JAA 2022

Virtual Restoration of Paperwork: Case Study of a Page from Khamse Jami

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Article Information
Received 17/06/2022
Revision Accepted 20/07/2022
Available Online 30/09/2022

Abstract: Given the ever-increasing use of information and communication technology, this science can be employed to protect, organize, and disseminate scientific work, especially manuscripts and museum archives. A major breakthrough in this technology is the digitization of manuscripts, which is referred to as virtual restoration. In fact, the virtual restoration of paperwork is considered a preventive protection strategy. Therefore, virtual restoration plays a key role in the field of document archiving, museology, and protection and restoration of objects. This study aimed to improve the quality of paperwork in Malek Museum through editing applications such as Photoshop in order to remove the damaging factors to the paper structures of a page from the Jami version. For this purpose, the desk and field research methods were adopted. An available copy in Malek Museum was first examined to select a page from the Jami version for virtual restoration. The flaws in the designated page were fixed in Photoshop for virtual restoration. According to the findings, virtual restoration of damaged manuscripts preserved this paperwork. Hence, it is considered a major preventive measure. Moreover, virtual restoration can be used as a risk management strategy in the preventive conservation program, which allows for preservation and maintenance. By creating a virtual information bank, researchers can access the manuscripts with peace of mind in the shortest possible time.

Keywords: *Virtual Restoration, Malek Museum, Jami, Preventive Conservation.*

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Introduction

Restoration and protection of paperwork refer to a set of operations aimed at reducing the wear and tear of research work and long-term stability in the end. The use of scientific and principled treatment methods, strengthening restoration, and finally proper maintenance of research work will be effective in its long-term protection. Digital restoration can be considered a novel strategy for the restoration of historical work, especially printed work. It can cause a better presentation of the artistic and content values of the work. Therefore, it is possible to use any printed work that can be scanned for "virtual repair". Since virtual restoration is not a well-known term, it is necessary to examine some relevant terminologies in order to clarify its meaning. Therefore, the concept of virtual restoration has a tangible notion with a more or less clear vision. In other words, the virtual restoration of printed work is considered a major preventive protection strategy, as the protection and restoration operations on paperwork are limited to conservation measures. To achieve the correct concept of digital restoration, it is first essential to provide the definition of preventive protection. The American Institute of Conservation has defined the term "preventive paper conservation" as minimizing damage and injuries to printed work through the formulation and implementation of policies and methods for maintaining paperwork characteristics such as suitable environmental conditions, placement and storage methods, techniques of storing, displaying, packing, transporting, and using manuscripts properly. Moreover, the integrated management is employed to remove pests, make the necessary preparations, meet emergency needs, and take correction and reproduction measures (AIC Definitions of Conservation Terminology, 1996). Digital restoration means scanning or photographing manuscripts. This method of protecting paperwork relies on photography and advanced digital methods as much as conventional methods such as making restored copies of valuable documents. All these techniques provide many audiences with the access to some of the most important elements of the original work without any risks of damage to the work (Mionz Vinas, 2019: 33). Digital restoration is a suitable method of protecting the information contained in the work along with artistic and historical data. This process has an effective and useful role in the protection and maintenance of paperwork, for the restoration measures in the work are limited to treatment operations and the reconstruction of the work (if it does not lead to greater strength, it is performed digitally) (Mohsenian and Haddadi, 2014: 153). However, virtual restoration is performed through digital image editing programs such as Photoshop. This method can be employed to restore colors, fix deficiencies, and remove stains and additions. Virtual restoration of paperwork is performed to achieve certain goals, i.e., prevention of damage to the effect through restoration with restorative materials, preservation of historical nature and integrity, removal of direct repair from the effect, and evaluation of the prior state of the printed work before erosion with its virtual reconstruction (Ružić et al., 2011). Other intended goals include paying attention to the aesthetic values in the work through the digital reconstruction of the missing parts, removing stains and pus in the work, contributing to the historical analysis of the work (Ružić et al., 2011), ensuring readability of the work to researchers and visitors, and showing the image of a copy that has undergone virtual restoration in the museum exhibition hall or making this printed version available as a backup copy to researchers. Over the last two decades of the 20th century, there has been an interest in virtual restoration of photographs. Nowadays, virtual restoration is common for photographs. It is also applied to oil paintings and wall paintings; however, virtual restoration is very limited for printed documents and manuscripts.

This study aimed to address the following questions:

1. Can the originality of the work be preserved by using the virtual restoration method in printed documents?

2. Can photo editing programs be utilized to remove stains and grease from museum documents for restoration?

This study aimed to minimize the direct restoration of the paperwork of Malek Museum in addition to restoring and removing stains on the restored documents with the help of photo editing applications for the sake of aesthetics and legibility of documents.

