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Sas Maria Alexandra[1]

GIULIO MAGNI, AN ARCHITECT FOR THE PROJECT OF THE STATE ARCHIVES IN BUCHAREST AT THE END OF THE 19TH CENTURY

Abstract

Purpose: *The aim of this article is a conceptual analysis of the first complex architectural project for the headquarters of the Romanian State Archives.*

Method: *The methods used for this article were documentation, comparison and analysis.*

The documentation was carried out in archives in Romania and Italy, as well as with the help of thematic books identified in Romania and Germany. The comparison was made between European archives and the proposed project for the Romanian State Archives. Finally, a detailed analysis was carried out for the final version of the project for the Romanian State Archives.

Results: *The research revealed many similarities and differences between the European trends and the proposed headquarters project for the Romanian State Archives.*

Conclusion/findings: *The results of the study showed that the project was in line with the trend of archives throughout Europe, despite the lack of the architect's experience with this type of projects. This archive building was the only one of its kind in Giulio Magni's entire project portfolio.*

Key words: *building, projects, history of archive buildings, storage warehouse, Romania,*

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INTRODUCTION

This text was prompted by the identification of some plans for the building of the General Archives of the Romanian State Archives, made by the Italian architect Giulio Magni.

We wanted to compare how his creation was specific to Romania or whether it was inspired by European archives that had already been built. To get there, an analysis of the European framework in the field of architecture will be done first, followed by the analysis of what happened in Romania.

In order to understand the relevance of the subject and the thinking of the architect Giulio Magni, we thought it would be useful to go through the subject step by step. We will therefore discuss the emergence of this architectural programme, as well as the first books on architectural theory in which this programme was included.

ADAPTING EXISTING BUILDINGS FOR ARCHIVES

In the 18th century, all archive buildings, regardless of the country, were adapted in buildings built with other purposes. Monasteries, schools, houses, and castles were used. Initially this was not seen as a problem, but as the chosen buildings were overcrowded, and no repairs or heating were done in the storage rooms, their condition deteriorated as they became full of mould and damp. The documents they housed began to deteriorate (Hermann Rumschöttel, 2006) and the solution had to be found. In the 19th century, the idea arose to build special buildings for documents. This was to keep them in good condition and to provide enough space.

THE THEORY OF SPECIAL BUILDINGS FOR ARCHIVES

The first books on architectural theory from the 19th century (architectural programmes) consider the library model as the starting point for archive buildings. The ideas of the reading room and the storage room were borrowed from libraries, but step by step improvements were made to meet the needs of archives.

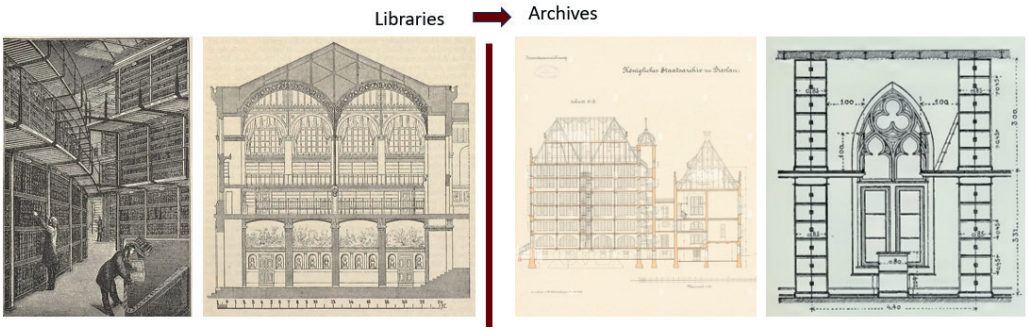

Figure 1: Collage, from libraries to archives

We believe that these improvements were due to the use of new building materials (metal and concrete), the increasing number of archival documents compared to libraries (which often made space insufficient), adapted storage conditions and the development of a theory of archival organisation.

In the 19th century, we witness the evolution and transformation of the architectural programme as practice becomes theory and is documented in books. Three books appeared in the German literature dealing with archive buildings. As the volumes developed, more examples were given. Their number increased, and if in the first book from 1887 there were 2 examples (Klasenn, 1887), in of 1893 edition there were already 9 (Opfermann, 1893) and in the last edition of the 20th century there would be 16 examples (Opfermann, 1906). The archives of: Bordeaux (1861-1866 - departmental archives), Wiesbaden (1879-1881 - state archives), Weimar (1883-1885 - state archives), Paris (1849 - archives of the Court of Audit), Frankfurt (1874-1877 - state archives), Munich (1832-1843 - Royal Court and State Library with Imperial Archives), Breslau (1875-1877 - state archives), Nuremberg (1877-1880 - district archives), Münfter (1886-1889 - state archives) were considered good examples. It is one of the few sources to which an architect of the period would have had access for documentation. This aspect is relevant to our study because it shows how widespread this architectural program was, and how it particularly developed in one region only.

Another common practice was to visit for the purpose of study, but this will be dealt with in another sub-section.

As we have already mentioned, at the end of the 19th century there was an important push for such constructions in Europe, mainly in the Germanic and French

language area, and according to our research we can say that Romania also joined the European trend for the construction of archive buildings (Sas, 2023).

CASE STUDY

The case study for our research is the most elaborate project proposed for the construction of an archive building for the State Archives of the United Principalities at the end of the 19th century in the country known today as Romania. The subject is relevant because there has been no analysis of archive buildings in Romania, or of archives built in Europe compared to those in Romania.

We discovered that Romania was indeed part of the European trend of building archives, which took place in several countries from the second half of the 19th century until the 20th century. This trend continued after the 20th century, with interruptions due to the World Wars, but this period is not the subject of this case study. Therefore, we will limit ourselves to the 19th century, without considering that the subject is completely covered and closed.

The State Archives were founded in 1831, they were moved and distributed among several monasteries, houses, and the Orthodox Metropolis, but in 1864 they received the monastery of Mihai Voda in Bucharest, which was undergoing repairs until 1866, as their permanent seat. The works in the monastery gradually ceased but the State Archives were moved there before the reconstruction work would be completed for financial reasons.

This were the first permanent headquarters of the Archives in Bucharest at the end of the 19th century. After a lot of insistence and written requests from the directors and unfortunate events, the Ministry decided to support the Archives and to start developing a project, as it had heavily financed maintenance work over the years. Until then, there had been several unsuccessful attempts to build a special building, leaving only the blueprints as evidence of the attempts. At least five projects had been proposed before, but they remained at the level of intentions.

THE STEPS TO THE REALIZATION OF THE PROJECT

To make the project modern and responsive to the needs of the institution, but with a limited budget, two approaches were adopted. The first was to appoint the architect Gheorghe Duca to travel to Europe to visit and document the archive

buildings (Sas, 2023). He reformed polytechnic education (1881) and was a founding member of the Polytechnic Society. The second was to hire a foreign architect to design the building.

We assume that the first option was chosen because there was no technical information available in the country on the requirements and standards for an archive building, due to lack of experience. It was common practice to visit buildings that had already been built and learn from them. This approach was followed in the next century, in the construction of the Magyar Nemzeti Levéltár (Csaba Reisz, 2015) and the Österreichisches Staatsarchiv – Haus, Hof- und Staatsarchiv in Vienna (Gustav Winter, 1903) and many other buildings.

The architect Gheorghe Duca had a three-month journey to Europe. He was sent by the Ministry to visit the archives in Fulda, Vienna, Munich, Paris, but he changed his itinerary and visited Vienna, Paris, Frankfurt, Wiesbaden, Weimar (Sas, 2023).

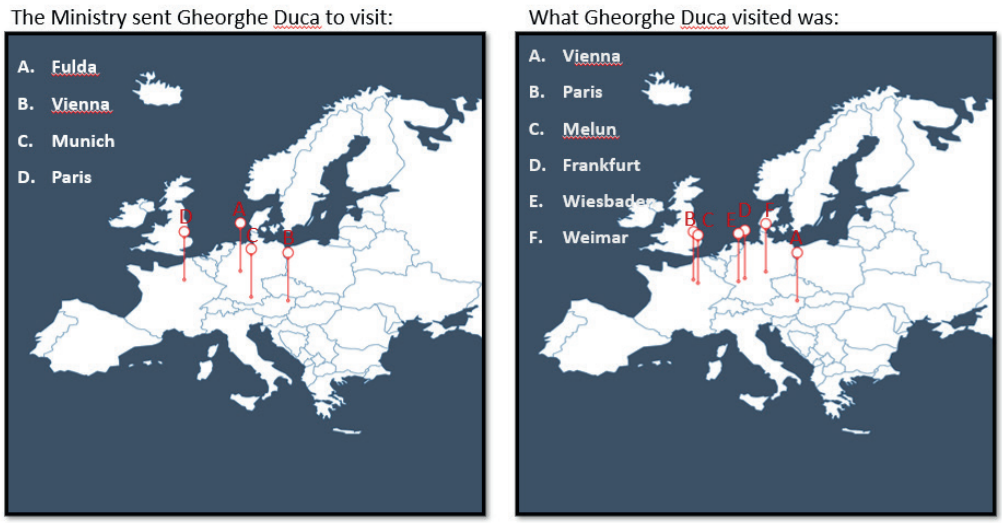

Figure 2: Map of Europe with marked cities, proposed and visited by Duca.

After the journey in 1891, he submitted a comprehensive report on the buildings he had visited. The report included case studies as well as the essential general characteristics to be observed in such a structure, drawings, and explanations. The report also mentions Klasenn L. (1887). book, which was probably the only book on the subject in the field of architecture at the time. The theoretical approach and documentation were therefore an important element at the beginning of the project, as we will see.

The second option was to send the subject to the architect Giulio Magni, who was in Italy in 1983. He made a proposal and after the analysis of Magni's project by Romanian architects (Ioan Mincu and Louis Blanc) and the directors of the Archive (Bogdan Petriceicu Hasdeu - current director and Grigore Manu - former director), the contract was signed (Sas, 2023).

DETAILS OF THE PROJECT

The Ministry, together with the Commission, decided to keep the site of the Mihai Voda Monastery as the location for the new project. This meant that the church of the monastery complex would remain at the centre of the new proposals. This site was attractive because it was located on a hill known as Mihai Voda Hill, close to the state institutions, but not cramped between buildings, which would have easily facilitated a fire. It was furthermore protected by the Dâmbovița River, which ran along the valley of the hill and could have caused catastrophic floods.

In conclusion, they kept the site because it met the safety requirements and because they did not have to invest in the land, as it belonged to the Ministry (Sas, 2021).

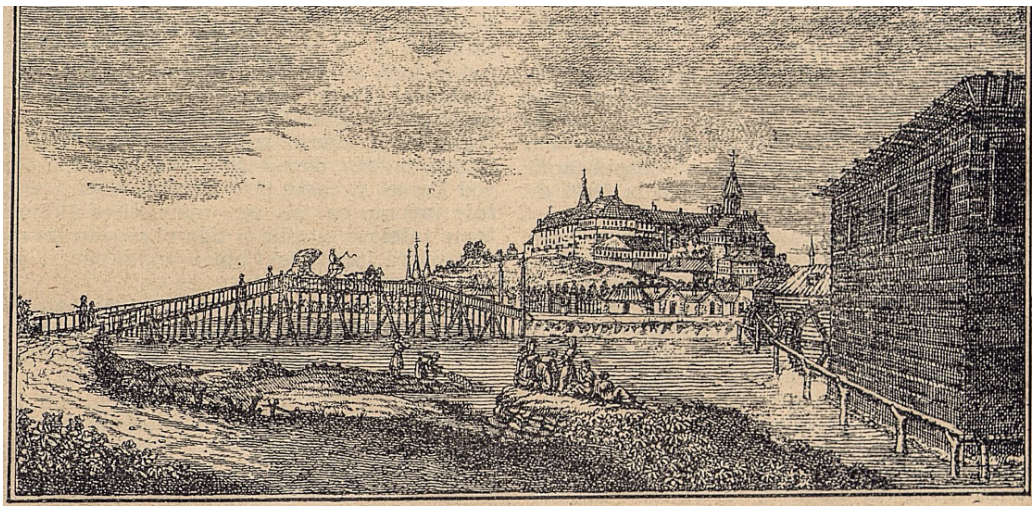

Figure 3: Lithograph of Michai Voda Monastery

The First Draft that was submitted

The first draft was made in 1893, even though the architect had never designed such buildings before. This project can therefore be seen as a challenge for Giulio Magni, to which he responded with an interesting solution.

In Italy until then there were a few archive buildings adapted for Archives, but we cannot say how relevant they were for architect Magni and his proposal for Romania. There was also a regulation for libraries completed in 1816 (Leopoldo Della Santa, 1816), but we do not consider it so relevant for this task. We do not know what he had studied or what materials he had access to, but nevertheless Magni's proposal shows a high degree of topicality, and we consider it closer to the German archive building model. It is therefore possible that Magni knew some of the information contained in the publications and that he also visited some of the archive buildings.

From the first draft that was submitted, only an axonometry and two sections are preserved in Italy, but thanks to the comments of the committee, preserved in writing in Romania, I have more details. The proposed building was „U"-shaped, with the main side dedicated to administration and study rooms, and the ends, resolved in a mirror, for storage rooms.

This first draft that was submitted, although interesting, was criticised by the committees that examined it, because the storage buildings were each 16 metres wide and about 22 metres long. Considering the materials that could be used, this would have been a very heavy building for an archive repository at the time, and its structure would have posed serious safety problems due to its location on a hill (on an unstable terrain). Following these observations, Giulio Magni redesigned the project (ASCV, 1893).

The Second Draft that was submitted

The second draft that was submitted gave the project its final shape. This version was worked on and perfected before the project was handed over.

In this draft, the shape of the building was changed from „U" to O". Thus, the main body remained for the administration, study rooms, museum and palaeography school, and the rest of the remaining U-shaped building was to be used for the warehouses.

The architect reduced the width of the building for the storerooms and organised the building around the church, thus obtaining a composite in which he combined the functional, aesthetic, and historical parts of the site in a beautiful proposal.

DESCRIPTION OF THE MAGNI PROJECT

The project was complex, requiring urban interventions and the demolition of all other buildings in the area that could pose a danger to the archives. The building was divided into two functional parts: one for administration and the other for storage. The two buildings were connected by an underground and an overground passage.

Storage area had metal shelves with an impressive structure, like the archives in France and Germany, and had lifts for documents, as the storage areas were arranged on several levels. The warehouse building had a basement and two floors divided by a metal ceiling. This gave five floors of storage space.

Administration building was functionally resolved in mirror image, using the monumental staircase and the Hall of Honour as an axis of symmetry, resolving the distribution of rooms.

The ground floor of the administration building was organised with rooms for the porter, the steward, the technicians (for the heating system) and the bookbinder's office (there were two such rooms).

The first floor was used both for the administrative area (offices of the archivists, the director, and the deputy director) and for the study rooms, of which there were two, as mentioned above. The vertical and horizontal corridors (passageways) have been retained, with minor modifications.

On the second floor there was a series of five rooms arranged in a single wing on the west side, as follows. The library was located on the axis of the main staircase, and the rooms to the left and right of the library were also connected by a door. On the left was the Museum and the Hall of Heraldry, and on the right the School of Palaeography and the Hall of Stamps and Miniatures. On this level there was no longer any connection between the administrative and storage buildings (Sacerdoțeanu, 1940).

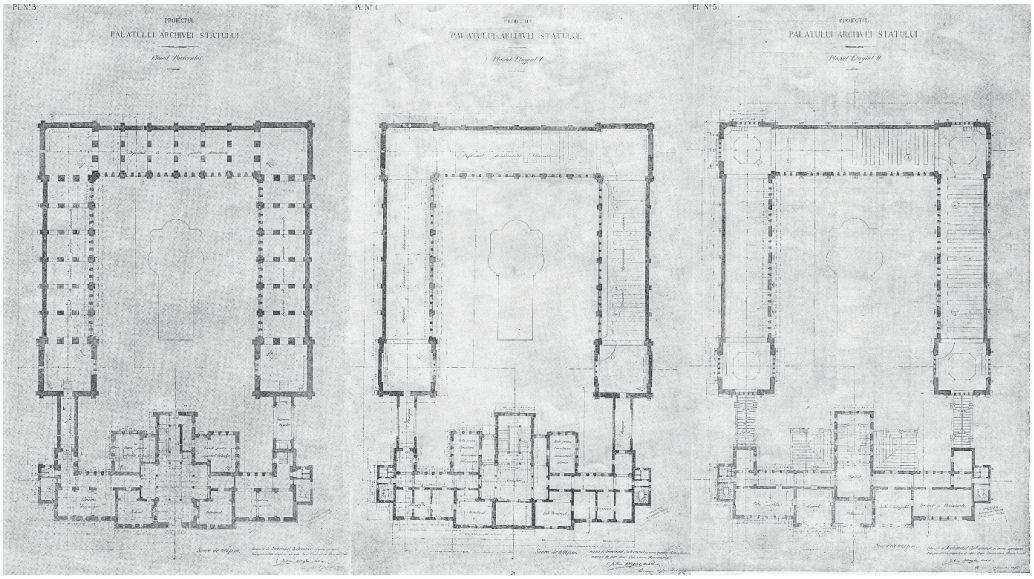

Figure 4: Plans of the project, drawn up in 1895 by Giulio Magni (Sacerdoțeanu, 17–20).

COMMON ELEMENTS OF THE MAGNI PROJECT AND EUROPEAN ARCHIVES

The project was framed in the European framework archives, there are therefore common elements in the construction of archives building at the end of the 19th century, as reflected in Magni's project:

A) Separation of the administrative and storage buildings; this increased safety against fire and burglary and allowed the building to be expanded in the future, doubling the storage capacity without interfering with the functional circuits.

B) Connection of the two buildings with passageways, as the administration and warehouses were separated.

C) Isolation of the building from the surrounding buildings; to find a plot of land large enough to isolate the buildings, or to demolish buildings that were in the way and posed a danger to the Archives.

D) Using fireproof materials and excluding wood from any part of the building.

E) Using iron galleries with perforated metal to allow light into the warehouse.

F) Retaining the windows of the warehouse building, but in Mani's final proposal only in the courtyard.

G) Using the basement only as a back-up storage area.

H) Keeping as much of the permanent storage space off the ground as possible.

I) having a library and a museum.

J) Avoiding the need for mobile staircases and not to use rooms with high ceilings.

K) Putting the windows in the middle of the corridors between two shelves.

NEW CHANGES AND ENHANCEMENTS

The designs were analysed by a committee of Romanian architects who helped a lot to improve the project. We believe they were very much inspired by Duca's report because their observations were followed step by step after that. As mentioned earlier, what was and is imported into every project, and we believe they had access to this documentation because some of the committee members who reviewed Magni's project also reviewed Duca's report when it was submitted (Sas, 2023).

The solution was unique for several reasons:

A) the whole project was compared to other archive buildings built in Europe up to that time on a very large scale.

B) the church conditioned the location of the buildings around it; in other archives made until then, we have the deposits in the form of I, but in no example in the form of „U".

C) the solution was to have two study rooms on the first floor for the two storage sections (administrative and historical documents); only in the twentieth century do we find this concept applied to the Magyar Nemzeti Levéltár; it would therefore have been necessary to create the study according to the documents selected in the hall (not very different from today if we refer to the technology and the way study rooms are converted).

D) The size of the storeroom was 1600 square meters and the height of the storeroom was 5.40 metres; in reality, the storerooms built up to that time had an average size of 500 square metres at the most.

E) The lack of windows in the warehouses facing the street, which today seems logical and perhaps even trivial, but in Europe at that time all buildings had windows, so there was no difference in appearance between the warehouse and the administration as we are used to today.

F) The connection between the two buildings (administration and storage) was underground and above ground to ensure the security of the documents. We do not have both options, as is the case in other Archives in Europe.

G) On the top floor of the administration building, there was a museum, a library, a school of palaeography, a room for heraldry and a room for stamps and miniatures.

H) The project was designed to be built in stages, not all at once. This was a fantastic innovation because of the cost of such a large building was high.

All these innovations were gradually introduced into the design after discussions with the committee. By the end of the project there were five drafts of the project, but the shape and organisation around the church remained the same.

