

## STANDARDS FOR DIGITALIZATION AND DATA ARCHIVING

Sandra Milunovic Koprivica<sup>1</sup>, Olga Ristic<sup>1</sup>, Lidija Paunovic<sup>1</sup>

<sup>1</sup> Faculty of Technical Sciences in Cacak, University of Kragujevac  
Svetog Save 65, 32000 Cacak

### Abstract

*In an era where every segment of business can be improved by using information technologies that rely on cloud resources, there is a need for a more efficient and secure way to store documents. Digitization of archives is the key to the successful functioning of a company. Complete digitization certainly means complete automation of business processes, with the aim of achieving business models that are in step with time and market requirements. After that, of course, the application of the appropriate standards that regulate this area follows. In this paper, will be presented some most significant standards with basic information about their potential use in digital archive.*

**Keywords:** digitization, data, archiving, standards.

### INTRODUCTION

Archiving is a procedure that should be done for the sake of data storage and security, so it can be said that archiving data is as important as entering it. In order to preserve the data in its entirety and avoid losing it, it is necessary to archive it more often, especially in the period when a large amount of data is entered or changed, then it is desirable to archive it daily. The causes that can influence data to be deleted or damaged are: computer viruses, loss of electricity during operation, or some other cause of computer shutdown, technical failure of the equipment, damage to the medium on which the data is stored – disk, loss or theft of the device. The process of archiving, if we take a closer look, can be found in all segments of life, such as, for example, saving money, storing some supplies, personal belongings, and more. Archiving is done on two levels. Archive unchanged data is saved as a minimum on one additional device or in the cloud, and the software solution takes care of possible additions or changes to archive files. Data used in daily use should be synchronized in real time to an additional device or the cloud. Nowadays, with the advancement of technology, it is possible to find a cheap, even free space for archiving data, which is

sufficient for the majority of all users. Considering that the Internet is available everywhere and has a wide application, it can be said that the best way is to archive in the cloud, so that the user can access his data wherever he is from a computer or mobile phone. With the advancement of technology on the computers themselves, there are programs that perform archiving for us. Programs collect data and process them. The forms of these data are different (audio, text, numerical, image) and each of them is recorded in a different way.

### DIGITAL ARCHIVING

Digital archiving represents the long-term preservation of digital content, those that were created in that digital form, as well as those that were created by digitization itself, that is, by dematerialization of content written on paper and other solid materials. The goal of archiving itself is the availability of data at any moment, if it is also well organized. In addition to the fact that digital archiving enables faster and easier searching, the advantage is also expressed in the fact that it enables lower costs, greater reliability and security, and better access to the information contained in the documents (Fig. 1).



*Fig. 1. Digital archiving*

Digitization is the use of existing technologies and information to improve or replace business processes, generate profits and create an environment for digital business in which information plays a central role. The simplest example is using google drive to save and share documents instead of a drawer full of papers or using some platform for internal business communication or project management.

## **DOCUMENT MANAGEMENT SYSTEM – DMS**

DMS or document management system is a technological platform that serves to design business processes, types of documents, business process management, document processing, their inclusion in business processes and archiving. It offers users an efficient working environment that will best automate, shorten, speed up and make their work processes for managing business documents more efficient. DMS systems serve integrated management of documentation in paper and electronic form, and the most common functionalities that this type of service enables are:

- Saving documents in different formats (docx, xlsx, pdf, ppt...).
- Searching of electronic documents using keywords and meta tags of assigned documents.
- Ability to digitally sign saved electronic documentation.
- Restricting access to documents depending on the role assigned to the user within the DMS system.
- Ability to track changes made to documents and view different versions of the same document.

- Ability to share documents with other users.
- The possibility of making the so-called workflow, which automate the process of sending documents between users, according to defined stages.
- Ability to access, edit and share documents on mobile devices. There are a large number of solutions on the market that enable integrated document management. Some of the most famous are eFileCabinet, M-Files, SecureDocMan, ComDoc DMS... What differentiates the solutions is the functionalities they offer, the price and the target group they are intended for.