Methodology

The desk and field research methods were employed first in this study to examine the copies available in Malek Museum. For this purpose, a page from the Jami version was selected for virtual restoration in Photoshop to fix its flaws and damage.

Designated Version

In this project, a page of the Khamsa Jami version available in Malek Museum was selected and is below along with its damage. The edition consists of five separate treatises: Tohfato al-Ahrar (complete), Yousof and Zuleikha (complete); Kherad Name Eskandari's, the beginning of which is missing; Lily and Majnoun, the end of which is missing; and Sabhat al-Abrar (complete). This version corresponds to another manuscript of Khamsa Jami, which is available in Malek National Library (number 5995).

Pathology of Designated Version

The following pathological categories are defined by examining the damage caused to the texts and illustrations of the work:

1. Tearing and falling parts of pictures and writings;
2. Sticking pictures and writings on the facing pages;
3. Spilling of pigments due to water corrosion;
4. Making joiners for pictures and writing;
5. Cracking and shedding of pigments due to mechanical stresses;
6. Purulent surface of some paintings;
7. Late interventions and robberies;
8. Abrasion of writings and colors;
9. Spreading of ink;
10. Presence of foreign particles in images;
11. Chemical darkening of some colors;

The above categories are now discussed below.

Tearing and Erosion of Pages due to Physical and Mechanical Factors

The edges, especially the corners of the paper, are torn and worn more than other parts. The role of human factors as well as the proximity of this part of the copy with environmental factors caused the occurrence and intensification of erosion on the outer edges of the book pages. The damage is so severe all the damaged parts have not yet been removed, even though the

pages of the book have been restored. Hence, the process continued afterwards (Fig. 1).

General Soiling of Pages and Staining in Layers of Sheets

In terms of size and distribution, purulent stains are related to the lower corners of pages in the book. These stains were formed over time due to continuous contact and transfer of fat and hand contamination while the pages were being turned. These stains occupy the largest area, which can be compared on nearly all pages of the book with different intensities. The intensity and extent of these stains on the initial pages of the edition as well as the gilded pages and the painting sessions of the edition are significantly different from those of other pages. The cause of this phenomenon can be viewed as further references to these pages and more reflection on them, something which resulted in more contact of these parts with fat, hand dirt, other factors, and environmental pollution (Fig. 2).

Observed in large numbers and with high dispersion on the surface of the prescription, the third category includes stains caused by spilling liquids and various substances such as drinks, food, paint, and glue on the copy paper. Each of these stains usually affects nearly from one to four pages. These spots can be recognized in a spectrum of light to dark brown color (Fig. 3). The staining substances have penetrated into the tissue of the paper and are impossible to sample. If it is possible to take samples, they will be taken without destruction. In this study, the nature of all these stains was not tested.

Surface Abrasion of Pictures and Writings

Surface abrasion is another mechanical piece of damage caused to manuscripts, arrays, and illustrations. This type of damage, which ensues from the continuous contact of colored surfaces with the facing pages and other external factors, has affected many colored surfaces. The appearance of this damage is more evident on the writings and gilded parts, which are not as thick as other colors. The effects of paper texture, bumps, and unevenness on the paper surface in this kind of damage is well-known, for the wear of the colors is more severe in the prominent and uneven parts (Fig. 4). The amount of this erosion in the wrinkled parts of the paper was also higher for the same reason. In folds, the surface of the paper had uneven waves. Moreover, the wear intensity of the pigment surface increased. Therefore, this damage is more visible in places wrinkled due to water corrosion.

Analyzing Presence and Activity of Fungi and Molds

Microbiological agents are among the most dangerous threats to the health of organic materials, especially paper and other cellulosic materials. Historical books are usually affected by a collection of organic materials (e.g., cellulose, gelatinous, starchy foods, and leather) as well as adhesive ingredients (Plender Lit, 2003: 69). In fact, they provide an ideal environment for the growth and development of fungi. Corrosion spots indicate the presence of moisture in a short period of time, and the accumulation of dirt and dust on the sides of pages and the edges of the book can also increase this possibility. At the same time, various stains on papers of this edition on the margins near the place of stitching, binding of pages, especially in the parts where the stitching of the book is opened with adhesive erosion products being accumulated, are visible with the possibility of microbiological origins (e.g., fungus and mold). Considering all these factors, it is necessary to analyze the possible presence of microorganisms in this effect (Fig. 5).