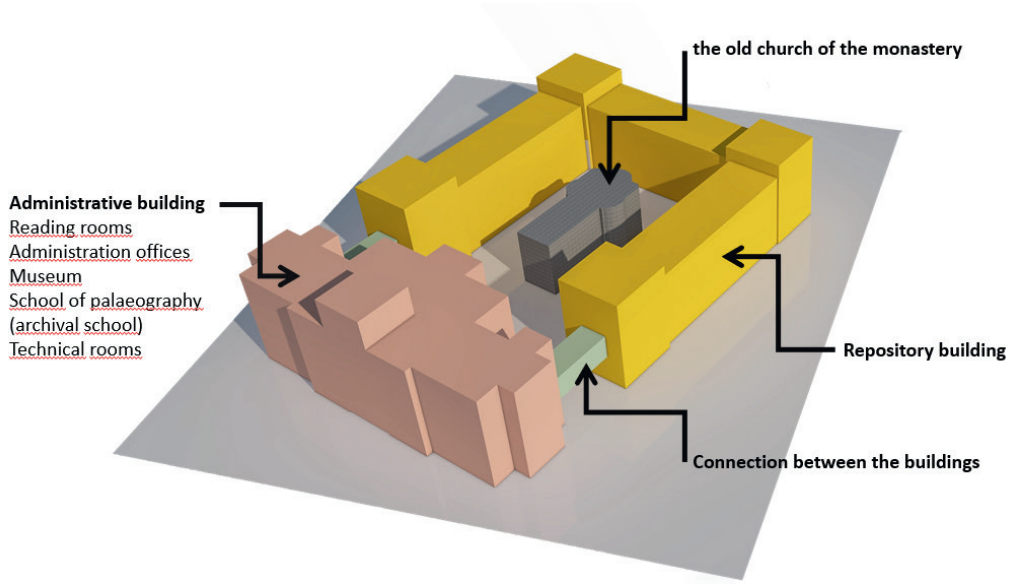

Figure 5: Schematic representation of how the archive designed by Magni is organized.

THE PROBLEM OF WINDOWS IN ARCHIVAL REPOSITORIES

Until then, all Archives in Europe had windows, as mentioned earlier, but at that time windows were used to provide light in the repositories so that archivists could do their work with ease. We are talking about a period when electricity was beginning to spread, but not all buildings had this facility, so oil or gas lamps were sometimes used for archives, which posed a great risk to the safety of the documents.

To increase the amount of light in the repositories, the walls were painted white and the furniture grey, and the intermediate galleries were made of perforated metal to increase the amount of light and avoid shadows.

The Commission insisted on several occasions that the windows on the external façade should be removed because they posed a risk of burglary or fire (as the building was on the boundary of the site, it could not be fenced off).

The project retained the windows on the internal façade (from the courtyard and the church), which were safe and probably sufficient for the lighting requirements. This project was the first in Europe to be identified as having no windows in its warehouses, even if only on the outside.

What today would be seen as a need to maintain temperature and relative humidity was then seen as a need to increase security.

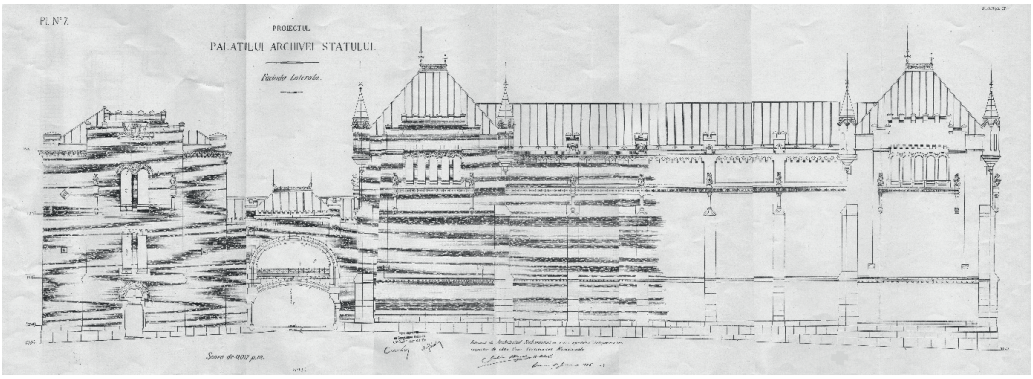

Figure 6: The southern exterior facade of Magni's building (Sacerdoțeanu, 1940, 28).

A DRAWBACK OF THE PROJECT

The question remains: how did they come up with the idea of building such large warehouses? We understand that storage space was needed, but the size of 1600 square metres was too large for one room. We also think it would have been very difficult to control the temperature inside. We believe that they took the information from other warehouses in Europe and applied it on a larger scale, not realising that in many ways it would have worked much better if the space had been divided into smaller areas 200-300 square metres.

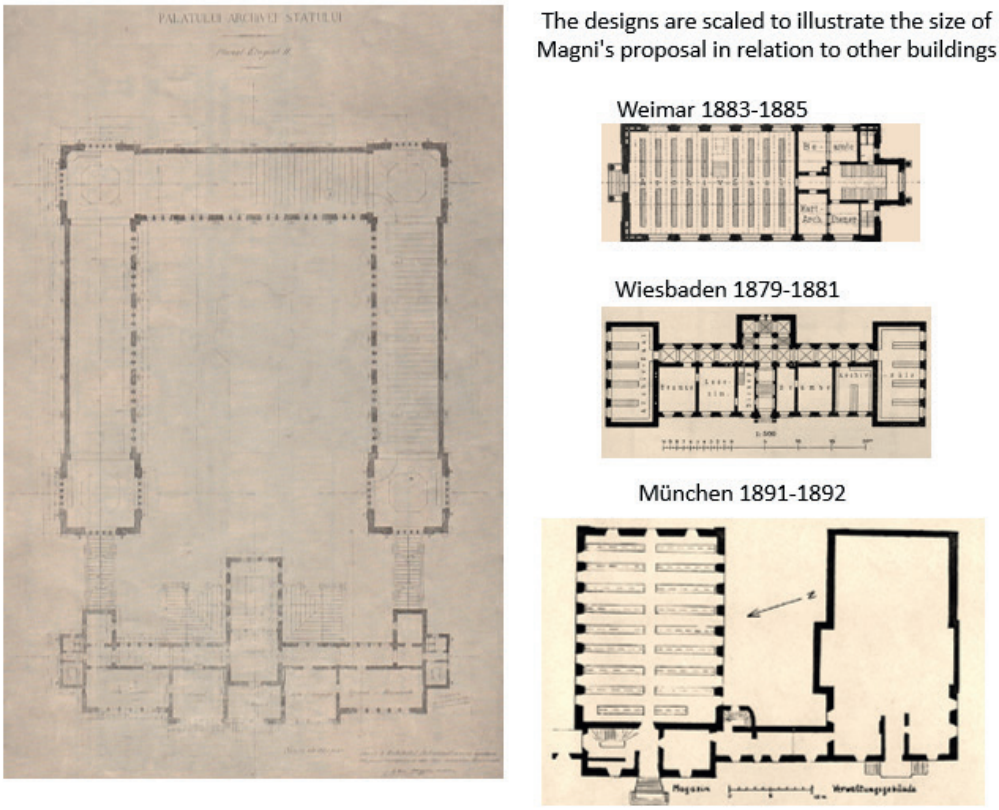

Figure 7: Many plans for archive buildings ran parallel to Magni's project. The plans are scaled to show the size of the proposed building.

THE FINAL PROJECT

The implementation of the project was delayed by discussions between the Ministry, the Archives Institution, the Commission, and the Town Hall, as it was necessary to carry out some expropriation work to increase security. The problems were financial, as there was a mismatch between supply and demand for the land required. The Ministry did not want to invest as much as the municipality wanted, and the municipality did not want to accept as much as the Ministry offered.

A major urban development was to take place in the area, with the extension of a major boulevard that would pass in front of the institution. The city therefore wanted to charge the Ministry for the construction of a section of the boulevard, since the Archives were located there.

On 4 December 1896, the architect presented the final version to the Ministry. Shortly afterwards, however, the minister changed and Spiru Haret, who succeeded him at the head of the ministry, did everything in his power to stop the project.

He persuaded the Council of Ministers to cancel the contract that had been awarded for the construction of the building, without any justification. He basically presented the issue in a way that suited him, without fighting for the protection of the Archives as he should have done. Thus, in June 1897, the Council of Ministers approved his request, finally burying any hope of realising a project for the Archives in that century. Spiru Haret was a Romanian mathematician, astronomer, and pedagogue, famous for the organisation of modern Romanian education, several times minister of the Ministry of Religious Affairs and Public Instruction, but clearly without any understanding of the importance of the archives.

CONCLUSIONS

In conclusion, this was a thorough and ingenious project, both functionally and constructively, in relation to the period in which it was carried out. This may have been due to the involvement of so many architects in its co-ordination, as well as the relatively long planning period which allowed for its refinement.

It will go down in history as the first project to come so close to realisation, and sadly it won't be the last to end that way.

After a careful analysis, based on literature and archival documents, we can say that none of the buildings has been completely copied between them. The functional, technical, and organisational elements were taken as models because it was more practical to invest the little money the Archives received in something that really worked, rather than testing it out.

So, the solutions were customised and adapted to the needs of their owners in all the archive buildings.

We have been able to see that the elements used in some buildings can be found in others, which means that this architectural programme has evolved step by step, and I think there is still a lot to be said and done.

We think that it is important to understand the past of the archive buildings and how they came to be, because they need to be improved in the future. So, this kind of research is necessary because we can't improve if we don't know how architects and archivists worked together before us. But some questions remain unanswered: Is there still a need for such buildings? What will happen to the existing buildings, will they be extended, or will we be limited to maintenance work? How big should an archive be in the future? Will all the basic rooms still be needed, or will new ones be created?

I believe that these questions should be considered by architects and archivists together as a team, because soon we will get all the answers and we need to be prepared.

REFERENCES

Archivio Storico del Comune di Velletri (ASCV), fondo Archivio di Stato di Bucarest, Sezione A-B e C-D 10 ottobre 1893, 8 Aut. Photo 15/2023.

Archivio Storico del Comune di Velletri (ASCV), fondo Magni, Archivio di Stato di Bucarest, tav. 5, First floor plan, Aut. Photo 13/2023.

Della Santa, L. (1816). Della Costruzione E Del Regolamento Di Una Pubblica Universale Biblioteca: Con La Pianta Dimonstrativa (Italian Edition)

Klasenn, L. (1887). Archive und Bibliotheken. In *Gebäude Für kunst und wissenschaft* (pp. 964-965) Leipzig, Baumgärtner's Buchhandlung.

Opfermann, R. (1893). Archive und Bibliotheken. In *Gebäude Für erziehung, wissenschaft und kunst.* (p. 4-40) Darmstadt: Verlag von Arnold Bergsträsser.

Opfermann, R. (1906). Archive und Bibliotheken. In *Gebäude Für erziehung, wissenschaft und kunst.* (p. 4-53) Stuttgart, Alfred Kröner Verlag.

Reisz, T. C. (2015). The History of the NAH Central Building's Construction. *Atlanti+*, *25*(2), 71–81.

Rumschöttel, H. (2006). Archivbau in deutschland: modelle und erfahrungen. In H. Rumschöttel, L. Cristofolinie, C. Curtolo (eds.), *La construzione degli Archivi linee di planificazione e tecniche construttive,* (pp. 33-35). Trento: Provincia autonoma di Trento.

Sacerdoțeanu, A. (1940). Proecte pentru palatul Arhivelor Statului, contribuție la istoria arhitecturii noastre în sec. XIX, București, Carte românească.

Sas, M. A. (2021). Arhivele statului în șantier continuu. Cazul Ansamblului monastic. In M.Vodă din București (sec. XIX-XX) (ed.), *Buletinul Cercurilor Științifice Studențești, Vol. 27*, (pp. 67-104). Cluj-Napoca: Mega.

Sas, M. A. (2023). Sediul Arhivelor Statului în șantier continuu, Onești: MGP

Winter, G. (1903), Das neue Gebäude des Haus-, Hof- und Staatsarchivs zu Wien. Wien: C. Gerold's Sohn in Komm.

Charles J. Farrugia[1]

IT AND ARCHIVES: CHALLENGES, THREATS, AND OPPORTUNITIES

Abstract

Purpose: *Archives world-wide have managed to embrace the benefits of Information Technology (IT) in order to preserve records and also reach bigger audiences. At time this has been done through international collaboration with organizations that specialize on the reprographics, interpretation and rendering content online.*

Method/approach: *The method used in our paper is based on case studies from the National Archives of Malta and demonstrates the benefits of international collaboration in digital curation in archival settings.*

Results: *The cases indicate that there are benefits that go beyond the financial management dimension and that the learning experience and bridge building are beyond monetization.*

Conclusions/findings: *International collaboration in the field of digitization provides huge opportunities and benefits to the sector as the sharing concept results in a critical mass of content, expertise and promotes excellence and accessibility.*

Keywords: *archival digitization, Malta Study Centre, Archives Portal Europe, Ancestry, The Genealogical Society of Utah.*

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During the last few decades, archives, worldwide, have experienced a transition from inward-looking institutions to information centers within communities. The traditional focus on the fonds, the preservation of the record and the attention to the diplomatic and paleographical content of the document is giving way to the openness of the same records to wider cohorts of people. In so doing, digital technology plays an important role. Information Technology (IT) has transformed the way we preserve documents, study them, and present them to our clients.

This paper focuses on four case studies from the National Archives of Malta. The way digital technology is used to preserve the records and widen access to them is at the core of this presentation. The collaboration with the Genealogical Society of Utah (GSU), the Malta Study Centre at the Hill Museum and Manuscript Library (MSC), the Archives Portal Europe (APE), and recently with Ancestry have provided the National Archives of Malta and the collaborating institutions several opportunities and challenges.

Digitization has become an important component in the way we preserve cultural heritage. It has enabled easier access to millions of items within archival holdings to people worldwide without the need to travel. We now have the ability of sharing records whose accessibility was previously limited because of their format, access rules or the equipment need to view the documents. Digitization has added value to collections, both from a business and a research perspective. The transformation processes brought about by digital technology are giving a new impetus to the development of archival science. (Romanova, 2019, 24).

The impact of digitization projects is often praised as an effective tool of rendering documents open to wider sectors of society. However, such perspective often underestimates the impact such projects have on the creation of descriptive metadata that is a prerequisite to any digitization of archival documents project. The metadata creation, especially when carried out within a rigorous process of professional archival description will provide for the control of the newly created digital content, facilitate research, pave the way to greater retrievability of information, and open new avenues of across-nations collaboration.

Most business operators nowadays embrace the power of digitization and are rapidly automating their operations and embracing the benefits of AI in such processes. (Colavizza, 2021). This is often triggered by the incentive that seamless

data digital systems strengthen efficiency and generate profit. Thus, such a frame of mind is rather challenging to be embraced by archives, that are generally, by their very nature, non-profit organizations.

The learning experience at the National Archives of Malta (NAM) has been that there is great benefit in collaborative digitization projects, whether they are for profit or not. Empowering an archive to digitize large collections is a preservation mission with the added benefits of wider public outreach, in settings where it would be almost impossible to reach such targets entirely inhouse.

CASE STUDIES

The National Archives of Malta have been collaborating with international companies and institutions for the past 20 years and we aim to continue doing so.[2] These collaborations have a multitude of benefits, for us as National Archives, for the companies and institutions we deal with, and most importantly for researchers internationally. But it is fitting at this point to document how the concept of reprographics for preservation and access was introduced into Maltese Archives.

It was the initiative taken by the Hill Monastic and Manuscript Library of St John's University, Collegeville, Minnesota, USA that brought the concept of reprographics for preservation and access to documents to Malta. Throughout the Middle Ages the Benedictine Order preserved extensive wealth of classical and religious texts through their monastic scriptoria. This was followed by the initiative of the Jesuits of St Louis who asked and obtained permission from Pope Pius XII to microfilm the Vatican Archives (Azzopardi, 2008, 353).

Such projects are critical to any archives not necessarily due to the benefit of the provision of services at no cost to the institution. It is more the combination of passion, commitment, funding, and *esprit de corps* that makes such initiatives most welcome. They often endow the institution with a sense of adventure, purpose, and well-defined targets.

In 1971 a group of prospective donors were invited at St John's and this group included Dr Joseph S. Micallef, Malta's Honorary Consul General in Minnesota.[3]

2 For an extensive account on the establishment and development of the National Archives of Malta see Farrugia, 2022, pp. 267–290.

3 Chev. Joseph S. Micallef is a Maltese lawyer who became Malta's Honorary Consul General at St Paul, Minnesota, United States of America and also the founder of the Malta Study Centre.

He provided the link to Malta, did the preliminary investigations and contacts, and paved the way to a rather lengthy negotiating process to try and convince both Civil and Ecclesiastical authorities in Malta of the benefits of reprographics for archival institutions (Azzopardi, 2008, 355).

Microfilming work in Malta by the Benedictines started in August 1973 and one can say that save for a period of years when projects were stopped, such activity on the Maltese islands still persists. What started as a modest microfilming project inspired other initiatives. The conservation laboratory inaugurated in March 1982 at the Cathedral Archives was as a direct result of the pre-microfilming needs of the holdings. The project also matured to the extent that the same promoters felt the need to set up a Malta Study Centre and later appoint a curator.[4]

The new drive towards archives in the late 1980s led to Phase Two of the Malta project with more work on the Cathedral records, triggered by the enthusiasm of Dun Ġwann Azzopardi who was the main promoter of archival activity within the Cathedral Archives at the time (Farrugia, 2002).

The learning experience of the projects between HMML and the Church in Malta were finally taken on board by the Maltese government in terms of its National Archives. On 23 October 2007, an agreement was signed that kick-started work on the legal documents dating back to the sixteenth century (Azzopardi, 2008, 372). Following that agreement, extensive work was carried out on important fonds for the legal history of Malta, and the first such records became much more accessible to the public (The Malta Independent, 2015).

Such international collaborations do not only provide the normal benefits any digitization project offers. When the reproduced product is put side by side with other holdings within an institution that is specialised on a certain typology of records (such as HMML is in the manuscript world), it is often the case that they are integrated into access portals that are professionally structured and reach extensive audiences. In this case, clients can already benefit from extensive access to holdings that are now online on the HMML platform. It is indeed a pity that as stated by Paolo Leon in 2008, the added value generated by archives and archival research is not valuated in a tangible way in the general economic model of any country (Tatò 2019, 99).

4 The first curator of the Malta Study Centre was Dr Theresa Vann who was appointed on 30 September 2000 and the endowment was to be titled 'The Joseph S. Micallef Curator for the Malta Study Centre.' See Azzopardi 2008, 371.

However, this collaboration was not the first of its kind. The National Archives of Malta had already built a collaboration with the Genealogical Society of Utah (GSU). Negotiations started in 2001 and the first agreement was reached in 2002. The project targeted the microfilming of NAM's collection of passport applications for the period of 1880 – 1923 which totaled to approximately 50,000 applications.

The GSU were offered working space and logistical support at NAM's premises to carry out the project. The project was finalized in 2003 but the GSU showed interest to extend the project and digitize more records from NAM's holdings. On 17 November 2006, another agreement was signed. This time records were to be digitized rather than microfilmed. This collaboration was extended for a number of years.

The challenges here were more issues of overcoming the taboo that might have existed for archives of what was ones one of the staunches Catholic countries to work with an organization of a particular religious orientation. Discussions were quite lengthy but finally the agreement achieved even the blessing of the President of Malta of the time during a courtesy call by the delegation of GSU to His Excellency on 23 October 2002 (Farrugia, 2006, 103). What was even more ambitious was convincing sections of the local Church in Malta to work with the Mormons. The account of such negotiations and the approval given by the Archivist of the time Mgr. John Azzopardi have been published by the author of this article who was also the main interlocutor between the two (Farrugia, 2002).

The advent of a consistent drive towards digitization further underlined the need of adequate finding aids to make huge amounts of digital records retrievable. And more than that, the need that finding aids in the respective archives can interoperate in a way that searches can be carried out across institutions and countries. The Archives Portal Europe network (APEnet) project originated as a result of such a need (Archives Portal Europe, 2023). The National Archives of Malta was one of the founding members of the project and joined as an associate of the Archives Portal Europe Foundation in 2015. The project empowered partner archives to tackle the tricky path of making finding aids speak to other research tools in sister archives abroad. It also provided some basic EU funding targeted at developing human resources and the purchase of new equipment for digitization for APE inspired initiatives.

One of the latest (2021-2022) collaborations was the digitization and metadata creation of 1000 large format plans and sketches of various locations on the Maltese Islands. The collection was ingested in APE and Europeana (via APE's backend).

What was also remarkable about the APE collaboration was the long-term sustainability of the project. One of the challenges with any EU-funded project is that it is often for a defined period of time. Once that funding dries up, several valid projects and platforms died a natural death. This was not the case with the Archives Portal Europe. The setting up of a Foundation helped in maintaining the governance of the project. It also sustained its visibility in society through the setting up of a network of Country Managers that continuously reach out for new content and to sustain and iron out any technical issues that crop up from time to time.

The consolidation of our participation side-by-side with the APE experts came at a time when a decision was taken at the National Archives of Malta to apply the ICA sponsored software AtoM to manage our holdings. Even this brought with it new challenges in terms of setting up Linux operated servers and train the cataloguers. The whole process was a learning experience. Any entity which forms part of a bigger government infrastructure operates under limited budgets and this poses a real threat to the sustainability of any digital platform. Furthermore, all operations need to respect the general government and EU frameworks in terms of legal parameters (Intellectual Property Rights, GDPR and FoI) and procurement procedures.