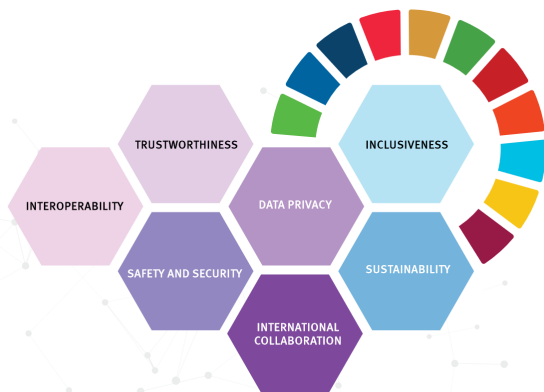
Although DMS are not new, they have great potential for application in the Serbian market in the coming period. In parallel with the expansion of other electronic services and the widespread use of electronic signatures, this type of system can significantly simplify administrative procedures and make business far simpler and more efficient. The main reason for the introduction of DMS is to reduce costs, given that: the prices of optical media are lower compared to the prices of paper, information flows faster, shorter processing time and greater possibilities of providing information.

DMS is one type of comprehensive Content Management System (CMS) that combines the following types of systems: Enterprise CMS (ECMS), WebCMS (WCMS), Document Management System (DMS), Mobile content management system, Component content management system, Media content management system, Learning Content Management System (LCMS).

## **STANDARDS IN DIGITAL ARCHIVING**

The extensive adoption of digital technologies and their far-reaching pervasive impact on people, their prosperity and the planet suggest a core set of distinct principles is needed to guide standards developed for digital transformation governance. Account for these

principles contribute to the integral process of risk management, helping to avoid undesired outcomes associated with digital technologies while ensuring the technologies achieve their functional goals, benefitting people and the planet. Identified are the following seven principles for standards to be placed in the center of standard making: trustworthiness, Inclusiveness, Sustainability, Interoperability, Safety and security, Data privacy and International collaboration (Fig. 2).



*Fig 2. Seven principles for standards in digital archives*

The following text presents the standards that are most commonly used in digital archives.

- **ISO 15489-1:2019 Information and documentation - Records management - Part 1: Concepts and principles.** This standard defines the concepts and principles that are used when creating, capturing and managing the documentary material that is created. This part of ISO 15489-1:2016 describes terms and principles related to: - documentary material, metadata for documentary material and systems of documentary material, - policies, assigned responsibilities, monitoring and training that support the effective management of documentary material, - control of documentary material, - processes for creating, obtaining and managing documentary material. ISO 15489-1:2016 applies to the creation, acquisition and management of documentary material with regard to structure or form, within all types of business and technological environments, over time [1].
- **IFLA Principles for the Care and Handling of Library material** contains recommendations

for the processing, use, preservation, protection, transport, display of traditional (paper), photographic and film materials, audiovisual, magnetic and optical record carriers, and their duplication, for the purpose of protection, by means of photocopying, microfilming and digitization [2].

- **ISO 11799:2015 Information and documentation - Document storage requirements for archive and library materials** specifies the conditions that should be met by a room used as a depot for the storage of archival and library materials: construction, location, installations and equipment [3].
- **ISO 18902:2013 Imaging materials - Processed imaging materials - Albums, framing and storage materials** specifies the main physical and chemical requirements for archiving cases, albums and containers specially designed for the storage of processed photographic films, plates and papers. Stating the chemical and physical characteristics of photographic and housing materials alone does not ensure satisfactory storage behavior. It is also necessary to ensure appropriate storage temperature and humidity, as well as protection against fire, water and fungal growth; from contact with certain chemicals in solid, liquid or gaseous form (eg air pollutants); and from physical damage. In addition, different types of photographic materials may respond uniquely to different storage conditions. Because solid particles abrade prints and negatives when they are moved in and out of filing cabinets or when sorted items are sorted, and because such particles can sometimes chemically destroy images and base material, clean, dust-free storage areas are essential. Atmospheric conditions, natural and artificially created, must be controlled because paper and plastic cases are permeable and do not protect the photographic image from environmental influences. Such effects include non-recommended relative humidity or atmospheric pollutants such as hydrogen sulfide, sulfur dioxide, nitrogen oxides, and peroxides [4].