Deliberate Interventions and Later Paintings

Probably, the most regrettable damage can be introduced as deliberate or ignorant interven-

Fig. 1: The damaged edges of the designated version (Malek Museum).

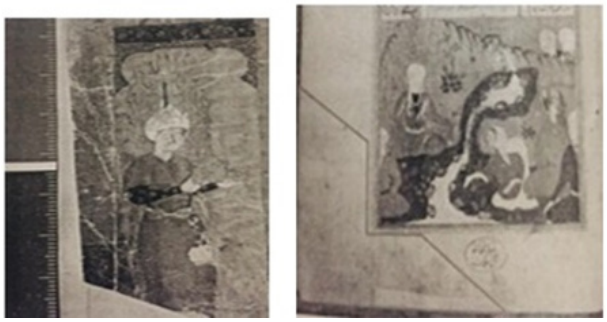

Fig. 2: Purulent Stains in Layers of Pages (Malek Museum).

tions in this manuscript, something which seriously distorted the content of the work in terms of its nature. This intentional damage has irreversibly targeted the illustrations of the manuscript, especially the unfinished illustrations and the initial designs made by illustrators. The deletion of the scribe digit can also be included in this category of damage (Fig. 6).

Virtual Restoration of a Page from Khamsa Jami Version

After the pathology, a page from the manuscripts of Khamsa Jami was selected for virtual restoration. As mentioned previously, the most significant damage to the manuscript includes scratches and human interventions. Due to the limitations of conventional restoration methods, the best techniques of restoring this version is to employ virtual and digital restoration. In the selected sheet, interventions can be seen as restoration and covering traces of old designs with ink as well as the implementation of new motifs on historical motifs (Fig. 7). Due to the elegance of the designs and effects of the new ink on the paper texture, many parts under the traces of the new motifs were lost and cannot be recovered through conventional restoration. Evidently, these crude patterns are executed with ink and have irreversibly destroyed the artist's original designs.

Virtual Restoration and Reconstruction

For virtual restoration, the desired page was first scanned with high quality. The retouching and restoration processes were then performed. Afterwards, an attempt was made to revive the copy without interfering with the entire work. According to the concepts used in restoration, the processes of renovation, improvement, and reconstruction were finally performed.

Reconstruction

In short, a series of actions taken to improve the body include repair, protection, reconstruction, and retouching, which together mean the physical concept of improvement and rehabilitation. Finally, these actions lead to the revival of historical monuments in terms of physical, structural, and functional aspects. According to the foundation and principles of reconstruction, which should change the basic principles of the photo under no circumstances, there was no right to any kind of interference. Therefore, the necessary actions were taken for restoration. As discussed previously, the photo was scanned with a quality of 300 dpi. The extra images and objects were then removed in Photoshop. Due to the special conditions that prevailed in this work, it was not allowed to change the nature of this photo. Therefore, the Remove option and Pixel Changes were used. In the next steps, the Delete and Copy options were employed (Fig. 8).

The light was then changed in the field. Based on the original color of the work, it was changed

Fig. 3: Various stains on the manuscript sheets (Malek Museum).

Fig. 4: Erosion of colored surfaces against continuous and gradual wear (Malek Museum).

Fig. 5: Fungus stains on the manuscript (Malek Museum).

Fig. 6: Damage caused by human interventions to manuscripts of Malek Museum.

again. We started renovating and retouching the work. Finally, the retouching process was completed in Photoshop with 30 layers, and the work kept its original nature (Fig. 9).

Conclusion

According to the results, the paperwork virtual restoration approach is a suitable and effective method of improving the durability of printed work and preserving the nature and integrity of documents. Thus, virtual restoration had continuous and direct effects on the reduction of

wear and tear processes in archival documents. In virtual restoration, photo editing programs are employed to remove stains, fats, and human interventions by reconstructing photos and manuscripts in a virtual form. Hence, this method minimizes the possibility of destruction in printed work and preserves the integrity and strength of such manuscripts. As a result, virtual restoration is a method of managing the prevention and of damage in the work to a minimum or restore any possible effects of damage caused to the work. The restoration process is performed to enhance the aesthetic characteristics of the paperwork.

Acknowledgment

The authors would sincerely like to thank Mr. Haq Gou, who is in charge of manuscripts at Malek Museum.

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Fig. 7: The designated page and damage caused by human interventions (Malek Museum).

Fig. 8: Erasing the damage caused by human interventions in Photoshop (Authors, 2018).

Fig. 9: The final result of digital (virtual) restoration on the designated version (Authors, 2018).