The final case study that this article refers to is the recently signed agreement between the National Archives of Malta and Ancestry. It was a known fact that family research in Malta is often carried out in the private rather than in the public domain. (Farrugia, 2006). The reason for this was that the Public Registry in Malta started operating only in 1863 (Identità, 2024). This means that anyone interested in conducting family research had to visit several parish archives from the 78 around Malta and Gozo. This situation was to some extent partially improved through the portal which the Church in Malta now offers (Malta Diocesan Archives, 2018). However, while the local Church authorities are putting online the oldest material they have, and the Public Registry dates back only to the nineteenth century, the gap in between still provides family research historians with a challenging terrain.

Through the collaboration agreement with Ancestry, the National Archives of Malta will digitize the Guljana Letard-Ciantar, a circa 800-volume strong collec-

tion that the National Archives bought from private hands in 2020. As with other Guljana collections it consists of data retrieved from Church Archives scattered across the Maltese Islands listing baptisms, marriages, and deaths.[56] Genealogists used to send private clerks to the parish archives to collect such data and render it in searchable volumes for the purpose of commercial family research. This collection also contains copies of notarial deeds, benefits, legacies, wills, and concessions on titles of Maltese and Gozo nobility.

When this treasure trove for family history was purchased, our team intervened in terms of cleaning, minor conservation, and the preliminary listing. Soon after this process was finalized, the records were opened for public research from the premises in Rabat. However, in the absence of detailed and automated finding aids, research from the primary sources is still challenging. Thus, the decision was to partner with Ancestry.[7]

The agreement, signed on 9 February 2024, will provide for the digitization of the records, their cataloguing and services to the public by Ancestry. Concurrently on-site clients will have the added resources of the catalogue, the digital data and access to all databases that currently Ancestry offer to their clients.

Thus, through this collaboration, not only will the National Archives of Malta speed up a digitization and cataloguing project that would have had to wait decades due to other digitization/cataloguing projects, but also partner with a worldwide system of research that is both renowned and specialized in the sector of genealogy. User statistics indicate that even the announcement of the deal already increased the user base when it comes to family history on-site research at the main reading room in Rabat.

OPPORTUNITIES AND CHALLENGES

If one had to list the opportunities that such collaborative approaches posed to our organization, topping the list would be the possibility to enlarge in an impressive

5 Reference to signing re Guljana Letard Ciantar.

6 It is known that a number of Guljani existed in Malta. They were compiled by or on commission from the main genealogists on the island including Letard Ciantar, Arturo Scerri, Armando Mifsud, Gian Karl Muscat and Dr Geoffredo Adami.

7 Ancestry is an American genealogy company registered in Malta. It is considered as the largest for-profit genealogy company in the world, and it operates a network of genealogical, historical records, and related genetic genealogy websites. It provides access to billions of historical records and is nowadays also providing DNA kits to costumers.

manner our digital content and thus, digital repository. This in turn helped to foster a new awareness of the need to digitally preserve our holdings and prepare our human resources capability to archivally process large holdings.

The second advantage is the newly acquired capability to share data from our holdings across archives and beyond country territories. If we just consider the widely sought after collection of Passport Applications (MFA fonds) at the National Archives of Malta, these were digitized by the GSU and are available via the APE platform. This fonds has become one of the most researched from our holdings.

The opening up and working with colleagues coming from both European and American institutions instilled in our operations and newly acquired awareness about the importance on interoperability, whether in terms of archival standards, hardware, and software we use. The use of open-source software platforms such as the ICA developed AtoM increase accessibility by giving worldwide access to our collections on different platforms.

These projects have also a hidden benefit that is only appreciated as soon as one enters the behind-the-scenes logistics. Most of these international organizations rely on an army of volunteers. A case in point is the extensive the GSU has of volunteers all over the world who feed into the system thousands of hours of metadata work. This process provides a much desired, but often extremely expensive, process of interlocution between the original records, the digital data and the names and details in the records.

Digitization projects carried out in collaboration with international organizations do not bring only benefits but also challenges. One of these is the adjustments the institution has to make in terms of working with technical people from the organization providing the services and also agreeing in terms of metadata standards that will be adopted. Contrary to hiring a private digitization company, the organizations involved in the case studies are all entities that capture, process, and provide access to the data. They come equipped with metadata standards, policies, and procedures. Thus, an initial major challenge is creating the right synergy with the house rules of the host institution.

As soon as a project starts, one soon realizes that large volumes of data start getting created daily. Thus, apart from the right workflow procedures to manage

the new data in terms of cataloguing, labelling, and placing the data in the right archival 'containers', one needs to think about the storage. While the days of travelling through Customs with luggage full of microfilm reels are things of the past, digital transfer, preservation, and organization is still challenging. A sturdy digital infrastructure is required, and this does not mean only huge servers or cloud storage provision, but the right level of human expertise to maintain the flow, preservation, and access to the data.

Over almost three decades throughout which we have worked our way through these projects, there were huge transitions in the Maltese human capital. Although the country opened up its labor market and considerable numbers of EU and non-EU workers moved to Malta, specialized human resources with specific expertise in specialized IT are difficult to enroll on a public administration salary. Furthermore, this scarcity of skills is even more pronounced when it comes to knowledge and expertise in digital preservation and data migration and continuity.

Table 1: Opportunities and Challenges of Partnerships for Digitization in Archives

Opportunities		**Challenges**	
Content	- Facilitates production - of digital content, - Paves the way and facilitates the metadata creation, - Makes it possible to identify related holdings elsewhere.	Legal	- Negotiating agreements that are in line with national legislation, - Carry out processes that respect the legal and regulatory processes, - Navigate through conflicting legal frameworks.
Collaboration	- Build contacts between archives and private operators, - Expose content to a global rather than local audience, - Provide new opportunities for scholarship and partnerships.	Cultural	- Certain archivists are still protective with sharing the contents they are entrusted with, - Some institutions prohibit such sharing of data outside their platforms, - Shifting the user experience beyond the reading room walls.

Skills	- Transferability of specialized skills across countries and institutions, - Most training and intervention can be done online, - Internationally based training available.	Skills	- Identifying the right persons to work on projects, - Overcome the skills and linguistic barriers, - Retaining skilled personnel.
Visibility	- Exposes digital holdings to the world, - Renders archival records useable for social media and in-depth study, - Provides opportunities to carry out joint projects.	Digital Infrastructure	- Needs constant migration and sustaining, - Requires strong and consistent financial resources, - Can suffer from cyber threats.

CONCLUSION

One of my articles published in 2016 had the title Lone Rangers no more: archival cooperation in transition (Farrugia, 2016). It was written at a time when the archives sector was coming out from the isolation and nation-centric approach of the Cold War era. Europe-wide and EU structures were coming together to help archives speak to each other, learn for their experiences and benefit from the benefits of joint up thinking and action. The IT revolution transformed such collaborative thinking not only into desideratum but into a daily need. This has been stimulated also by specific formative courses bringing together archiving and digital preservation. In his writing about the development of the role of digital technology in personal archiving Allegrezza speaks about the courses in Personal Digital Archiving and how such initiatives are underlining not only the need or archiving (*bisogno di archivistica*) but reaching out to the public and transforming archiving into a basic skill needed by everyone. (Allegrezza, 2019, 73.)

The three decades of collaboration and experimentation the National Archives of Malta has just experienced in digitization of archival records through agreements with international organizations has made us appreciate the opportunities and challenges. Generating content, collaboration across territories, empowering skills and building a robust digital infrastructure rest in one of the scales. Battling legal issues, overcoming cultural barriers, training people in new digital procedures and guaranteeing a robust digital infrastructure rest in

the other. Our assessment so far makes us strongly believe that the benefits by far outweigh the challenges.

Summing up, we would argue that the whole experience has been positive. As a community we can embark on the development of scientific models to assess whether the benefits outweigh the drawbacks in such processes. No such model, however, can factor in and value enough the friendships, sharing of ideas and strong sense of doing something noble for the community and future generations.

REFERENCES

Allegrezza, S. (2019). The Importance of Personal and Family Digital Archives for a New Perception of the Archival Discipline. *Atlanti, 29*(2), 58–76.

Archives Portal Europe. (2023). *The portal*. Retrieved at https://www.archives-portaleurope.net/about-us/the-portal/ (accessed on 5. 3. 2024).

Azzopardi, J. (2008). A microfilm project by the Benedictines of Minnesota for Malta. In C. J. Farrugia (ed.), *Guardians of Memory: Essays in remembrance of Hella Jean Bartolo Winston* (pp. 353–390). Malta: National Archives of Malta.

Colavizza, G., Blanke, T., Jeurgens, C., & Noordegraaf, J. (2021). Archives and AI: An Overview of Current Debates and Future Perspectives. *Journal on Computing and Cultural Heritage, 15*(1), 1–15. Retrieved at https://doi.org/10.1145/3479010 (accessed on 5. 3. 2024).

FamilySearch. (2024). *Family Tree*. Retrieved at https://www.familysearch.org/en (accessed 5. 3. 2024).

Farrugia, C. J. (2002). Dun Ġwann – An Archival Influencer and Reformer. In P. Caruana Dingli & M. Gauci (eds.), *Non omnis Moriar: Essays in Memory of Dun Ġwann Azzopardi* (pp. 489–496). Malta: Wignacourt Museum.

Farrugia, C. J. (2006). *L-Arkivji ta' Malta*. Malta: Pubblikazzjonijiet Indipendenza.

Farrugia, C. J. (2016). Lone Rangers no more: archival cooperation in transition. *Comma, International Journal on Archives*, *2016*(1-2), 115–123. Retrieved at https://www.um.edu.mt/library/oar/handle/123456789/45764 (accessed on 5. 3. 2024).

Farrugia, C.J. (2022). The Making of a National Archives: the case of Malta 1944-1990. In C. Serracino, *Ardet Amans. Essays in honour of Horatio Caesar Roger Vella* (pp. 267–290). Malta: Midsea Publishers.

Hill Museum and Manuscript Library (n. d.) *Reading Room.* Retrieved at https://www.vhmml.org/readingRoom/view/139831 (accessed on 5. 3. 2024).

Identità. (2024). *Public Registry.* Retrieved at https://identita.gov.mt/public-registry-main-page/ (accessed on 3. 3. 2024).

Malta Diocesan Archives. (2018). *Malta Parish Archives*. Retrieved at https://www.maltaparisharchives.org/ (accessed on 5. 3. 2024).

Romanova, E. (2019). Archival Science: Bridges between tradition and innovation. *Atlanti, 29*(1), 17–27.

Serracino, C. (2022). *Ardet Amans. Essays in honour of Horatio Caesar Roger Vella*. Malta: Midsea Publishers.

Tatò, G. (2019). Archives and the Society. In *Atlanti, 29*(2), 95–101.

The Malta Independent. (5. 8. 2015). *National Archives of Malta announce completion of the digitisation of the magnia curia castellaniae.* Retrieved at https://www.independent.com.mt/articles/2015-08-05/local-news/National-Archives-of-Malta-announce-completion-of-the-digitisation-of-the-magnia-curia-castellaniae-6736140033 (accessed on 3. 3. 2024).

Miroslav Milovanović[1]

ZERO SHOT CLASSIFICATION FOR UNSTRUCTURED TEXT OF ARCHIVAL VALUE

Abstract

Purpose: *The purpose of the article is to investigate if artificial intelligence and, subsequently, machine learning can provide any solutions to ease some of the archival tasks when dealing with classification of unstructured texts which have archival value. The research was aimed specifically on how to approach a specific archival task within content classification of unstructured texts.*

Method/approach: *In the research, the methods of content analysis and experiment were used. Different approaches to managing the classification of unstructured text with the use of machine learning were investigated, as well as the conduction of experiment testing of some of the most prominent technological solutions currently available.*

Results: *The research showed that the use of machine learning for the purpose of classification in managing unstructured text with archival value is achievable and effective.*

Conclusion: *The approach, with its method and technology, which was used in the research is mature, manageable, and available to carry out the archival task of classification of unstructured text where needed. Zero shot classification provides a suitable path to solve problems relating to the classification of unstructured texts of archival value where pre-labelled data for following the supervised approach to create the model for classification is not available.*

Key words: *Machine learning, unstructured text, classification, zero shot classification, description.*

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INTRODUCTION

One of the biggest problems in dealing with unstructured texts which could have archival value is how to handle the ever-growing amount of individual unstructured records using archival practice. While certain technology and methods exist that could be used for executing some of the individual tasks when dealing with unstructured texts, it is still hard to find or develop an organized approach in the form of a model or a guideline as how to proceed to achieve completeness when doing certain archival tasks, such as arranging unstructured texts or providing archival description to individual unstructured texts. Novak (2019) exposes that using modern information technology solutions in archival professional work, requires an approach which uses many ad hoc skills that are currently hard to acquire through formally established educations and trainings.

Unstructured text has no predefined structure, such as format or data model. Unstructured text thus represents any form of record that can include any information. Because this type of data is not organized in a predetermined way, it is more difficult to process and analyse when using traditional methods (OpenText Corporation, 2024).

In recent years many organisations started with their digital transformation processes resulting in the creation of a large number of digital records. The exponential growth of the number of digital records thus exposes numerous problems when dealing with those records such as the aforementioned arrangement of unstructured texts or providing an archival description to an individual unstructured text. Burgener and Rydning (2022) have outlined that an ever-growing number of digital records will be dominated by unstructured data in the proportion of up to 90% which is created on a yearly basis, and the proportion will just keep increasing.

There are several approaches available as to how to proceed when handling unstructured data but, when proceeding with such approaches, certain challenges should be addressed and taken into consideration, such as (OpenText Corporation, 2024; Baig, 2023):

- Accessibility and usability of unstructured data: The rapid evolution of information technologies and diverse formats may impact the readability of data, posing a challenge in maintaining its usefulness for subsequent processing.

- Efficient handling of vast data volumes: Managing the exponential growth of unstructured data poses the challenge of processing and capturing information promptly to prevent potential losses.
- Complex indexing and classification: The diverse forms and unknown contents of records make indexing and classification a demanding process prone to errors, significantly affecting the quality of the obtained results.
- Security challenges: Safeguarding confidential data during processing becomes intricate, as this information can swiftly proliferate across diverse record formats and storage locations, leading to difficulties in identifying sensitive content.
- Support for diverse record formats: Unstructured data lacks predetermined standard record formats, complicating data processing by requiring versatile solutions to handle various types of formats effectively.
- Requirement for specialised resources and expertise: Unstructured data constitutes a majority of created material today, necessitating robust hardware for efficient processing and skilled personnel, often referred to as "data scientists," capable of devising appropriate solutions for handling unstructured data.
- Considerable expense in establishing unstructured data processing systems: Beyond hardware and human resources, the cost of additional components, including specialised software, data storage equipment, and measures related to information security, must be considered when setting up systems for processing unstructured data.

ARTIFICIAL INTELLIGENCE AND ARCHIVING

There are several definitions of the concept of artificial intelligence but, generally, artificial intelligence could be defined as "*a science whose goal is to make a machine that will do things which require human intelligence*" (Balič, 2004) and as a system that can design or execute independently without human intervention (Barredo et al., 2020). Klasinc (2023) defines the use of artificial intelligence in Archival science as collective solutions "*that help in generating and managing archival content, context and other relations established in archival material*".

There are several advantages and disadvantages of using artificial intelligence.

Some of the advantages that can help in the field of archiving are "task automation" where faster task execution can provide a solution for mass data handling; no overload or stress when executing tasks; an ability to perform several tasks at the same time, low costs in relation to the work undertaken; possibility to discover relations, connections and patterns in previously unknown content etc, (Khanzode & Sarode, 2020; Bhosale, 2020). While there are some clear advantages to using artificial intelligence, there are also some disadvantages that need to be addressed when deciding if using such a system is appropriate, such as: a significantly higher inaccuracy given the potential errors when executing tasks; dependency and subjectivity with regards to the rules designed by the system architect (creativity and vision); the potential high cost in the development and implementation; dependence on specific technology; impact on a need for human resources; potential abuse and unethical use etc., (Khanzode & Sarode 2020; Bhosale, 2020).

ARTIFICIAL INTELLIGENCE AND ETHICS

Ethics within the field of artificial intelligence primarily involves assessing the implications and potential outcomes associated with the development and deployment of artificial intelligence (Boddington, 2023). One significant consideration is how the advancement of artificial intelligence may impact the demand for human labour and influence the nature of work (Kumar et al., 2021). The archivist's discretional approach as someone who evaluates the archival material and subsequently carries out the archival tasks is one of the most important things for quality assurance for the long term preservation of archival material. Even if artificial intelligence is used for such tasks, the human factor (the archivist) is still needed to initially develop and later evaluate the execution of expert systems and results gathered.

There are several topics that should be taken into consideration when developing solutions, including artificial intelligence, with regard to the execution of archival tasks. Some of the topics can include how to handle or manage privacy, responsibility, trust, continuity and sustainability, dignity, solidarity, transparency and availability, freedom and autonomy to make decisions and the provision of guidelines to enforce harmless execution (Boddington, 2023).

MACHINE LEARNING

Machine learning is a specific application of artificial intelligence. According to Murty and Avinash (2023), machine learning is considered a mature, dynamic and crucial field that has evolved over more than six decades. The accelerated expansion of machine learning can be attributed, in part, to the recent surge in the availability of machine-processable data and the enhancement and accessibility of hardware which is capable of efficiently processing substantial amounts of data.

At its core, machine learning relies on the processing of data to facilitate learning, making the format of the data a crucial factor. Data can be broadly categorised into structured, unstructured, semi-structured, and descriptive data or metadata. Furthermore, the quality and appropriateness of the input data play a vital role, influencing the approach and expected outcomes. Inadequate data or data containing extraneous information can significantly impact the expected results (see Caliskan et al.,2017).

There are many approaches to the use of machine learning, four of which are the most commonly used today (Sarker, 2021): supervised learning, which relies on data processing in respect to the relationship between input and output data, utilising pre-processed data which is readily available for learning and training; unsupervised learning which involves data processing without prior manipulation or human intervention; semi-supervised learning which combines elements of both supervised and unsupervised approaches, utilising both pre-processed and non-pre-processed data in processing; and reinforcement learning which is a machine learning approach facilitating the automatic assessment of optimal behaviour within a given context or environment to enhance performance.

NATURAL LANGUAGE PROCESSING

One of the domains where machine learning is extensively used is “natural language processing” (NLP). Eisenstein (2018) draws a direct comparison between natural language processing and the term “computational linguistics.” Despite a significant overlap, a distinction persists between the two definitions. “Computational linguistics” primarily emphasises “linguistics,” wherein various forms of computer processing play a supportive role, while in the case of natural language processing, the focus is on the design and analysis of computer algorithms and approaches for natural human language processing.

The primary objective of natural language processing is to provide new computing capabilities related to human language, including tasks such as extracting information from texts, language translation, question answering and engaging in conversations etc. Khurana et al. (2022) define natural language processing (NLP) as a branch of artificial intelligence and linguistics dedicated to enabling computers to comprehend statements or words written in human languages. Natural language processing was developed to simplify user tasks and to fulfil the desire to communicate with computers in a natural language. Additionally, the authors categorise the field of natural language processing into the "understanding of natural language" and "natural language creation."

Some of the most common uses of natural language processing using machine learning can include (McMullen, 2023): text summarisation, automated chat rooms, machine translation, classification of texts, answering questions, recognition of named entities, creation of natural language, discerning the meaning of words, sentiment analysis, speech recognition and connection of entities, etc.

RESEARCH

Managing extensive digital content with unknown and unstructured data with regards to identifying potential archival value poses a significant challenge. To provide swift, efficient and accurate handling of content with archival tasks, such as providing descriptions or arranging records, becomes problematic, particularly when attempting to classify, edit or list such vast quantities of digital material and when not undertaken immediately may lead to a poor preservation process and an inferior quality in respect of the records retained (Popovici, 2022).

When dealing with unstructured and content-ambiguous records, there is a likelihood that numerous records may not be worth retaining or preserving (Moss and Gollins, 2017). Therefore, it is essential to devise an approach for identifying and preserving those records of archival value (Grigory, 2023) through content classification and evaluation. This involves ensuring the accessibility and usability of the retained material while distinguishing it from what should be discarded.

The research presented here outlines the "zero shot classification" (ZSC) approach to classifying unstructured texts with archival value using machine learning. The object of the research was also to determine how the ZSC compares to a more guid-

ed approach of building a decision model based on a learning process and if it is possible to create an implementation model for the processing of unstructured texts. An example that was directly covered in the research was "text classification".

ZERO SHOT CLASSIFICATION

Zero shot classification relates to an approach to achieve a classification through a prediction of a classes that were not part of the initial training of the model (Hugging Face, s. d. b). ZSC still uses a pre-trained model to achieve its goal, but the aim is to provide an approach which can achieve a task of classification where training data for supervised classification is scarce.

