical objects, which help in determining the preservation plan and selecting the suitable materials for restoration. The study uses the scanning electron microscope (SEM) to examine the surfaces of historic textiles, infrared (FTIR) to identify the chemical composition of historical materials, and X-ray diffraction to identify materials with a crystalline structure.*

### INTRODUCTION

Cultural heritages present us today the changes in social structures of human beings since time immemorial that created through the wisdom and creativity of the peoples. They are assets shared by all humanity for use in the creation of contemporary and future cultural society. For this reason, cultural heritages consider precious objects, should they ever be lost, and they cannot be recovered (Yamamoto 2007; Chen, You et al. 2018; Taylor 2018).

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## **A Case Study**

Historical objects influenced by different kind of deterioration factors. It is the responsibility of today's society to preserve this inheritance, to pass it on to future generations. Two streams of preservation of cultural properties: first by the restoration of cultural properties themselves: second by the compilation of databases using digital archives and other information technology. Obviously, both approaches are necessary for the preservation and restoration of tangible cultural properties. Following the logical structure of cultural heritage conservation principles, where objects are first phenomenological observed, identified/described, analyzed, and appraised according to their historical, artistic, and cultural (Yamamoto 2007; Yastikli 2007; Ahmed, Reda et al. 2016; Fritsch and Klein 2018; Isa et al., 2018). Digital technologies naturally applied to our private lives, everyday work and culture. Digital technologies seem to be perfect integrated with conservation-scientific analyzing processes and documentation, archival routines such as mass- and retro-digitization of historic documents and cultural heritage (Ioannides, Fink et al. 2018; Gottardi, Balletti et al. 2019; Jo and Hong 2019).

This chapter addresses people wishing to improve their knowledge of digital archiving of cultural heritage. In addition, conservators and restorers, custodians and curators of archives and cultural collections, museums, and galleries are additional professionals will be interesting by this chapter. Therefore, this study will present multi- scientific examinations approaches, digital technologies: and their roles in documentation, preservation, detection of forgery for cultural heritage (especially, historical textile).

## **THE HISTORICAL OBJECTS**

Different historical textile objects were used in this study: one of them object dates back to the late Ottoman era as it manufactured in 1327 Hijri. It contains different types of decorative motifs such as floral, geometric and writing. In the decorations, using of metal yarns (black and yellow yarns), the structure of metal yarns is a solid metal wire. The object contains different colors such as black and red color as shown in figure 1. Furthermore, other historical textile samples will use in this study.

## **Pre-Documentation Questions**

Before documentation process starting, some questions come to mind of archaeologists. How this object manufactured, designed, or assembled? What are the materials used for this object and how the creator has found them and used them? Where it originates, where it lived and used and where it is going to about (storage, display or use)? What is the effect of damage factors? Is there any previous restoration? Is this object original or fake? These are the usual questions that arouse and many more according to each case. The documentations process present excellent answers for all the questions.

## **Documentation and Scientific Examinations**

### **Visual Examination**

The first important step in documentation process of the historical object is a visual examination by the naked eye. It appears through the historical aspects, type of decorations, type of colors, deterioration aspects such as losses, abrasions, tears, holes - indicate size, shape, and location, and general conditions of the objects. As well as, type of textile structures, embroidery, and objects dimensions, method of dis-

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