- **ISO 18911:2010 Imaging materials - Processed safety photographic films - Storage practices** gives recommendations regarding the storage conditions, storage facilities, handling and inspection of all processed safety photographic films (hereafter referred to as photographic films) in roll, tape, slot or sheet form, regardless of size. This international standard is applicable to long-term and medium-term storage of photographic film. It is applicable to photographic film records intended as backup copies, which should not be in frequent use. It does not apply to "working" or "use" copies. This International Standard, although intended for properly processed materials, should also be of considerable value in extending the useful life of photographic film whose processing conditions are unknown or which have been toned, retouched, or have markings on materials of uncertain or unknown stability. It is only applicable to security photographic film. Nitrate-based films are hazardous and are not covered by this International Standard. They require special storage considerations, but the applicable environmental conditions are specified in this International Standard. Storage of photographic prints and photographic plates requires different considerations [5].
- **ISO 18918:2000 Imaging materials - Processed photographic plates - Storage practices** specifies dark storage conditions, warehouses and procedures for handling and inspection of processed photographic plates having integrated photographic layers and intended for recording. It is applicable to black and white, silver images, gelatin, processed photographic plates, it is also applicable to medium and long term storage conditions. No particular distinction is made, apart from the degree of care, between photographic plates for medium or long term storage. Recommendations for the storage of boards refer to materials, methods, conditions and forms of protection that are specifically applied to boards. However, these storage recommendations can also be applied to varnished and opaque plates, black-and-

white plates modified with color or toner, color plates, and other historic photographic plates. It is not intended to predict or assign a useful life to processed photographic plates stored in accordance with the specifications of this International Standard. Recommendations for the storage of photographic film are given in ISO 18911, and for the storage of processed photographic reflection material in ISO 18920. Although there are some differences in the recommended storage conditions between these types of photographic materials, the recommended temperature and relative humidity ranges overlap. If all three types of photographic materials are found in one collection or one storage area [6].

- **ISO 18920:2011 Imaging materials - Reflection prints - Storage practices** addresses ways of storing, protecting and using photographs. The general conditions for storing photos, the shape and quality of protective jackets and boxes, the equipment of the depot and the microclimatic conditions in them have been determined. The scope of the standard includes traditionally printed photographic images as well as modern digitally printed images. Does not include recommendations for documents printed with digital output systems [7].
- **ISO 18921:2008 Imaging materials - Compact discs (CD-ROM) - Method for estimating the life expectancy based on the effects of temperature and relative humidity** specifies the procedure for determining the expected duration considering the influence of temperature and relative humidity). Recommendations and results of testing the age of compact discs with regard to changes in temperature and relative humidity are given. Covers methods of testing the life expectancy of CD-ROM media. It is suggested that a suitable acclimatization time for a disc removed from the refrigerator is 24 hours. The purpose of this standard is to establish a methodology for estimating the life expectancy of information stored on CD-ROMs. This methodology provides a technically and statistically sound procedure

for obtaining and evaluating accelerated test data. An important measurement for determining whether a CD-ROM is still accessible is the "block error rate" or BLER. This is the ratio of erroneous blocks measured per second at the input to the data decoder. A number of suppliers apply this method and claim a lifespan of around 200 years under optimal conditions [8].