There is one problem in particular that can present a serious obstacle to building a dedicated classification model and that is the lack of quality labelled data set for training, especially in the case of supervised classification. This is even more highlighted when we are dealing with multilanguage content. Generally, the ZSC relies on learning to recognise the layer of semantic attributes while building the model which can be used to identify classes that were not visible in the training process of the pre-trained model (Alcoforado et al., 2022).

There are several practical cases where ZSC can be used, given that there are no required prerequisites apart from the pretrained model such as: categorisation or topic classification, identification of intent, sentiment analysis and even image classification. Some of the advantages that ZSC could bring to the aforementioned tasks are mostly related to the optimisation of the processes, such as the time required to achieve the tasks, flexibility with regards to the inclusion of new material and independence regarding the form of data etc.

There are also some disadvantages which could impact the decision to use ZSC as an approach to undertake archival tasks such as the quality of the pre-trained model and connected class descriptions, extreme variation between the content and classes which were used for pre-training the model data and data which is intended for zero shot classification. One of the biggest drawbacks in using ZSC is also how to provide a tangible evaluation process with the intention of measuring the performance of the zero-shot learning process, as there are no preexisting labels that could provide any type of quantification such as in the supervised classification approaches (Xian et al., 2020).

Since ZSC is not a supervised approach there are also concerns in using such an approach in respect of tasks which may include ethical considerations. Given that the general guideline of the ZSC model relies heavily on the pre-trained model, certain points need to be taken into consideration like "content subjectivity" with an unsuitable class description process, which does not correctly capture the relationship between model decisions and the intended architectural layout, "biased decisions" for the same reason given the unsuitable class description, "misclassification" with regards to not understanding the context and "privacy concerns" etc. (Van Otten, 2023).

An inherent limitation of utilising the ZSC approach can also be in their narrow focus when declaring the hypothesis to implement the classification. If these approaches fail to detect the specific semantics they're trained to identify initially, it's unlikely they'll retrieve it any time later. This outlines the importance of maintaining consistency and clear instructions in the criteria creating the hypothesis. Any alterations from its concise meaning must be carefully considered to avoid disrupting the coherence of understanding as to what it needs to search for and how it should understand the similarities between classes. Utilising machine learning and ZSC can provide the basis for providing autonomously established rules for assessing content relevance, given the use of a suitable pre-trained model. This facilitates the possibility of identification and segregation of material with potential archival significance.

EXPERIMENT

The purpose of the research was to assess the efficiency of ZSC on individual text records when compared to the more controlled and supervised approach to text classification.

The data which was used to execute the ZSC were publicly available unstructured news articles in the English language, aggregated in the machine-readable textual form.

The following architecture was used to test the zero shot classification approach and compared with the variant of the supervised classification approach:

- 1000 individual records, each record containing one news article (Guardian Media Group, 2023); all individual records were pre-labelled under three sections or topics which were named: "government", "business" and "sports".

- For Zero Shot Classification, the pre-trained model "Roberta-large-mnli" (Hugging Face, s. d. a) was used.
- For the comparison classification using the supervised approach pre-trained model, the "Bert-base-cased" (Hugging Face, s. d.) model was used.

The workflow for executing the classification was divided in two parts. The first one being the Zero Shot Classification approach, which directly executed predictions, and the second one with the supervised approach including the additional "learning step" and, subsequently, the creation of a decision model to make predictions. Since the ZSC method does not include the "learning" step, the evaluation of efficiency would prove to be difficult as such so for valuation purposes, the data was pre-labelled with three topics.

The Zero Shot Classifier parametrisation, with the use of a pretrained model, was as follows:

- 1000 individual records as input for executing the Zero Shot Classification.
- A classifier was executed on each individual record.
- Content of each individual record was in its original, unstructured form.
- Candidate labels of expected classifying classes were "government", "business" and "sports".
- Custom hypothesis was used with the following narrative "The topic of this content is {}"
- Batch size: 10.
- 1000 individual records as output with assigned predictions on individual records in respect of the pre-labelled data
- Analysis and quantified distances (efficiency) between pre-labelled classes and predicted classes.

The supervised classification approach, using pre-trained model parametrisation, was as follows:

- 1000 individual records as input for executing the learning process and the creation of a decision model for classification.
- A classifier was executed on each individual record.
- Content of each individual record was in its original unstructured form.

- The classification learner included data (individual records) which were pre-labelled with one of the following classes (labels): “government”, “business” and “sports”.
  - Maximum sequence length: 512.
  - Number of epochs: 8.
  - Batch size:32.
  - Validation batch size:20.
  - Optimiser: Adam; Learning rate: 0.001.
- 1000 individual records as output with assigned predictions on individual records in respect of the pre-labelled data
- Analysis and degree of difference (efficiency) between pre-labelled classes and predicted classes.

RESULTS

Zero Shot Classification

The Zero Shot Classification result was as follows:

- 71% accuracy in respect of the pre-labelled data.
- 0.57 Cohen’s Kappa.

Row ID	government	business	sports
government	319	21	4
business	169	157	16
sports	75	2	237

Figure 1: Confusion matrix ZSC (Knime, 2024)

Supervised classification approach

The supervised classification result was as follows:

- 97% accuracy in respect of the pre-labelled data.
- 0.96 Cohen’s Kappa.

Row ID	government	business	sports
government	103	3	0
business	1	99	1
sports	2	1	90

Figure 2: Confusion matrix supervised classification (Knime, 2024)

DISCUSSION AND CONCLUSIONS

Discussion

Results for the ZSC approach show that in the case of classification, where no explicit learning process was involved and based on a generic pre-trained model, an accuracy of 71% was recorded. This in turn represents a good result given that the only "fine tuning" that was undertaken was where hypotheses and expected labels (classes) were provided without an actual pre-understanding of the data that was intended for classification. Because the ZSC approach is generally aimed at classifying data that can't be used for a supervised learning process of classification, it does provide a good way to solve problems classifying unstructured data with potential archival value where content is unknown.

The confusion matrix (Figure 1), in turn, shows where discrepancies were identified. While the "sports" class showed certain deviations towards being misclassified as "government" it was the "business" class that showed the biggest deviation with regards to the "government" class, as it was in most cases classified as "government" instead of, "business," as expected. This may, in a way, be explained by the fact that the content in individual records, which were pre-labelled with those classes mentioned, is very similar between two classes and, as such, provided the biggest challenge to make a suitable distinction. This deviation could also be attributed to the process of using different weights on the side of the pre-labelling process where "pre-classification" has already been undertaken for the evaluation purposes where the classifier could use a slightly different approach thus producing the contrasting results seen using the ZSC approach.

While the ZSC classifier went through the process of classification without the additional learning activity provided for input data, this was not the case in the second approach creating a decision model, based on additional activity of learning on the actual content that was intended for the classification prior to the final classification task. Because the second approach included the learning phase on the input data provided, accuracy was measured at 97%. This certainly represents an excellent result, but this could only be achieved while having the pre-labelled data available for training purposes. When dealing with unstructured texts with potential archival value, such availability or un-availability of pre-labelled data may prove to be one of the biggest obstacles for using this approach.

The confusion matrix (Figure 2) in the second approach shows that the learning process was crucial for eliminating confusion regarding content similarity. It shows that understanding content and its attributed values before actual classification does provide for a more coherent way to accept decisions.

Conclusions

Zero Shot Classification does provide a useful approach when dealing with unknown content which has potential archival value and with no accessible means to train the decision model based on pre-labelled data. It does exhibit certain disadvantages when compared to the supervised classification approach, but it also shows certain advantages in specific real-life scenarios. There are many archives and many creators which could benefit from the use of ZSC for providing usable content in accessing archival records, such as a virtual archive reading room (Sabadin, 2023) or any other digital platform accessible to the public.

With the proliferation of digital content creation and usage, the need for effective management of mass, unstructured data of potential archival value has become paramount. However, alongside this challenge comes the dilemma of determining what content to capture, when to capture it, and how to do it, raising questions about the necessity of capturing all digital material or just a selection. Given the vast volume of digital content being generated, it's imperative to establish criteria for evaluating material, identifying what warrants long-term retention or preservation as archival material. Adaptations and enhancements to evaluation approaches are essential to accommodate the sheer volume of digital content, ensuring that management processes maintain their quality without compromising efficiency. To address these challenges, it is crucial to exert control over new methods and technologies used for evaluating the value of potential archival content and ensuring transparency throughout the process which uses such technologies. Additionally, clear procedures and mechanisms must be established to ensure compliance with archival regulations and standards, fostering a clear and comprehensive environment conducive to effective management of unstructured text when using machine learning approaches to classify records.

REFERENCES

Alcoforado, A. & Ferraz, T. P. & Gerber, R. & Bustos, E. & Oliveira, A. S. & Veloso, B. M. & Siqueira, F. L. & Costa, A. H. R. (2022). ZeroBERTo: Leveraging Zero-Shot Text Classification by Topic Modeling. In P. Gamallo, R. Amaro, C. Scarton, F. Batista, D. Silva, C. Magro & H. Pinto (eds), *PROPOR 2022*: *Computational Processing of the Portuguese Language* (pp. 125-136). Fortaleza, Brazil: Springer.

Baig, J. (2023). *Unstructured Data Challenges for 2023 and their Solutions*. Retrieved at https://www.astera.com/type/blog/unstructured-data-challenges/ (accessed on 10.03.2024).

Balič, J. (2004). *Inteligentni obdelovalni sistemi*. Maribor: Faculty of mechanical engineering, University of Maribor.

Barredo, A. A. & Díaz-Rodríguez, N. & Del Ser, J. & Bennetot, A. & Tabik, S. & Barbado, A. & Garcia, S. & Gil-Lopez, S. & Molina, D. & Benjamins, R. & Chatila, R. & Herrera, F. (2020). Explainable Artificial Intelligence (XAI): Concepts, taxonomies, opportunities and challenges toward responsible AI. *Information Fusion,* 58, 82–115.

Bhosale, S. & Pujari, V. & Multani, Z. (2020). Advantages and Disadvantages of Artificial Intelligence. *Aayushi International Interdisciplinary Research Journal, 77,* 227–230.

Blei, M. D. & Ng, A. Y. & Jordan, M. I. (2003). Latent Dirichlet Allocation. *Journal of Machine Learning Research 3*(2003), 993–1022. Retrieved at http://www.jmlr.org/papers/volume3/blei03a/blei03a.pdf (accessed on 10.03.2024).

Boddington, P. (2023). *AI Ethics*. Singapore: Springer Nature Singapore Pte Ltd.

Burgener, E. & Rydning, J. (2022). High Data Growth and Modern Applications Drive New Storage0 Requirements in Digitally Transformed Enterprises. *IDC White paper*. Retrieved at https://www.delltechnologies.com/asset/en-my/products/storage/industry-market/h19267-wp-idc-storage-reqs-digital-enterprise.pdf (accessed on 10.03.2024).

Caliskan, A. & Bryson, J. J. & Narayanan, A. (2017). Semantics derived automatically from language corpora contain human-like biases. *Science, 356*(6334), 183–186.

Eisenstein, J. (2018). *Natural language processing*. MIT press. Retrieved at https://cseweb.ucsd.edu/~nnakashole/teaching/eisenstein-nov18.pdf (accessed on 10.03.2024).

Grigory, L. N. (2023). Archival science in the postindustrial society. *Atlanti+*, *33*(1), 38–44. Retrieved at https://journal.almamater.si/index.php/atlantiplus/issue/view/41 (accessed on 10.03.2024).

Guardian Media Group. (2023). *The Guardian Open Platform*. Retrieved at https://open-platform.theguardian.com/ (accessed on 10.03.2024).

Hugging Face (s. d.). *Bert-base-cased*. Retrieved at https://huggingface.co/google-bert/bert-base-cased (accessed on 12.03.2024).

Hugging Face. (s. d. a). *Roberta-large-mnli*. Retrieved at https://huggingface.co/FacebookAI/roberta-large-mnli (accessed on 12.03.2024).

Hugging Face. (s. d. b). *Zero shot classification*. Retrieved at https://huggingface.co/tasks/zero-shot-classification (accessed on 10.03.2024).

Khanzode, C. A. & Sarode, R. D. (2020). Advantages and disadvantages of artificial intelligence and machine learning: a literature review. *International Journal of Library & Information Science (IJLIS)*, *9*(1), 30–36.

Khurana, D. & Koli, A. & Khatter, K. & Singh, S. (2022). Natural Language Processing: State of The Art, Current Trends and Challenges. *Multimedia Tools and Applications, 82*(6). Retrieved at https://www.researchgate.net/publication/319164243_Natural_Language_Processing_State_of_The_Art_Current_Trends_and_Challenges (accessed on 10.03.2024).

Klasinc, P. P. (2023). Archivistics, Archival science and Artificial intelligence. *Atlanti+*, *33*(2), 25–36. Retrieved at https://journal.almamater.si/index.php/atlantiplus/issue/view/42/31 (accessed on 22.05.2024).

Knime. (2024). *Knime*. Retrieved at https://www.knime.com/ (accessed on 12.03.2024).

Kumar, P. & Jain, V. K. & Kumar, D. (2021). *Artificial Intelligence and Global Society*. Boca Raton: Taylor & Francis Group, LLC.

McMullen, M. (11. 5. 2023). 11 NLP Use Cases: Putting the Language Comprehension Tech to Work. *Readwrite*. Retrieved at https://readwrite.com/11-nlp-use-cases-putting-the-language-comprehension-tech-to-work/ (accessed on 10.03.2024).

Moss, M. S. & Gollins, T. J. (2017). Our Digital Legacy: an Archival Perspective. *The Journal of Contemporary Archival Studies, 4.* Retrieved at http://elischolar.library.yale.edu/jcas/vol4/iss2/3 (accessed on 10.03.2024).

Murty, M. N. & Avinash, M. (2023). *Representation in Machine Learning.* Singapore: Springer Nature Singapore Pte Ltd.

Novak, M. (2019). Identificirati, ukrepati in povezati - o znanjih in spretnostih za potrebe sodobnega upravljanja z arhivskim in dokumentarnim gradivom. *Atlanti*, *29*(1), 48–59.

OpenText Corporation. (2024). *Unstructured data*. Retrieved at https://www.opentext.com/what-is/unstructured-data (accessed on 10.03.2024).

Popovici, B. F. (2023). Facets of archival memory: Between legal and historical perspectives. *Atlanti+*, 32(1), 38–44.

Sabadin, I. (2023). Analysis of web applications for access to archival material in a sample or European national and regional archives. *Atlanti+*, *33*(1), 9–19.

Sarker, I. H. (2021). Machine Learning: Algorithms, RealWorld Applications and Research Directions. *SN Computer Science*, *2*. Retrieved at https://link.springer.com/article/10.1007/s42979-021-00592-x (accessed on 10.03.2024).

Van Otten, N. (1. 8. 2023). Zero-shot Classification [Top 6 Models, How to Tutorial in Python & Alternatives]. *Spot Intelligence.* Retrieved at https://spotintelligence.com/2023/08/01/zero-shot-classification/ (accessed on 10.03.2024).

Xian, Y. & Lampert, C. H. & Schiele, B. & Akata, Z. (2020). Zero-Shot Learning -- A Comprehensive Evaluation of the Good, the Bad and the Ugly. *Cornell University.* Retrieved at https://arxiv.org/abs/1707.00600 (accessed on 10.03.2024).

Markus Schmalzl[1]

THE ARCHIVING OF DIGITAL RECORDS IN GERMANY - EXPERIENCES AND CHALLENGES FOR ARCHIVISTS AND FUTURE SCIENTISTS

Abstract

Purpose: *Digital records are one of the central components of the digital transformation of administration in Germany. Numerous authorities have been creating digital records for many years, but corresponding data has not yet been able to be archived on a large scale so far. The purpose of the research was to examine the current challenges of standardized and semi-automated archiving of digital records.*

Method/Approach: *The approach taken in this research builds in the evaluation of the current challenges and initial results of various archiving projects in Germany and especially in Bavaria as well.*

Results: *Archiving digital records is a complex issue and requires partially automated and standardized interfaces. In order to implement, adapt and keep these evident, close, and continued collaboration between data producers, software manufacturers and archivists is necessary. In addition to the so-called file systems, other software systems that manage records-relevant data must also be taken into account.*

Conclusions/findings: *In order to further archive digital records in a material sense data from various systems must be archived. Specialized digital systems in particular must be given greater consideration in this regard so that sufficient metadata is available for later evaluations. With first large-scale e-file archiving based on the standard xdomea in Germany, Valuable experience will be gained through Bavaria's state archives in 2024. From this point onwards, far more archivists will be working with digital data in a conceptual and an operational way as well.*

Key words: *digital records, electronic records management, archiving of electronic records, digital transformation*

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INTRODUCTION

The digital transformation of administration has been a central concern of politics in Germany for several years and is also part of the coalition agreement of the current federal government.[2] The first important steps for this major reform in Germany were taken more than 20 years ago with different initiatives on federal and state level, like the eGovernment concept and corresponding catalogs of measures in Bavaria 2002 (Bayerische Staatsregierung, 2002). One of the most important components in this project is management of digital records with the help of electronic file systems. Under certain conditions digital records offer a whole range of decisive advantages when it comes to legally compliant management of administrative data such as easier research of information relevant to processing, location-independent, continuous access to information, elimination of media breaks, accelerated processing of processes, increased transparency, automatic verification (audit security) and simplified exchange of information and documents and after all savings on office and registration space. This requires that the files are kept authentically, with integrity, in a usable and reliable manner for the entire duration of the retention period, as required by the common standards for records management (DIN ISO 15489). And this in turn requires the use of certain software products, so-called document management systems and process processing systems (DMS/VBS), which technically implement these specifications. In addition, legally compliant records management requires organizational regulations and changes in previous data management, which often delay the rapid digitization of work processes or even digital transformation.

IMPLEMENTATION OF ELECTRONIC RECORDS MANAGEMENT IN GERMANY

The implementation und rollout of these e-file-software was not a centrally controlled and homogenous process throughout Germany and it is not yet finished. Rather, a lot of very different systems were implemented and are used today. In Bavaria alone, state authorities and justice use 10 different e-file systems. In ad-

2 MEHR FORTSCHRITT WAGEN. BÜNDNIS FÜR FREIHEIT, GERECHTIGKEIT UND NACHHALTIGKEIT. Koalitionsvertrag 2021 – 2025 zwischen der Sozialdemokratischen Partei Deutschlands (SPD), BÜNDNIS 90 / DIE GRÜNEN und den Freien Demokraten (FDP), Berlin 2021 im Internet abrufbar unter: https://www.bundesregierung.de/resource/blob/974430/1990812/1f422c60505b6a88f8f3b3b5b8720bd4/2021-12-10-koav2021-data.pdf?download=1 (zuletzt abgerufen am 23.11.2023).

dition, very heterogeneous levels of implementation have been developed in the individual branches of administration and justice as well as at the federal and individual state levels. For example, while the state administration in Baden-Württemberg and the federal administration of Germany began introducing e-files only in the last several years, parts of the state administration in Bavaria have already been working with e-files for 10 years or longer. The Bavarian Ministry of the Environment already used an e-file-system in 1996. The Bavarian State Archives were the first entire administrative branch to introduce and roll out e-file with case processing across the board in 2009. But smaller authorities in Bavaria have also been working with e-files for 20 years. The status of the e-file introduction is now at an advanced stage in most federal states and the file is now being rolled out quickly at the federal level after a pilot phase in 2018/19.

When the systems were introduced, the foreseeably necessary archiving of these electronic records still seemed very far-away and seemingly more important challenges were prioritized. The implementation of corresponding archiving interfaces for electronic records was postponed. For this reason, electronic records have not been archived on a really large scale anywhere in Germany, although masses of archive-ready data have now been accumulated. This growth has increased dramatically in recent years in particular, as a number of implementation projects have been started in larger branches of government at the federal, regional, and local levels and in the judiciary since 2015. In many cases, the shortest retention periods of up to five years for the records stored there have already expired.

Basically, it is also a matter of fact that numerous government agencies already have archive-ready electronic records, and this number has increased significantly in recent years. Almost 60,000 users from various government agencies are currently working with the most common Bavarian e-File-System, the so-called eAkte Bayern. This software is also used in specific adaptations by the federal government, in Hesse and Rhineland-Palatinate as well as in the federal and state administrations of Austria (Schöggl-Ernst, 2020). In Bavaria users of this software have already processed more than 44 million documents in almost 9 million records. Of these, up to a million records are currently ready for archiving. Exact numbers are difficult to obtain because in many cases the correct retention periods have not yet been stored in the system.

EXCHANGE STANDARD XDOMEA

For deposing and archiving all of these data successfully, the exchange standard xdomea has long existed throughout Germany[3]. Like other standards, xdomea is an important prerequisite for the long-term archiving of authentic data and enables the implementation of automated interfaces (Ernst, 2022). The standard includes both a workflow and the definition of process-related, content-related and technical metadata that is to be supplied with the primary documents based on XML (Hoppenheit & Schmidt, 2022). The xdomea-workflow is closely based on the processes of disposing and appraisal of analog-based administrative information that have been established for many decades. Accordingly, the emitting office provides the archive with the records that are ready for disposal using an XML message. This message is similar to an offer list known from the analogue world and only contains metadata and structural information. Optionally, receipt of the message is confirmed by the archive. In a second process step, the archive evaluates the records offered based on the metadata and sends an XML message with the appraisal decisions to the submitting authority. Another XML message is then created there, which only contains the metadata and structural information about the information that is worthy of being archived. In addition, primary documents, e.g. PDF files are transmitted. The archive can now appraise the records on the basis of an autopsy. In the final process step, the archive confirms the successful processing of the information with another XML message and, if necessary, transmits the archive signatures. The data can now be deleted at the emitting office. The standards also enable a shortened two-stage process for records that have already been appraised. In this case, the XML message with metadata, structural information and primary data is sent to the archive and from there, after processing the data, only the acknowledgment message is sent back to the emitting office. The IT Planning Council of the federal and regional govern-

3 This archiving procedure was theoretically described as the basis for the transfer and appraisal of electronic files, records and documents from a records processing and document management system in 2004/2005 by the then Federal Government Coordination and Advisory Center for Information Technology in the Administration in the Federal Ministry of the Interior and became part of the DOMEA- Organizational concept and its expansion module "Segregation and archiving of electronic files". In 2008, xdomea was approved and recommended for use by the "Federal and State Cooperation Committee for Automated Data Processing (KoopA ADV)". With version 2.2 xdomea was XÖV certified for the first time, i.e. recognized as a standardized data exchange for public administration in XML syntax. The current version is version 3.0. Version 4.0 is currently being prepared. For the state administration in Bavaria, the ICT standard BayITS-20 for interoperability between e-file/document management and long-term archiving systems has stipulated xdomea as an exchange format for documents and processes since 2004.

ments determined in 2017 that for the exchange as well as the archiving of digital files, records and documents xdomea has to be used.[4] Corresponding xdomea interfaces have been mandatory for all newly built or essentially rebuilt applications which serve the cross-federal and state data exchange or the exchange of data with citizens and businesses for all state agencies in Germany since 2017. For all other affected software systems, the implementation deadline expired in October 2020 (IT-Planungsrat, 2017). Therefore, the xdomea standard offers a reliable basis for archiving the administration‘s e-files, which ultimately has to be used by all manufacturers of corresponding software products as well as by the archives. For this reason, the Bavarian State Archives have had a tool developed with the xdomea client and put it into production in 2016, which allows largely automated appraisal, structuring, ingestion, and acknowledgment as well as the basic automated indexing of electronic files and records that are worthy of archiving and the automated documentation of all working processes (Puchta, 2021).

NECESSARY EFFORTS AND COORDINATION FOR LARGE SCALE ARCHIVING OF ELECTRONIC RECORDS

Since e-files have been produced in Bavaria and other federal states of Germany for more than 15 years and the corresponding tools are available with the xdomea standard and in Bavaria with the xdomea client, it could be assumed that administrative and judicial e-files have already been archived on a larger scale. However, this is not the case. In fact, xdomea-compliant archiving on a large scale has not been exercised in Germany until now. In Bavaria, too, automated xdomea-based archiving was only carried out in the case of two specialist procedures and not in one of the ten different e-file systems currently in use by the Bavarian state administration. For the ten e-file systems of the state administration in Bavaria, however, the implementation of corresponding archiving interfaces is currently in various phases of coordination and implementation. The archiving of e-files is now most urgent for the major e-file system of the Bavarian state administra-

4 The IT Planning Council has existed since 2010 on the basis of the IT State Treaty of April 1, 2010 by the federal and regional governments of the Federal Republic of Germany. The IT Planning Council coordinates the cooperation between the federal and state governments information technology issues, decides on subject-independent and cross-disciplinary IT interoperability and IT security standards, coordinates and supports federal cooperation and state governments in questions of digitalization of administrative services and controls projects and products of government and administration supported by information and communication technology, which are assigned to the IT planning council and provide binding decisions.

tion, the so-called eAkte Bayern, due to the large amount of archive-ready data. This is where the implementation and coordination of an archiving interface on the original system side has progressed furthest and will be completed in the first half of 2024. This is also the case for the archiving of data from the first large pilot authorities. The first large xdomea-compliant data transfer from public administration e-file systems in Germany already clearly shows the associated challenges and opportunities. This already points to the effort and coordination that is necessary for archiving electronic records on a larger scale. For reasons of data provenance but also due to the large number of files and processes that are already ready for archiving and are to be archived in the future, an at least partially automated and standards-compliant solution for archiving e-files has to be used (Puchta, 2021).

This requires that a data mapping is coordinated for the XML data in accordance with the xdomea standard and kept evident for the respective version updates of the standard and the components involved. This means that for each individual piece of information from the original system that is worthy of being archived, it must be determined which xdomea XML attribute it should be assigned to. This is absolutely necessary for the long-term correct interpretation of the archived data, and this has to be defined for every e-file-system and every major update of that software. The process is time-consuming and can only be implemented sensibly in consultation with the responsible archives because the xdomea standard is broad and allows for different interpretations. So far, this coordination process for e-files in Bavaria could only be completed for the major e-file system and two specialized digital systems (Baumann & Schmalzl, 2021). For all other systems this process is still pending. A reason for the delays that should not be underestimated is that the implementation of suitable archiving interfaces is still not a priority for the software manufacturers. But even if automated interfaces between e-file systems and archives have been implemented and are working productively, important questions still remain to be clarified. This also applies in particular to the archiving of record-relevant data from specialized digital systems. In many administrative areas and also in justice document management systems or e-file systems were only implemented long after essential business processes had been digitized with the help of special software systems (Ernst,

2017). All too often, important record-relevant information is not stored in the so-called e-file systems. In some cases, it may be sufficient to ensure that the data from the connected specialist digital systems is transferred to the e-file systems. For this purpose, the focus must be directed not only on the interface between the e-file system and the archive but also on the interface between the e-file system and associated software systems. The data producers must be advised accordingly so that important data from all involved software systems can also be stored in the e-file systems and archived from there.

In many cases though the e-file systems only serve as a mere document storage and do not hold all the information that one would generally expect to be found in records (Ernst, 2017). Rather, the information on the course of business that is absolutely necessary for the traceability of administrative actions may only be found in a connected special software system. The same applies to essential content metadata that may not even be present in the documents stored in the e-file-system (Schmalzl & Unger, 2020). A mere fixation on e-file systems is not enough if complete files in a material sense should continue to be archived for posterity, containing all essential information about an administrative matter. Rather, data from different specialized digital systems and e-file systems have to be brought together for archiving. Archivists therefore will have to deal with these software systems much more intensively in order to be able to archive file-relevant information from these, but also to be able to automatically use the information stored there for the archival description of the archived files. Only then will sufficient data and metadata be available for digital files for scientific access and reuse of the records. In addition to these requirements, which are already clearly evident for various delivery points and source systems, some further challenges are to be expected with the introduction of productive archiving from e-file systems. This applies, for example, to the connective appraisal of hybrid – paper and electronic – files. Another issue is the archiving of a wide variety of data formats that were imported into the e-file systems as document attachments and file inserts and can only be interpreted using special software or only to a limited extent or even not anymore, fifteen years after they were stored.

With the implementation of the partially automated archiving interface for the major e-file system of the Bavarian state administration, valuable experience will

arise here over the course of 2024. This will be the first large-scale e-file archiving based on xdomea in Germany. From this point onwards, far more archivists will be working with digital data. This will continue to affect conceptual work as well. This includes, among other things, data mapping for other e-file systems, the definition of minimum requirements for metadata for the various departments and specialist areas or, of course, the adaptation of the already productive interfaces to the respective new versions of the different software systems and standards. The appraisal activity will also continue to change and shift more towards the run-up to data production. (Schöggl-Ernst, 2020). Last but not least an infrastructure has to be created and implemented to make the archived data conveniently available to users again.

REFERENCES

Baumann D. & Schmalzl M. (s. d.). *XDomea-SchnittstelleTIZIAN:Datenmapping-inkl.AIP-Bildung.* Retrieved at: https://www.sg.ch/content/dam/sgch/kultur/staatsarchiv/auds-2021/(pre-)-ingest-tools/Vortrag_Baumann_Schmalzl_XDomea.pdf (accessed on 25.2.2024).

Bayerische Staatsregierung. (2002). *eGovernment in Bayern. Unsere Pläne. Unsere Ziele*, München: Bayerische Staatskanzlei.

Ernst, K. (2021). Standards und Normen im Bereich der Langzeitarchivierung. *Archivar 74*(2), 62–70. Retrieved at: https://www.archive.nrw.de/sites/default/files/media/files/Archivar20212Internet_1.pdf (accessed on 21.2.2024).

Ernst, K. (2017). Welche Zukunft hat die Akte?. In M. Storm (ed.), *Transformation ins Digitale* (pp. 67–75). Fulda: Verband deutscher Archivarinnen und Archivare.

Hoppenheit, M., Schmidt C. (2021). xdomea und die Archive. Fragen und Antworten. *Archivar, 74*(2), 71–75. Retrieved at: https://www.archive.nrw.de/sites/default/files/media/files/Archivar20212Internet_1.pdf (accessed on 22.2.2024).

IT-Planungsrat. (5. 10. 2017). *Decision 2017/39 from 05.10.2017. Standard für den Austausch von Akten, Vorgängen und Dokumenten*. Retrieved at https://www.it-planungsrat.de/beschluss/beschluss-2017-39 (accessed on 22.2.2024).

Puchta, M. (2021). Automatisierung und Standardisierung ein Praxisbericht aus den staatlichen Archiven Bayerns. *Archivar, 74*(3), 180–186. Retrieved at: https://www.archive.nrw.de/sites/default/files/media/files/Archivar_2021_3_Internet.pdf (accessed on 22.2.2024).

Schmalzl, M. & Unger, M. (2020). Digitales Verwaltungshandeln nachvollziehbar archivieren oder: Was ist die (E)Akte?. *Archivar, 73*(4), 371–378. Retrieved at: https://www.archive.nrw.de/sites/default/files/media/files/Archivar_2020_4_Internet.pdf (accessed on 23.2.2024).

Schöggl-Ernst E. (2020). Bewertung digitaler Akten – eine Fallstudie. *Atlanti, 30*(2), 115–123. Retrieved at: https://journal.almamater.si/index.php/Atlanti/issue/view/31/PDF3002 (accessed on 29.2.2024).

Weber, M., Schwalm, S., Vogt, T., Krogel, W. (2018). *Records Management nach ISO 15489. Einführung und Anleitung*. Berlin, Wien, Zürich: Beuth Verlag GmbH.

Aleksander Lavrenčič[1]

PAST, PRESENT AND FUTURE OF ARCHIVAL MATERIAL AS (NON)PERSISTENT CHEMICAL MATERIAL - WITH SPECIAL FOCUS ON THE PROBLEM OF ACETATE DECAY OR VINEGAR SYNDROME

ABSTRACT

Purpose: *The purpose of this article is to show how important it is for archives to realize that the safe storage of originals is important for the preservation of material.*

Methodology: *With the help of the story of the Indian Ishi from the beginning of the 20th century and the destruction of important film material, it was explained what are the consequences for the existence of cultural heritage because of irresponsible handling of film material.*

Results: *The story of the collapse of film material that was stored in unsuitable conditions teaches us that we must pay attention to appropriate professional education. The damage caused by ignorance or carelessness in the handling of archival material is in most cases irreparable.*

Conclusions/findings: *The decay of film material is not only a problem of audio-visual archives. Similar problems have been detected in all archives. Digitization enables easier access to the material and more secure storage, but there is still a need for professional, flawless storage of the original analog material in archival depots. This is the only way cultural heritage can be preserved for future generations.*

Keywords: *archives, digitisation, chemical deterioration, acetate decay, audio-visual archives.*

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1 INTRODUCTION

This article addresses the problem of permanent preservation of archival material in audio-visual and other archives. Archives and the work of archivists are discussed from the perspective of three different times: past, present, and future. We were interested in how we can connect traditional archival theory and practice with digital archival theory and practice. A book, that we found on the shelves of a local library, prompted us to try to connect the points of time where three seemingly completely opposite time periods unconsciously meet each other. We highlighted archives as institutions that ensure that the material as well as the knowledge of professionally qualified archivists are transferred through the present from the past to the future. The first, purely coincidental contact between the past, which is unknown to us, and the century we experienced, and then, at its conclusion, stepped into a new century (the date limit is otherwise imaginary) was the invention of film. The invention of film and the first film of the Lumierre brothers in 1895 (Lavedrine, Gandolfo, 2011, 1) made it possible to record moving images. The beginnings of film, which developed from the processes of photography, almost coincide with the beginning of the 20th century.

2 PAST, PRESENT, FUTURE

How can past, present and future meet each other? Sometimes we think about it at the transition to the new year, which is repeated every year at midnight in all time zones. Baković (2023, 40) mentions midnight „*as that moment in which a person can be in the past, present and future*“, as the only moment „*in which the end and the beginning embrace*“.

For the Tralfalmadorians, people from the planet Tralfamadore, time runs differently (Vonnegut & Klavnica, 1969, 27–28), but we are not Tralfamadorians, at least for now, Earth is our only home, where time runs linearly from the past to the future and stops in the present in between. And just as the Earth is the only home, the originals are the only original copies, everything else is copies, and with the original as with the Earth we lose the only home. Billy Pilgrim, who traveled through time periods in Vonnegut‘s novel, could not change things like the past, present, and future. Even archivists cannot change the past (we mustn‘t), but we can influence the present and therefore change and improve the future.

According to film material, we can talk about three tenses: past, present, and future. The same applies to the archiving of classical documentary and archival material in archives, but this division is even more noticeable in the case of audio-visual documents, and analogies are made in relation to the archiving of digital born material, and even more so of digitized analogue material.

Audio-visual material always stands before us in the present tense. It is as it is at this moment, it carries both the material and substantive past and at the same time the future in which the material must be preserved. The present moves linearly towards the future with time, the content of the past becomes richer, the future more unpredictable and the concern for preserving the material more intense.

Many archivists agree that this work, which represents the preservation and transfer of material from the past to the future, is the most difficult task in archives. At the end of the 20th century and the beginning of the digital world, Bubenik (1999, 265) explained that the only way to save audio-visual cultural heritage is its digitization and the use of digital copies, which enable faster access and safe storage of the originals. Bubenik (1999, 257) conceived audio-visual archives as a temporal bridge between different technological sediments.

The past of the film includes all processes (Jacobsen, 2020), which led both to the material design of the film strip and to the content, to the present viewing of the film at this moment. Considering the changes that occur with the use of audio-visual material, we can say, like Heraclitus, who explained this idea by entering the river once, that we cannot watch the same film twice.

How to explain the importance of the work of archivists in the present for the preservation of the past and the future, describe the preservation of material under the required conditions, digitization of material, continuous work with originals - airing and turning over and control of chemical changes (Lavrenčič, 2005, 203–210)? We decided to try to explain this with a simple story.

3 ISHI‘S STORY

The story that we will describe here is very old, an extraordinary event in everyday life wrote it at the beginning of the last century not so far away, in America (if we ironically compare the geographical distances a hundred years ago and to-

day). I don‘t know why, but sometimes I get the feeling that such stories can only happen in America or in the movies. The story we are going to narrate is beautiful, sad, and instructive. It is a story that could happen to any of us can relate to each of us, at any time. It is a placeless, timeless story, but it is not an immaterial story. It teaches us how our improper handling of documentary and archival material can destroy not only centuries, but also millennia of human cultural history, back to the beginning of civilization.

“At the first light of the morning on August 29, 1911, a wretched, hunched over man was seen standing by the fence of a slaughterhouse near the town of Oronville, California. The man was almost naked, only a large piece of cloth, like the poncho of the South American Indians, was draped around his neck. The face betrayed an Indian, but of a special type, the likes of which had never been seen before. Later it turned out that Ishi, as the Indian was called, was the last American of the Stone Age. The scientists felt the importance of the event, took care of Ishi, employed him as a guard in the museum and carried out numerous investigations and documented them properly...” (Ceram, 1973, 329).

Five years later Ishi died. After his death, he was quickly forgotten. When interest in him was revived in 1957, and the boxes containing the stored wax cylinders containing recordings of Ishii‘s voice, singing and vocabulary were opened, they found that most of the cylinders had been broken. In addition, they could not train any of the old equipment to play music. Only one resourceful student was lucky enough to assemble a useful one from several wreckage of old devices and thus they were able to listen to part of the music recordings. Film recordings made for museum purposes by cameramen of the California Film Society fared worse. Cassettes with about 1,500 meters of film were perfectly stored in the vicinity of the heating pipes. When the cassettes were forcibly opened, they found only an unrecognizable slimy mass (Ceram, 1973, 329).

With Ishi, a part of human history disappeared forever, a part that could not be prevented in the development of human society in any way; however, about a century later after the story that unfolded in the west of the United States of America, the careless behavior of scientists with documentary records should not be repeated.

4 MATERIAL PROTECTION OF ARCHIVAL MATERIAL

The material protection of archival material includes the maintenance or protection of the material against damage, destruction, loss or unauthorized use or abuse. (Žumer, 2001, 267). The Act on the Protection of Documentary and Archival Material and Archives (ZVDAGA, 2006, 2014) established in 2006, regarding the protection of documentary and archival material against damage, destruction and loss, determined in general: „Archival material in physical form is permanently and professionally stored in appropriate rooms and equipment, in appropriate climatic conditions, protected against burglary, fire, water, biological, chemical, physical and other harmful influences“ (ZVDAGA, 2006, 2014, Article 36, 2. Paragraph). „Storage of archival material in digital form is permitted only as long-term storage of covered material in accordance with internal rules“ (ZVDAGA, 2006, 2014, Article 36, Paragraph 3).

The duty of public and private institutions and individuals regarding the professionally irreproachable protection of documentary and archival material is therefore a legal obligation, while damaging or destroying the material is a criminal offense according to the Criminal Code of the Republic of Slovenia. The conditions prescribing the methods of material protection of material are determined by the Decree on the protection of documentary and archive material (UVDAG, 2017). All public and private institutions must store documentary and archival material or their permanent collection of material in an archival warehouse with appropriate technical equipment (archival warehouses are equipped with metal equipment), which enables:

1. rational placement of material,
2. insurance against injuries,
3. easy accessibility of the material,
4. air circulation and
5. easy cleaning.

5 ACETATE DECAY – VINEGAR SYNDROME

The Report and Guide for film preservation by the California-based National Film Preservation Foundation published in 2004 explains the term acetate decay

as chemical deterioration of acetate plastic accelerated by high relative humidity and temperature. Also known as vinegar syndrome because of the odour released during the decay process (Melville, 2004, 98).

Research on the effect of acetic acid on the degradation of historic cellulose triacetate cinematographic film was begun in Great Britain at Manchester Polytechnic. A report from the Library of Congress (1993, ch.1) cited the study N. S. Allen, and others, "Degradation of Historic Cellulose Triacetate Cinematographic Film: Influence of Various Film Parameters and Prediction of Archival Life," Journal of Photographic Science 36 (1988). This study notes a link between the onset of vinegar syndrome and metal ion contamination, reinforcing anecdotal evidence among archivists that the most serious vinegar syndrome is occurring first in magnetic soundtracks. The Library of Congress report then cites that continued research in the United States has been conducted at the Image Permanence Institute, Rochester Institute of Technology, which was published in P.Z. Adelstein, J.M. Reilly, D.W. Nishimura, and C. J. Erbland, "Stability of Cellulose Ester Base Photographic Film," SMPTE Journal 101 (May 1992).

How to explain the occurrence and danger of vinegar syndrome? Richardson and Altias (2017) explained this phenomenon by relating it to living organisms that biologically age and die. Carbon-based organic living and non-living material are subject to aging, decay, or death, especially for plants and animals. However, where infection, disease, and extreme environmental conditions cause premature biological deterioration, a medical treatment may be developed to slow, stop, or reverse the process. In one sense, decay is a gradual process by which something breaks down or falls apart as a result of natural causes. Bones become brittle, skin loses its elasticity, hair gets grey. *"In another sense, decay is a natural reaction that results over time when a substance is exposed to a reactive environment and/or other substances with which the substance will chemically react."* (Richardson & Altias, 2017).