- **ISO 18923:2000 Imaging materials - Polyester-base magnetic tape - Storage practices** gives recommendations regarding the storage conditions, storage facilities, enclosures and inspection of recorded polyester-based magnetic tapes in roll form. Covers analog and digital tape and includes tape made for audio, video, instrumentation and computer use. This International Standard is applicable to medium- and long-term storage of magnetic tape, and is also applicable to magnetic tape records intended as master tapes, which should not be in frequent use. Deviations from these recommendations, either before or after imaging, may result in shortened life expectancy. For example, poor conditions during transport, handling or use. This International Standard is not applicable to "working" or "use" copies [9].
- **ISO 18925:2013 Imaging materials - Optical disc media - Storage practices** specifies the conditions for archival storage of optical discs for audio, video and computer use, ways of handling them, viewing, and cleaning have been determined. Only the effects of temperature and relative humidity on them are explained, but not the effects of light, polluted air and other hazards. This international standard specifies the long-term storage conditions of optical discs and provides recommendations regarding storage conditions, storage areas, enclosures and inspection of optical discs. It is applicable to discs made for audio, video, instrumentation and computer use. The recommendations are general in nature and the manufacturer's precautions for the particular material should be considered. Relaxing these recommendations, either before or after imaging, will generally result in reduced life expectancy [10].

- **ISO 18927:2013 Imaging materials - Recordable compact disc systems - Method for estimating the life expectancy based on the effects of temperature and relative humidity** processes the test results of determining the age of compact discs on which data cannot be changed, taking into account the influence of temperature and relative humidity. The first test, carried out in 2004 and 2005, showed that the voltage conditions and durations described in the standard (at least 500 hours per aging cycle at elevated temperature and humidity conditions) may be too harsh, resulting in a very large error in the rates obtained after only one aging period [11].
- **ISO 18928:2013 Imaging materials - Unprocessed photographic films and papers - Storage practices** recommended storage conditions for unprocessed photographic materials. Not applicable to processed films and graphics. It is applicable to black-and-white and color photographic materials (negative films, positive films, reversible films, positive papers and X-ray films), as well as security films [12].
- **ISO 18934:2011 Imaging materials - Multiple media archives - Storage environment** deals with storage conditions in the case of the existence of various media in the same space. This standard does not cancel the existing standards that concern storage conditions and refer to a specific medium, e.g. paper [13].

## ACKNOWLEDGEMENT

This study was supported by the Ministry of Education, Science and Technological Development of the Republic of Serbia, and these results are parts of the Grant No. 451-03-68/2022-14/200132 with University of Kragujevac - Faculty of Technical Sciences Čačak.

## CONCLUSION

In an era where every segment of business can be improved by using information technologies that rely on cloud resources, there is a need for a more efficient and secure way to store documents. Digitization

of archives is the key to the successful functioning of a company. Complete digitization certainly means complete automation of business processes, with the aim of achieving business models that are in step with time and market requirements. The digital archive enables the easier realization of all future ideas by simple upgrades and development of the already existing system.

## REFERENCES

- [1] ISO 15489-1:2019 Information and documentation - Records management - Part 1: Concepts and principles.
- [2] IFLA Principles for the Care and Handling of Library material
- [3] ISO 11799:2015 Information and documentation - Document storage requirements for archive and library materials
- [4] ISO 18902:2013 Imaging materials - Processed imaging materials - Albums, framing and storage materials
- [5] ISO 18911:2010 Imaging materials - Processed safety photographic films - Storage practices
- [6] ISO 18918:2000 Imaging materials – Processed photographic plates - Storage practices
- [7] ISO 18920:2011 Imaging materials - Reflection prints - Storage practices
- [8] ISO 18921:2008 Imaging materials - Compact discs (CD-ROM) - Method for estimating the life expectancy based on the effects of temperature and relative humidity
- [9] ISO 18923:2000 Imaging materials - Polyester-base magnetic tape - Storage practices
- [10] ISO 18925:2013 Imaging materials - Optical disc media - Storage practices
- [11] ISO 18927:2013 Imaging materials - Recordable compact disc systems - Method for estimating the life expectancy based on the effects of temperature and relative humidity
- [12] ISO 18928:2013 Imaging materials - Unprocessed photographic films and papers - Storage practices
- [13] ISO 18934:2011 Imaging materials - Multiple media archives - Storage environment
- [14] <https://committee.iso.org/home/tc299>
- [15] <https://www.iso.org/committee/5915511.html>
- [16] <https://webstore.iec.ch/publication/66698>