In 1993, the Library of Congress in Washington developed guidelines for the preservation of material on filmstrip. At that time, special attention was also paid to nitrate film. In the time before digitization, copies were made on polyester tape. The report (Library of Congress, 1993) stated: *"Films are ephemeral and fragile products. For the technical reasons outlined in the next section, even the*

most durable of films can become unusable in less than a single human lifespan, although some types have proven to deteriorate more rapidly and spectacularly than others. While preservation can be thought of as any effort to keep a film in a viewable form, most archivists consider a film preserved only when it is both (1) viewable in its original format with its full visual and aural values retained, and (2) protected for the future by "preprint" material through which subsequent viewing copies can be created." In practice and in casual language, preservation has usually been synonymous with duplication. The archival rallying slogan for the last two decades has been "Nitrate Won't Wait," and the primary preservation task--still far from accomplished--has been to copy unstable, nitrate-base film without significant loss of quality onto more durable "safety" stock (Library of Congress, 1993).

Before digitization began, the preservation of film material was considered to be that "One basic archival principle is that preservation is not accomplished unless the new medium has a considerably longer life than the original from which it is copied. On the surface, continued copying onto acetate base would seem to violate that principle. But there are two reasons to qualify such a conclusion: First, the original nitrate print is older and usually well into its decomposition cycle; and second, the new acetate print can be given proper storage right from the start. Thus, vinegar syndrome has not been detected in films duplicated under archival conditions and put into ideal storage immediately. The implications of vinegar syndrome in acetate have not yet been fully assimilated into preservation practice, but scientific research into its causes has also been accompanied by compelling evidence that it can be delayed by proper storage" (Library of Congress, 1993).

Historically, motion-picture bases consisted of three main types:

(1) cellulose nitrate (usually called simply nitrate), in commercial use through the early 1950s,

(2) cellulose acetate (usually called acetate), available for some uses since the 1910s but widely employed only after 1950, and

(3) polyester, available since the mid- 1950s but still in only scattered use. Both acetate and polyester are sometimes called "safety" film, in distinction from nitrate. (Library of Congress, 1993).

Water, high humidity, and heat can destroy the plastic base of acetate film. In the early stage of decay, the plastic releases acetic acid, which is chemically identical to vinegar, hence the name "vinegar syndrome." As the decomposition advances, the chemical reaction accelerates. Typically, the decay process follows this pattern:

1. The film begins to smell like vinegar.

2. The film base begins to shrink. As the base shrinks irregularly, the film resists being laid flat. It curls and warps along both length and width.

3. The film loses flexibility.

4. The emulsion may crack and eventually flake off.

5. White powder may appear along the edges and surface of the film. The acetic acid vapor released by films with vinegar syndrome can infect other acetate base materials stored nearby, particularly in a poorly ventilated storage area. The Image Permanence Institute (IPI) at the Rochester Institute of Technology advises freezing films in advanced acetate decay. (Melville, 2004, 14).

Acetate decay cannot be reversed, but it can be slowed by improving storage conditions (see chapter 6). At the early decay stages, the film content can be rescued by transferring it to new film stock. Generally, once the film becomes too brittle, it cannot be copied in its entirety, although less damaged sections may be salvageable (Melville, 2004, 15).

In 1948, the nitrate film, which had exploded several times, was replaced by a triacetate film carrier, which was supposed to be safer and more durable, but the stench of vinegar was detected several times in the film archives already in the fifties of 20th century. They found out that there is a silent killer of films hiding among the archival shelves, which does not kill as spectacularly as those from the time of nitrate films, but destroys slowly and reliably, causes the emulsion to retreat, brittleness and curling of the film, the polymers in the film base begin to split into monomers (Lavrenčič, 2005, 207). The process of disintegration of the films was accelerated due to storage in unsuitable conditions. Decomposition was influenced by the following factors: temperature, humidity, and degree of acidity in the microenvironment. Namely, this works in a hermetically sealed film box as a micro catalyst that accelerates a chemical reaction, similar to the „snowball" effect (Reilly, 1993).

However, it is not only audio-visual archives that store large quantities of film tape that have problems with the decay of film material. The scent of vinegar around photographic negatives and film reels points to a form of decay aptly named vinegar syndrome. (Carey, 2023). Classical archives are not safe from vinegar syndrome, as the events at the Reference Library in Toronto confirmed. In these archives, there has been severe damage to the original material on the photographic negatives. The deterioration of the originals probably occurred because the cabinets were closed during the epidemic, which reminds us that we must constantly ventilate the material. Some other archives have taken a different approach to rescue, digitizing the material and publishing it online. The Canadian National Exhibition (CNE) Archives started digitizing its collection of more than 109,000 acetate film photo negatives in the early 2010s because they were starting to succumb to vinegar syndrome. Similar problems were detected in The Arnprior & McNab/Braeside Archives (Ontario, Canada, 2019) which holds approximately 400 fonds/collections. As it was written, the best solution is to keep film cold to buy time: *"The best thing that we can do for films like that is to cool or freeze them because the lower temperatures significantly diminish the processes of degradation ... and it really buys us a lot of time,"* said David Daley, conservation advisor at the University of Calgary Archives and Special Collections (Brockbank, 2023).

Chemical changes are not only fatal for archival material; the changes are also dangerous for the personnel who handle the material. The use of appropriate protective equipment and procedures can mitigate the potential hazards of handling severely damaged films (Soleymani and Russ, 2021, pp. 154). Vinegar syndrome causes contact burns as well as nasal and lung irritation (Brockbank, 2023).

6 CONCLUSIONS

As we enter the new millennium and the digitization and digitalization of archival collections, many have forgotten that workers in film and other audiovisual archives around the world have long been fighting against time to secure their collections. Digitalization of archives provides many advantages, which ensure quality and cheaper transmission, regeneration and archiving of signals, easier access to digitized material also enables better material protection of the original

archival material, but we must be aware that we must first preserve the material and only then digitize it.

The story of Ishii, the Indian, teaches that the damage caused by the mishandling of cultural heritage cannot be measured in any monetary currency. However, we must also be aware that both digitization and digitization do not bring any sustainable solution if we discard the originals. The motto should remain: „First preserve, then digitize and enable safe access to the material and improve its material security.“ The story of the collapse of film material that was stored in unsuitable conditions teaches us that we must pay attention to appropriate professional education. The damage caused by ignorance or carelessness in the handling of archival material is in most cases irreparable. The decay of film material is not only a problem of audiovisual archives; problems have been detected in all archives. Digitization enables easier access to the material and more secure storage, but there is still a need for professional, flawless storage of the original analog material in archival depots. This is the only way cultural heritage can be preserved for future generations.

The Slovenian translation of the book The First Americans (C. W. Ceram) was published in 1973. In 2005, the story was used at the archival consultation “Technical and field related problems of traditional and electronic archiving” organized by the Regional Archives Maribor. At that time, it was difficult to find other information about the Indian Ishi in the libraries.

Today, his story is also available on the Internet. Ishi has his own entry in Wikipedia. Anyone who wants to know more about Ishi can also read the book by Theodora Kroeber (1961, 2002): Ishi in Two Worlds: a biography of the last wild Indian in North America. We used Ishi’s story as an example of inappropriate handling of film material by scientists and pointed out what happens to material that is kept under inappropriate conditions, in this case at too high temperatures. The material begins to disintegrate quickly; chemical reactions occur that lead to the disintegration of the polymers in the acetate base of the film. This causes the release of acetic acid and the appearance of acetic syndrome, which accelerates the breakdown of the film. Moreover, we must point out that the mentioned films were nitrate, i.e., explosive, and more dangerous.

The whole story of Ishi, however, is much darker and more terrifying. Ishi was the last member of the Yahi tribe of California, because that tribe suffered genocide in the 19th century (Rockafellar, 2018). The gold rush brought tens of thousands of miners and settlers to northern California, putting pressure on native populations. Gold mining damaged water supplies and killed fish; deer became scarcer. The settlers brought new infectious diseases such as smallpox and measles. Anthropologists at the University of California, Berkeley wrote a letter in 1999 apologizing for Ishi's treatment (Jimenez, 2017).

Ishi, his tribe, and the neighboring Yana tribe were wiped out by evil. The evil called greed. This greed led to the industrialization of human society in the 19th century. If history is the teacher of life, and archives are the textbooks of life, we must also consider the consequences that will be brought by digitalization. Or is life a teacher of history? Historia magistra vitae? Vita magistra historiae est?

And if we end up going back to midnight again. Baković wrote that „the essence of midnight is that it leaves us with a choice: shall we believe that something has ended with it or that something is just beginning with it?" (Baković, 2023, 40). This wonderful sentence leads us to think whether digitization is ending something for us or whether it is beginning a new era.

REFERENCES

Baković, Z. (23. 12. 2023). Moč polnoči. *Delo, Sobotna priloga*, 40.

Brockbank, N. (21. 8. 2023). When librarians smelled vinegar, they knew the clock was ticking to save historic archives. *CBC News*. Retrieved at https://www.cbc.ca/news/canada/toronto/vinegar-syndrome-acetate-film-1.6939032 (accessed 4. 1. 2024).

Bubenik, B. (1999). Arhiviranje audiovizuelnih dokumenata in promjene televizijskih tehnologija. V P. P. Klasinc (ed.), *Sodobni arhivi ,99. XXI. posvetovanje o strokovnih in tehničnih vprašanjih v arhivih. Referati s posvetovanja v Radencih od 23. do 24. 3. 1999* (pp. 256–266). Maribor: Pokrajinski arhiv Maribor.

Carey, E. (2023). Inside the Vault: Vinegar Syndrome. *Archives AMBA*. Retrieved at https://www.adarchives.org/blog/inside-the-vault-vinegar-syndrome (accessed 4. 1. 2024).

Ceram, C. W. (1973). Prvi Američani. Ljubljana: Cankarjeva založba.

Jacobsen, M. (2020). Handling actively degrading film – Tools and Products. *Dancan*. Retrieved at https://dancan.dk/?page_id=1807 (accessed 8. 1. 2024).

Jimenez, J. (1. 9. 2017). UC Berkeley looks back on dark history, abuse of Yahi man 106 years later. *The Daily Californian. Retrieved at https://web.archive.org/web/20190830165200/https://www.dailycal.org/2017/09/01/uc-berkeley-looks-back-on-dark-history-abuse-of-yahi-man-106-years-later (accessed 4. 1. 2024).*

Kroeber, T. & Kroeber, K. (2002). Ishi in Two Worlds: a biography of the last wild Indian in North America. Berkeley: University of California Press.

Lavedrine, B. & Gandolfo, J. P. (2011). The Lumiere autochrome. History, Technology, and Preservation. Los Angeles: The Getty Conservation Institute. *Retrieved at* https://books.google.si/books?hl=sl&lr=&id=30gkBAAAQBAJ&oi=fnd&pg=PP1&dq=lumiere+1895+peer+reviewed+articles&ots=JKdgbPEGe9&sig=FSYoYBCq7MjwlP9dwVTEPC46TRw&redir_esc=y#v=onepage&q&f=false *(accessed 4. 1. 2024).*

Lavrenčič, A. (2005). Ukrepi za zavarovanje filmskega arhivskega gradiva in preprečevanje širjenja okužbe z ocetnim sindromom. V S. Tovšak (ur.), *Tehnični in vsebinski problem klasičnega in elektronskega arhiviranja. Zbornik referatov z dopolnilnega izobraževanja, 4/2005, 1* (str. 203–210). Maribor: Pokrajinski arhiv Maribor.

Library of Congress. (1993). A Study of the Current State of American Film Preservation: Volume 1. Retrieved at https://www.loc.gov/programs/national-film-preservation-board/preservation-research/film-preservation-study/current-state-of-american-film-preservation-study *(accessed 4. 1. 2024).*

Melville, A. (2004). National Film Preservation Foundation. *The film preservation guide : the basics for archives, libraries, and museums*. San Francisco: National Film Preservation Foundation San Francisco, California. Retrieved at https://www.filmpreservation.org/preservation-basics/the-film-preservation-guide-download (accessed 4. 1. 2024).

Reilly, J. M. (1993). The Cause of the Vinegar Syindrome by Image Permanence Institute Rochester. Rochester: Image Permanence Institute Rochester Institute of Technology. *Dancan*. Retrieved at https://dancan.dk/?page_id=1820 (accessed 8. 1. 2024).

Richardson, C. A.& Atias, M. (2017). *The (Carbon-) Black Ops of Resording Tape: Sticky-Shed Syndrome Exposed.* Retrieved at: https://publish.iupress.indiana.edu/read/sustainable-audiovisual-collections/section/4971c90e-d10f-4503-b92a-6cfb9439c509 (accessed 8. 1. 2024).

Rockafellar, N. (2018). *The Story of Ishi*. San Francisco: The University of California San Francisco. Retrieved at https://history.library.ucsf.edu/ishi.html (accessed 18. 9. 2023).

Soleymani, S. & Russ, L. (2021). Naphthalene Syndrome and Vinegar Syndrome Affected Films: An International Survey of Audiovisual Conservation Practitioners. *Studies in Conservation, 66* (3), 154–166. Retrieved at https://doi.org/10.1080/00393630.2020.1792205 (accessed 4. 1. 2024).

Tató, G. (2020). The Archivist, a Superhero? Atlanti +, *30*(1), 49–54.

Uredba o varstvu dokumentarnega in arhivskega gradiva (UVDAG). (2017). *Uradni list RS*, (42/17).

Vonnegut, K. (1997). *Klavnica pet ali Otroška križarska vojna*. *Dolžnostni ples s smrtjo*. Ljubljana: Mladinska knjiga.

Zakon o varstvu dokumentarnega in arhivskega gradiva ter arhivih (ZVDAGA). (2006, 2014). *Uradni list RS*, (30/06 in 51/14).

Žumer, V. (2001). *Arhiviranje zapisov. Priročnik za ravnanje z dokumentarnim arhivskim gradivom*. Ljubljana: Založba GV.

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EXPLORING ARTIFICIAL INTELLIGENCE CHALLENGES IN THE DIGITIZATION OF TECHNICAL DOCUMENTATION: A PRELIMINARY STUDY[6]

Abstract

Introduction: *The study investigates the challenges of preserving corporate technical documentation. It explores artificial intelligence's potential to transform archival material for better utilization.*

Methods: *The research conducts an overview of regulations governing the preservation of corporate archival material and a pilot study on digitized technical documents from the Regional Archives Maribor, aiming to establish foundational practices for artificial intelligence's processing of technical documentation.*

Results: *Preliminary results indicate artificial intelligence's effectiveness in enhancing digitized technical heritage material. The study identified possible threshold indicators for the baseline quality of digitized documents that ensure artificial intelligence can process the data authentically.*

Discussion: *The findings suggest that while artificial intelligence can significantly improve borderline usable material, it cannot assist with unreadable originals. The study emphasizes the importance of selecting appropriate artificial intelligence models and maintaining human oversight in the process.*

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1 INTRODUCTION

There has yet to be a particular focus on preserving corporate archival material in developed market economies. The responsibility for maintaining and utilizing such material typically falls under the responsibility of its creator, who also holds exclusive ownership rights. In most cases, however, these creators represent economic entities. Technical documentation, including plans, bills of materials, catalogues, drawings, notes, sketches, etc., forms a crucial part of this corporate archival material.

We possess a significant volume of technical documentation in the Republic of Slovenia before 1990. During that period, legislation mandated that socially-owned companies transfer their respective archival materials to the relevant archives. However, post-1990, the approach to corporate archival material, including technical documentation, underwent a transformation after the shift to private ownership. Unlike before, it no longer receives comprehensive state protection. Instead, the responsibility for safeguarding it is largely entrusted to the respective economic entities. Acquiring this documentation, transferring it to the archives and digitizing it are very important tasks. In such tasks, archivists also face the challenge of scanning large document formats that are difficult to scan at sufficient resolution.

The rapid development of machine learning is transforming the way we utilize archival material. Machine learning algorithms require extensive data for their training and to produce user-desired results. With old, historical technical documentation[7], we encounter challenges due to a shortage of reliable information in the form of an insufficient volume that would provide enough data for machine processing.

The current research serves as a pilot or preliminary study focusing on the digitization of technical documentation. Its primary objective is to lay the groundwork for the way for further subsequent research and practical applications, facilitating the authentic manipulation of digitized material within a virtual environment. The study examines the utilization of digital tools through a sample of digitized technical heritage material from the *Pokrajinski arhiv Maribor.* Our aim is to

7 In the upcoming sections of this paper, we will regard technical documentation as part of the visual material.

identify the threshold values in the digitization of image material, ensuring that artificial intelligence, in its broadest sense, can authentically process the data.

The paper is structured as follows. In the second chapter, we provide a brief overview of the challenge related to the availability of a sufficient amount of authentic technical documentation (as corporate archival material). This sets the stage for understanding the dimensions of the challenge. Moving on to Chapter 3, we examine in detail the development and procedures of image enhancement using artificial intelligence (AI) algorithms. We also provide a brief overview of other algorithms facilitating the processing of information, including objects and text, present on visual material. Chapter 4 details the methodology of our work, outlining the approach to processing visual material at the limit values of document scanning for our pilot research. In Chapter 5, we present the preliminary results and draw broader conclusions regarding the appropriateness of utilizing AI on the mentioned problem, taking into account various circumstances.

2 A BRIEF OVERVIEW OF REGULATIONS GOVERNING THE PRESERVATION OF CORPORATE ARCHIVAL MATERIAL IN SELECT MARKET ECONOMY NATIONS

Established in 1948, the International Council on Archives is a global organization dedicated to promoting awareness and preservation of archival material worldwide. Within this institution, the Section on Business Archives, founded in 1990, focuses on the global preservation and utilization of corporate archival material. The third edition of the study 'Business Archives in International Studies (2021),' edited by Alison Turton, provides an overview of business archives in twenty-one reference countries, following a country-by-country review presented by experts. The study traces the evolving awareness of corporate archival materials, beginning in the United States.

In numerous countries, diverse approaches to the preservation of corporate archival material are evident. Lasewicz and Ryan (2021) highlight, for instance, that despite groundbreaking developments in the USA, programs for preserving and utilizing such material primarily support private economic entities, given the absence of specific legislation in this field. In Sweden, efforts to preserve corporate archival material date back to 1698, gaining momentum after 1870 during a period of robust industrial development, as observed by Gidlöf and Sjöman (2021).

However, specific legislation for corporate archival material is still lacking in Sweden. Turning to Italy, a substantial shift in the perception of the importance of corporate archival material has occurred over the last thirty years, particularly post-World War II. This evolution in Italy is evident through the establishment of associations, the initiation of archivist courses, and the creation of regional business archives, as outlined by Del Giudice (2021). Austria, on the other hand, displays a diversity of approaches, with Rigele (2021) noting the emergence of numerous corporate archives in private companies over the last twenty-five years, despite the absence of a specific state strategy for this domain. In contrast, China stands out with an exponential breakthrough in corporate archival material management since the establishment of the National Archives Administration in 1954, emphasizing centralization, standardization of management, and information transformation, as detailed by Yingfang and Rui (2021). China has successfully implemented an effective mechanism for controlling corporate archival material, including a comprehensive digitization initiative since 2014, extending to broader applications in data storage.

3 IMPROVING IMAGES USING AI: DEVELOPMENT AND TECHNIQUES

The evolution of image processing, starting in the mid-1950s, unfolds through general-purpose approaches and technological constraints of the late 1960s. During this era, a pursuit of optimizing images through synthetic additions emerged, complemented by the development of multiprocessor computer concepts and subsequent advancements in processor and memory technology. These innovations lay the foundation for contemporary applications in home computers and digital cameras (Rosenfeld, 1969).

As technology advances, the integration of AI becomes a driving force in ongoing endeavors for document content analysis, improvement, and recognition. In recent years, AI has emerged as one of the most rapidly advancing scientific techniques with practical applications (Anantrasirichai and Bull, 2022). Nevertheless, these efforts are also notable for contributions from various events such as the International Document Image Binarization Contest, as well as conferences like ICDAR and ICFHR (Philips and Tabrizi, 2020).

Artificial neural networks were initially explored for processing raster image material, particularly for scaling, as early as 1997 (Plaziac, 1999). Two algorithms were tested, yielding positive results (ibid.). However, at that time, the technology was deemed insufficiently powerful for widespread use, as the process was slow and overly memory-intensive (ibid.). Remarkably, over the last decade, technological advancements have made the technology more potent and accessible, leading to a surge in methods rooted in AI and machine learning (ML).

3.1 ENHANCE INFORMATION CONTENT USING NEURAL NETWORKS

The information-theoretic concept of inequality in data processing asserts that isolated local processing cannot augment the information content. This aligns with the objective of our study to enlarge images—extracting more details from limited data points. To compensate for missing information, AI or ML algorithms leverage (augment) knowledge gained during the learning process on numerous samples. Figure 1 illustrates how a neural network enlarges an image by applying acquired knowledge.

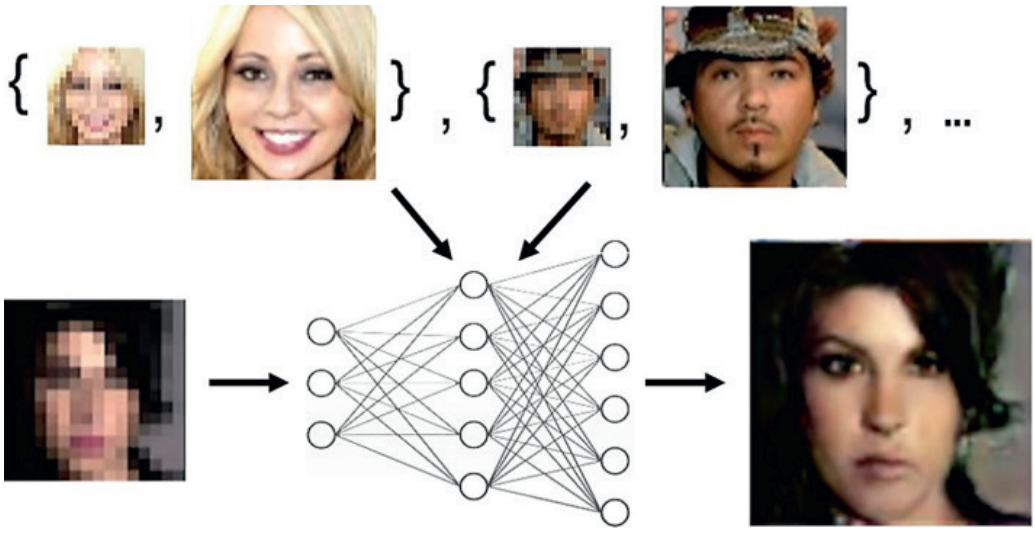

Figure 1: Schematic representation of the use of an artificial neural network for image enlargement (adapted from Litt, 2017).

In the subsequent Figure 2, we can discern the distinction between bicubic interpolation (classical approaches) and AI zoom. The first column displays the downscaled original, the second column showcases the bicubic interpolation method,

the third column demonstrates AI results, and the last column presents the original image.

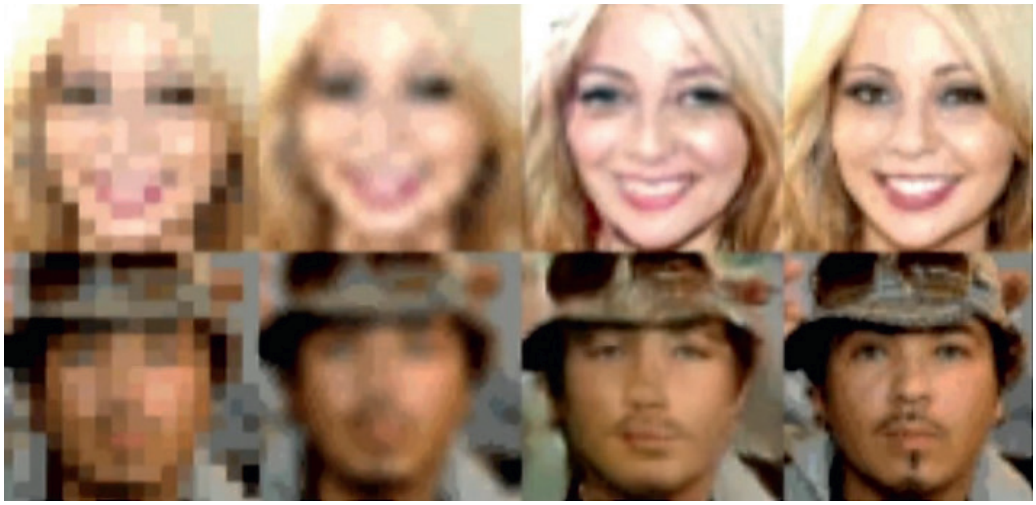

Figure 2: Differences between resolution enhancement algorithms (downscaled original, bicubic enlargement, AI zoom, original) (Litt, 2017).

The enhancement provided by AI algorithms to the zoomed image's perceived quality is evident. However, a noticeable distinction arises between the third and fourth columns. While the AI-generated image appears convincing, it's crucial to note that all additional details are essentially speculative, introduced through an educated guess.

The initial neural networks, assessing augmentation quality through basic error minimization algorithms during the learning process, showed subpar performance (Litt, 2017). However, in 2014, generative adversarial neural networks (GAN) emerged, featuring two components—the generator and the discriminator—alternating in the scaling process (Goodfellow et al., 2014). The generator produces enlargements, and the discriminator assesses the appropriateness of the result. Both components learn their procedures during the learning process. Each image enlargement involves an iterative cycle of proposals and rejections, sometimes spanning several hundred repetitions. Yet, this iterative process yields remarkably impressive results (Litt, 2017; Isikdogan, 2019). Such neural networks can generate a substantial amount of information, producing convincingly effective outcomes.

Enhanced digitized technical documentation, as detailed in the preceding chapters, opens up new possibilities for leveraging information from image material. Although these procedures are still in their early stages, the fields of construction and architecture are witnessing initial efforts to employ artificial intelligence tools for interpreting and analyzing building plans. These efforts encompass vectorization, segmentation, and the perception of building plans presented as visual material (Paudel, Dhakal, and Bhattarai, 2021).

The latest implementations of AI utilize various algorithms, including Support Vector Machine (SVM), Generative Adversarial Network (GAN), Convolution Neural Network (CNN) and Deep Neural Network (DNN). However, researchers encounter a scarcity of visual material, such as plans of rooms, buildings, machines, etc., which hinders mass data processing and consequently slows down machine learning with the aforementioned AI algorithms (Chen, Ye, Milne, Hillier, and Oglesby, 2022).

4 RESEARCH METHOD

In our preliminary research, we used large technical heritage blueprints scanned at 100 DPI (dots per inch). These plans contain valuable information about historical buildings and facilities in Maribor in different time periods. In some cases, plans are difficult to read and distinguish due to the low resolution.

We examined the potential enhancement of documents through AI-based general-purpose tools, aiming to assess the outcomes and identify the parameters influencing result quality. Our chosen general-purpose tools were selected with following consideration:

- They are the most accessible, both to creators and archives. Some are available as online services where we can quickly check the options they offer.
- AI algorithms are built into the filters of general-purpose graphics software or offered as stand-alone applications that also offer easy testing.
- They are developing at the fastest pace. By using these, the user is sure that he is using the most advanced technology possible and has the feeling that he is using a tool that offers the best possible.
- Not at last users learn to use general-purpose tools the easiest and fastest, as various educational content is available for them in the form of different and easily accessible manuals in a wide variety of formats.

Figure 3 below illustrates our initial experimentation on a scaled segment of the plan, featuring a signature and stamp. The first image presents a reduced original (to accentuate the issue), the second image depicts its enlargement using classic filters in the Photoshop application, and the third image showcases an enlargement created with the Topaz GigapixelAI software, consistently utilized in all subsequent tests. It becomes evident that the last image is visually the most appealing.

Figure 3: Reduced original (50 DPI), classic (Photoshop) zoom, AI zoom (Topaz Photo AI).

4.1 DESCRIPTION OF THE MATERIAL

The selection contains 500 plans with a resolution of 100 DPI. For the test, we selected two plans (Figure 4 and 5) from the technical documentation, where the insufficient resolution of the scan came to the fore and on which we had problems reading the inscriptions and distinguishing the details.

1. SI_PAM_0011_044_00005-060a
Dimensions: 147.22 cm by 105.69 cm at 100 DPI

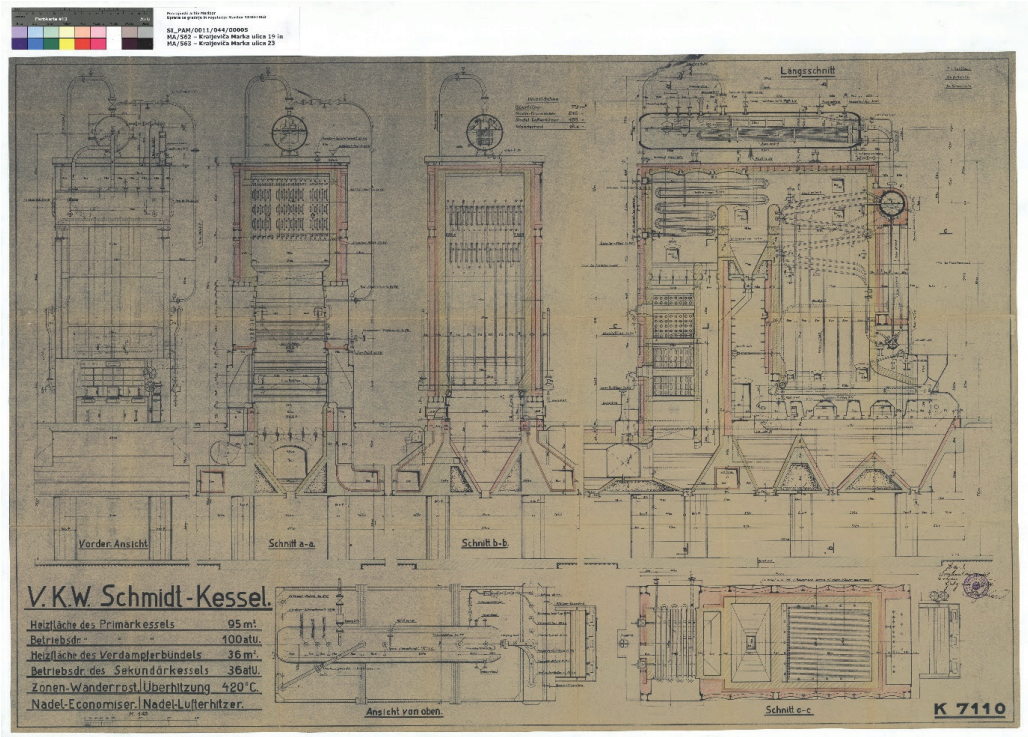

Figure 4: First plan.

Remarks on the sample: The plan is conditionally readable, on problematic parts (folds) it turns out that 100 DPI does not allow reliable data processing. An experienced machinist would probably be able to correctly read or guess all the values and inscriptions.

2. SI_PAM_0011_044_00005-062a

Dimensions: 121.46 cm by 93.17 cm at 100 DPI

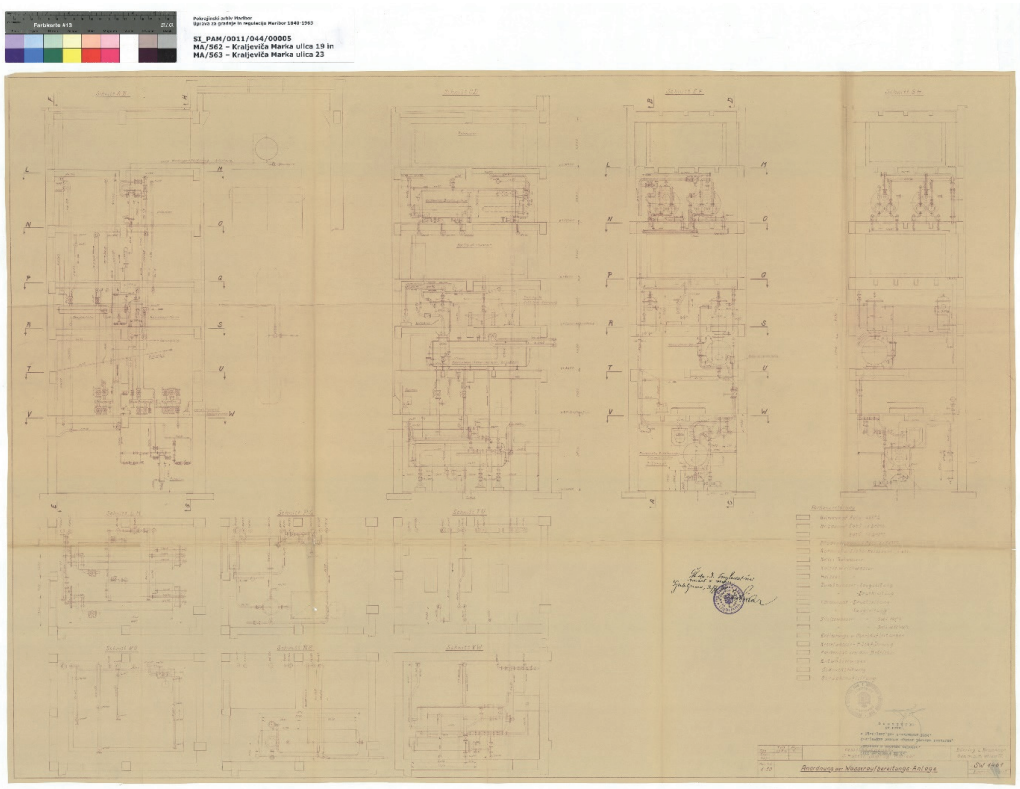

Figure 5: Second plan.

Remarks on the sample: The plan is not sufficiently readable. It suffers from insufficient scanning resolution and poor contrast of the original.

4.2 SIMULATION OF EVEN WORSE INPUT MATERIAL

In order to simulate an even worse situation than the given one, we selected some details on each of these two plans and lowered their resolution from 100 DPI to 75 DPI and 50 DPI. The following Figure 6 shows all selected cropped details.

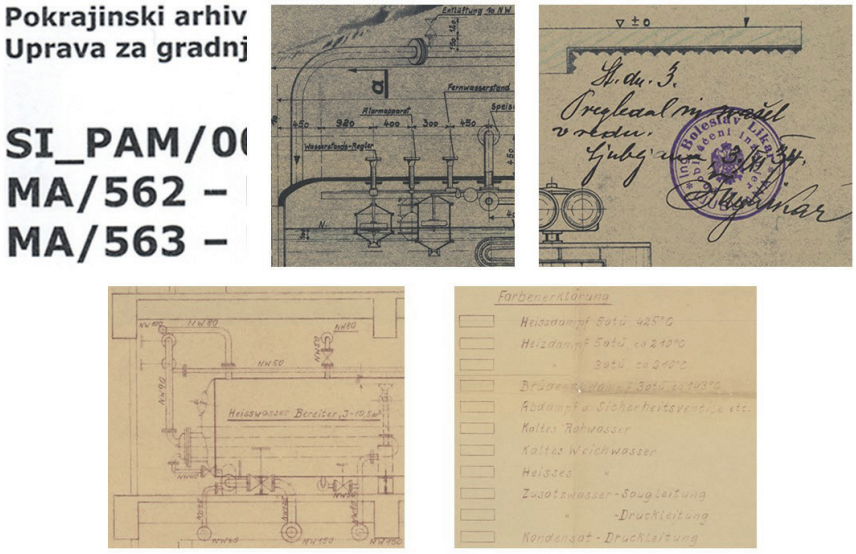

Figure 6: Cropped details of both samples (subsamples 1–5).

4.3 SELECTION OF SCALER AND SELECTION OF AI MODEL

The array of software designed to enhance image resolution is extensive and diverse. Image enlargement is a standard feature in almost all graphic processing tools, and the spectrum of online services is even broader. In recent years, specialized applications focusing on upscaling, sharpening, and noise removal have emerged. For our AI scaler, we opted for the widely advertised solution in 2023, Topaz Gigapixel AI.

Next, we needed to determine which scaling model within the application yielded the most convincing results. The software provides six models, each tailored to specific material types as defined by the equipment manufacturer:

1. Standard (Description in the application: Best choice across various images, suitable for all photography but may cause artifacts with fur and feathers).
2. Lines (Description in the application: Previously called "Architecture," ideal for architecture, cityscapes, typography, and images with thick lines).
3. Art & CG (Description in the application: Suited for any non-photographic image, including computer graphics, art, drawings, or scans).
4. HQ (Description in the application: Optimal for high-quality images from modern cameras, particularly those with many details and few compression artifacts, or as a final step after denoising and sharpening).

5. LowRes (Description in the application: Previously called "Compressed," recommended for images with blocky compression artifacts, preserving more detail than the Very Compressed model).
6. Very Compressed (Description in the application: Ideal for images with significant compression artifacts, such as small-sized, scanned, or old digital images).

We selected the Art & CG model, tailored for our use cases, and this choice was visually validated through a detail comparison. The distinctions between the models are illustrated below in Figure 7.

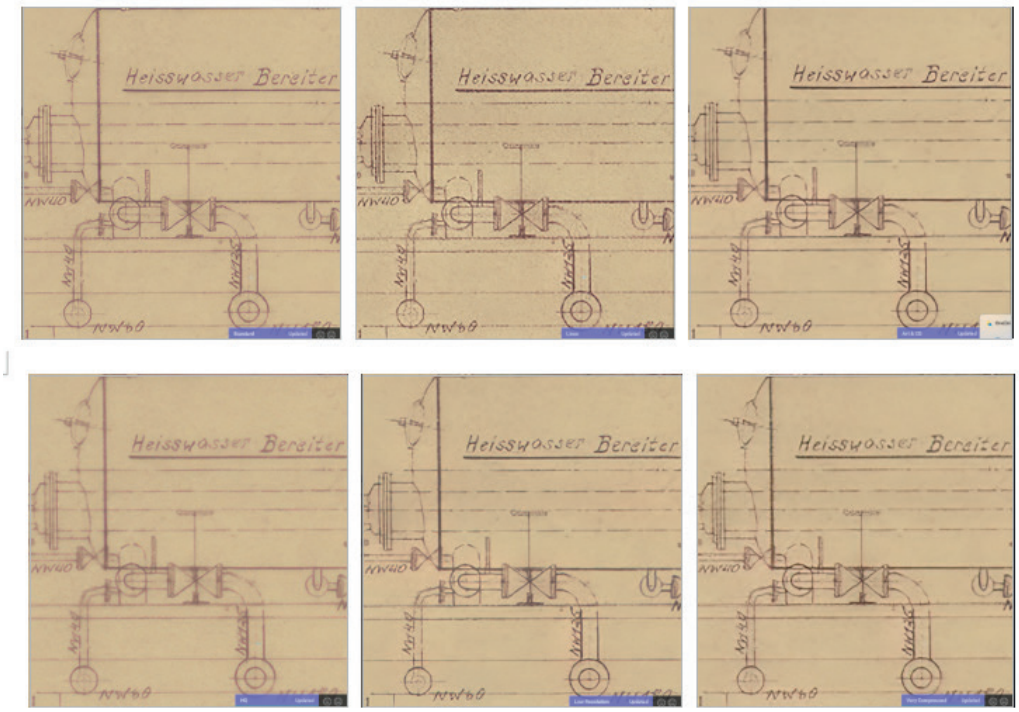

Figure 7: Differences between AI zoom models (1 to 6) offered by the software.

5 RESULTS

In the following, we present in more detail the results of the material processing trial at different source DPI.

Subsample 1 processing

Results in short: A dramatic improvement in visual image and readability can be seen. Enlarging the printed text is no problem for the AI model. There are no

defects, or they are not noticeable. Figures 8–10 shows original subsample at 50, 75 and 100 DPI and processed by AI model next to it.

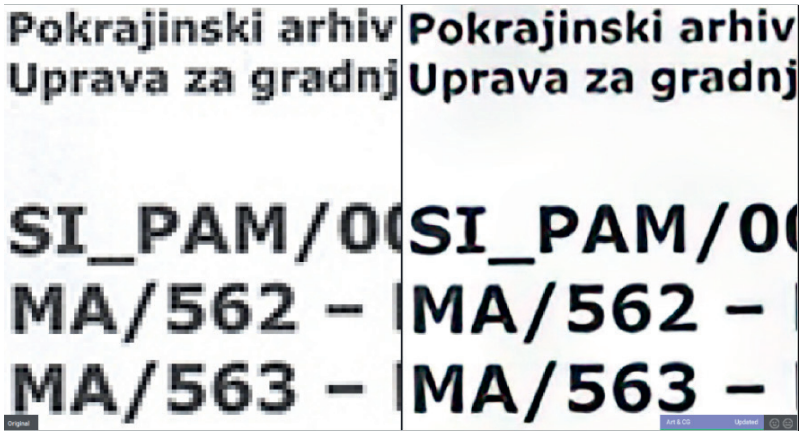

Figure 8: Subsample 1 at 50 DPI

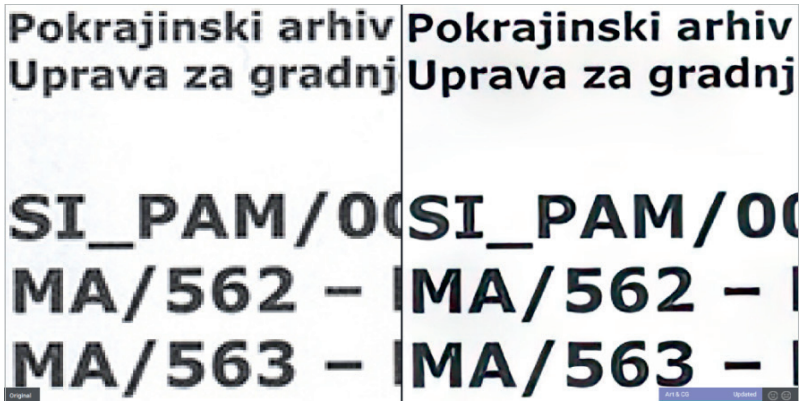

Figure 9: Subsample 1 at 75 DPI

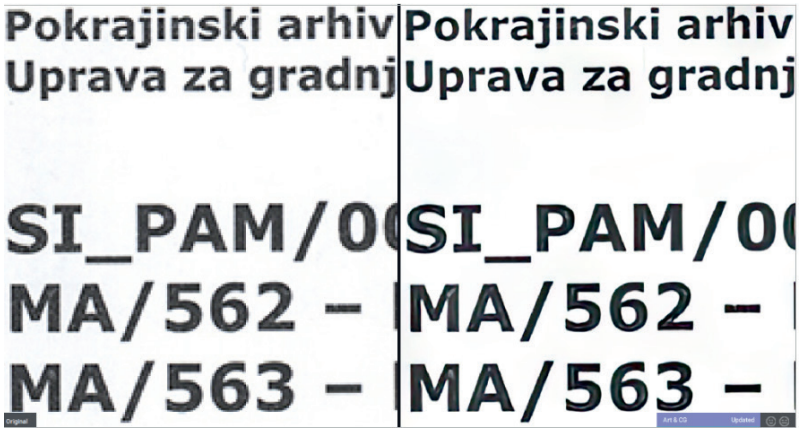

Figure 10: Subsample 1 at 100 DPI

Subsample 2 processing

Results in short: It can be seen that the readability of the plan increased slightly at the lowest resolution (50 DPI), where the model also tried to remove background noise. In the other two samples (75, 100 DPI), the improvement is obvious and almost flawless. Figures 11–13 shows original subsample at 50, 75 and 100 DPI and processed by AI model next to it.

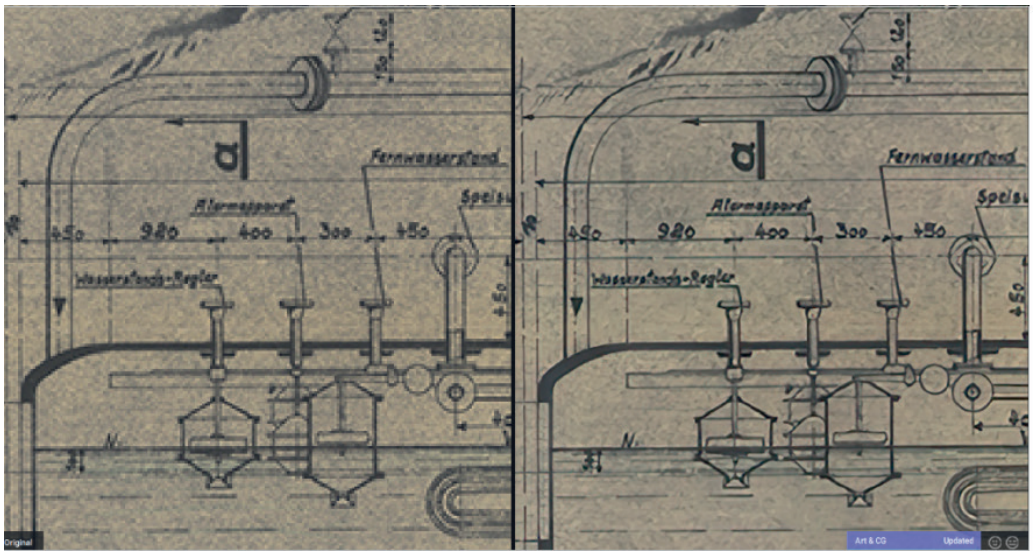

Figure 11: Subsample 2 at 50 DPI

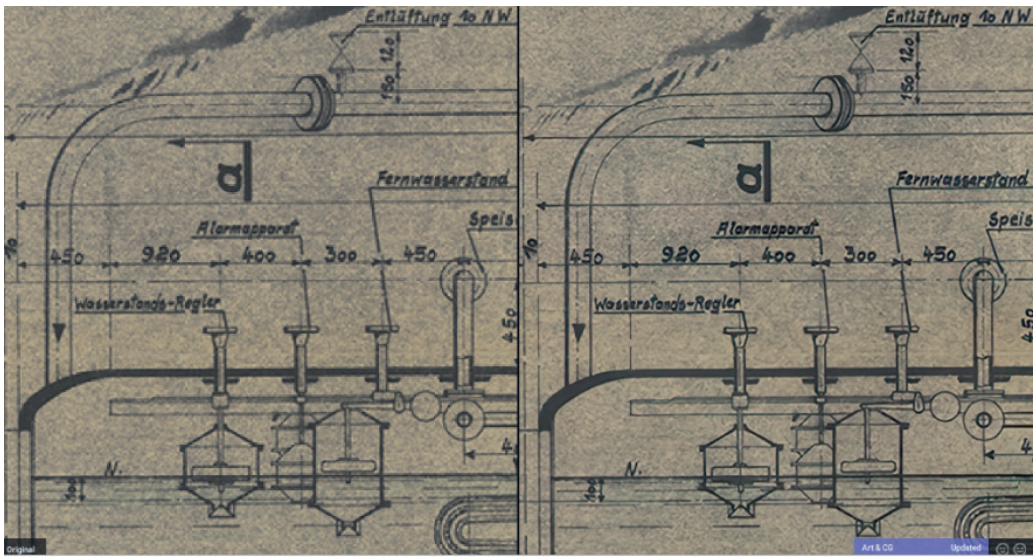

Figure 12: Subsample 2 at 75 DPI

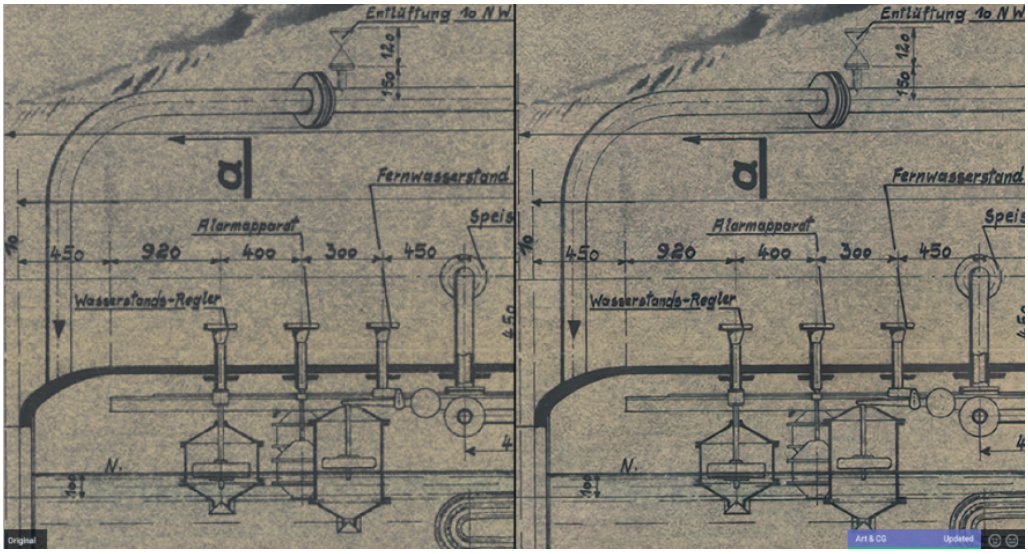

Figure 13: Subsample 2 at 100 DPI:

Subsample 3 processing

Results in short: In all three cases, background noise removal is noticeable. The written text has become suitably smoothed when zoomed in, and the inscriptions in the stamps are even easier to read. Figures 14–16 shows original subsample at 50, 75 and 100 DPI and processed by AI model next to it.

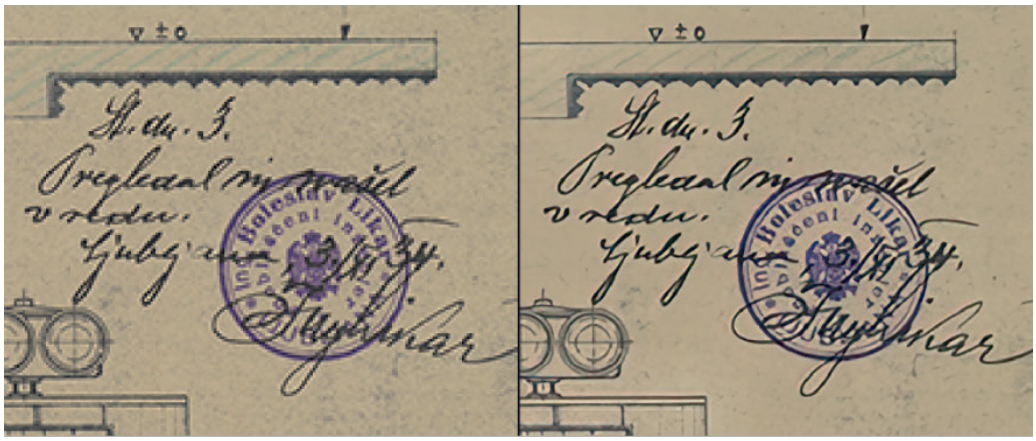

Figure 14: Subsample 3 at 50 DPI.

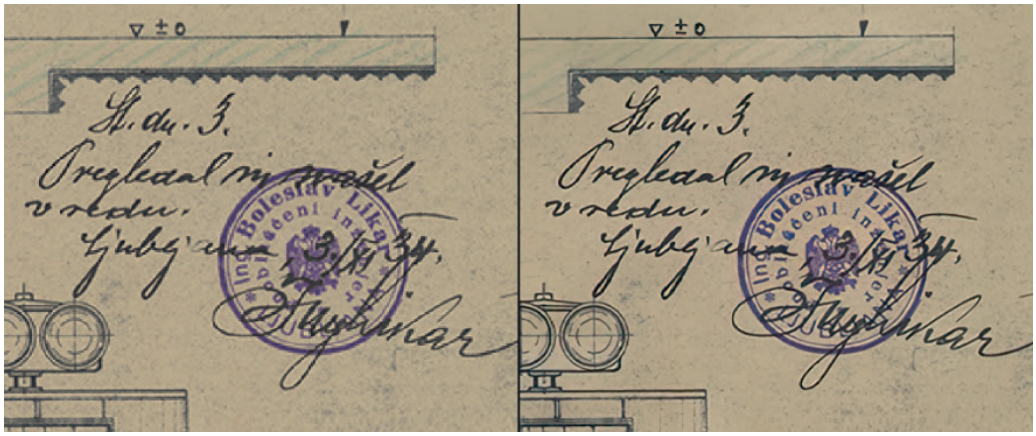

Figure 15: Subsample 3 at 75 DPI.

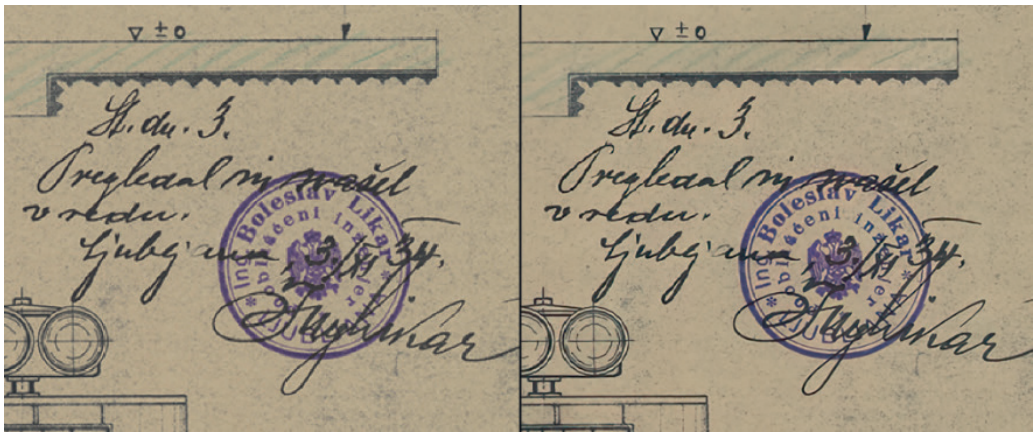

Figure 16: Subsample 3 at 100 DPI.

Subsample 4 processing

Results in short: It is a fundamentally less readable plan, which is scanned in insufficient resolution, the original is also poorly contrasted. We can see that at the lowest resolution (50 DPI), the model failed to improve the readability of the design. Improvements can be seen with the larger two (75 and 100 DPI). There is also pronounced noise cancellation. Figures 17–19 shows original subsample at 50, 75 and 100 DPI and processed by AI model next to it.

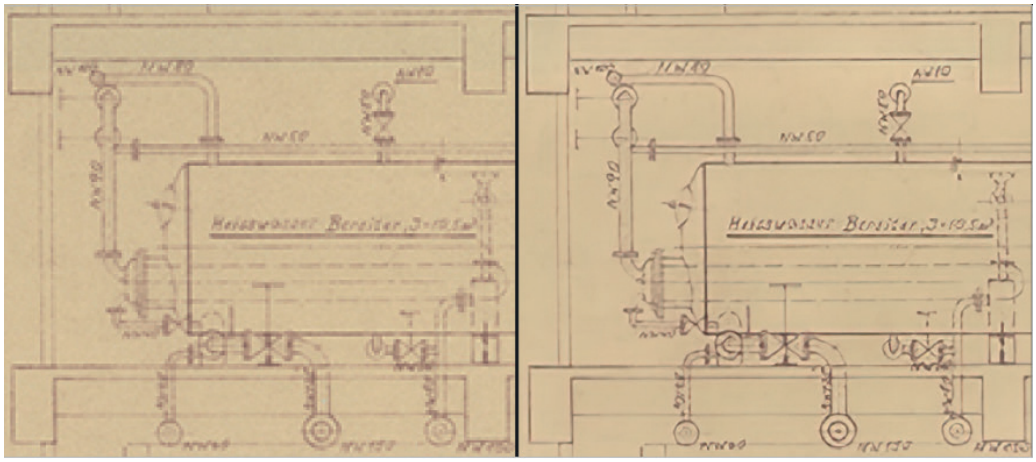

Figure 17: Subsample 4 at 50 DPI.

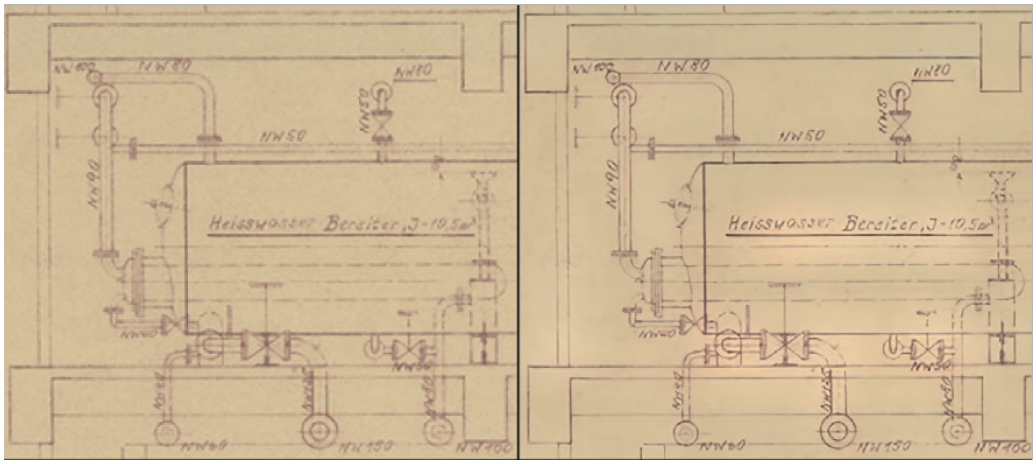

Figure 18: Subsample 4 at 75 DPI.

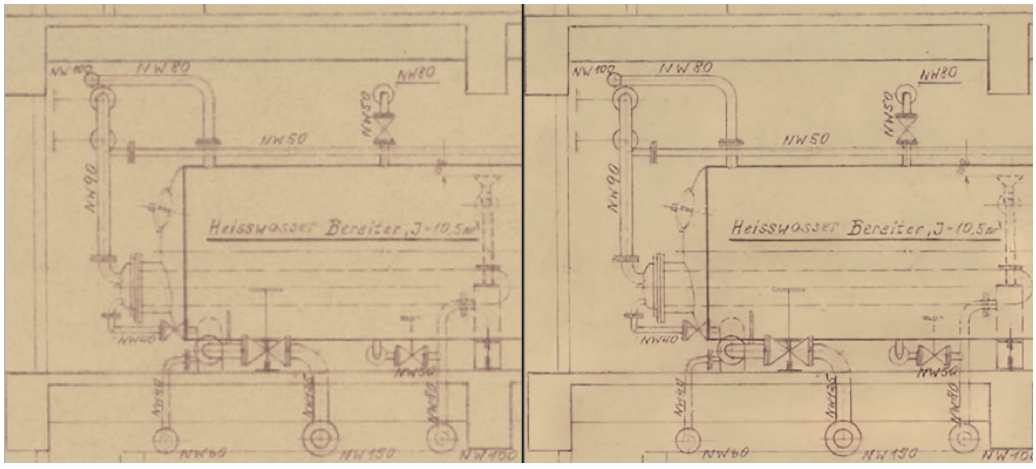

Figure 19: Subsample 4 at 100 DPI.

Subsample 5 processing

Results in short: At the lowest input resolution, the model failed to significantly increase the readability of the text, but at larger samples it can be traced and contributes to easier readability. Figures 20–22 shows original subsample at 50, 75 and 100 DPI and processed by AI model next to it.

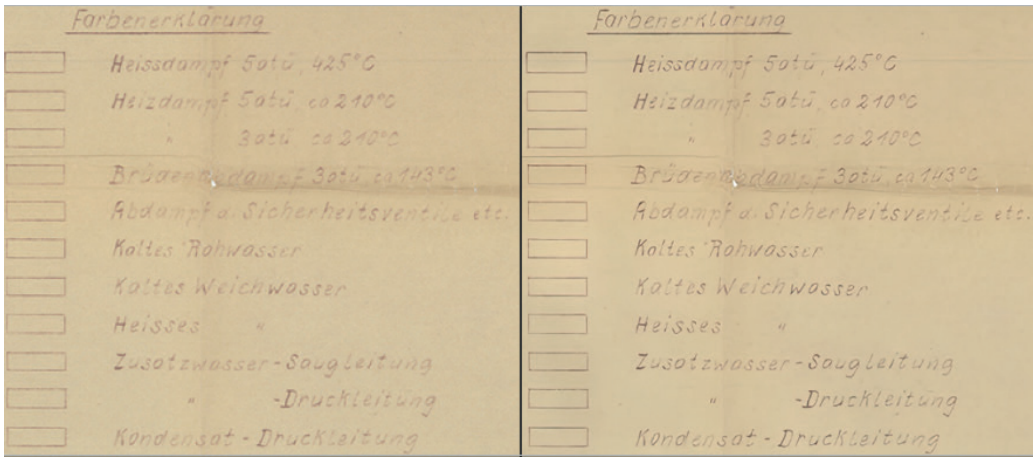

Figure 20: Subsample 5 at 50 DPI.

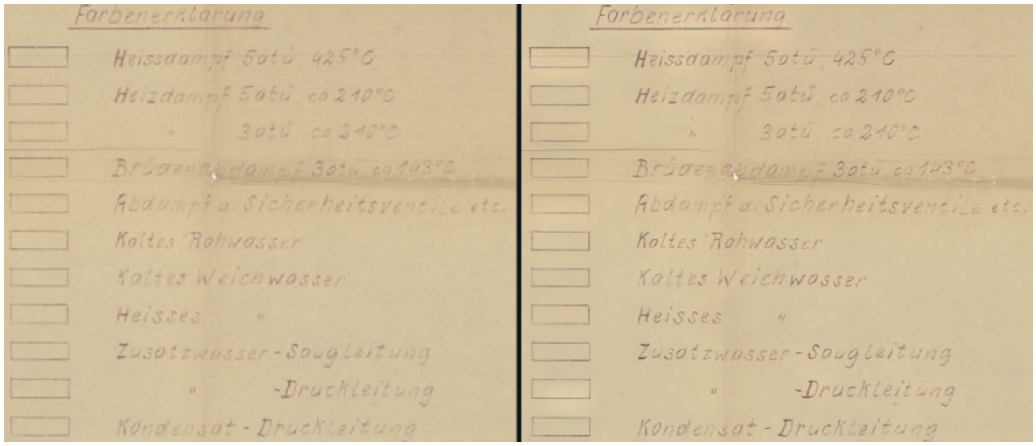

Figure 21: Subsample 5 at 75 DPI.

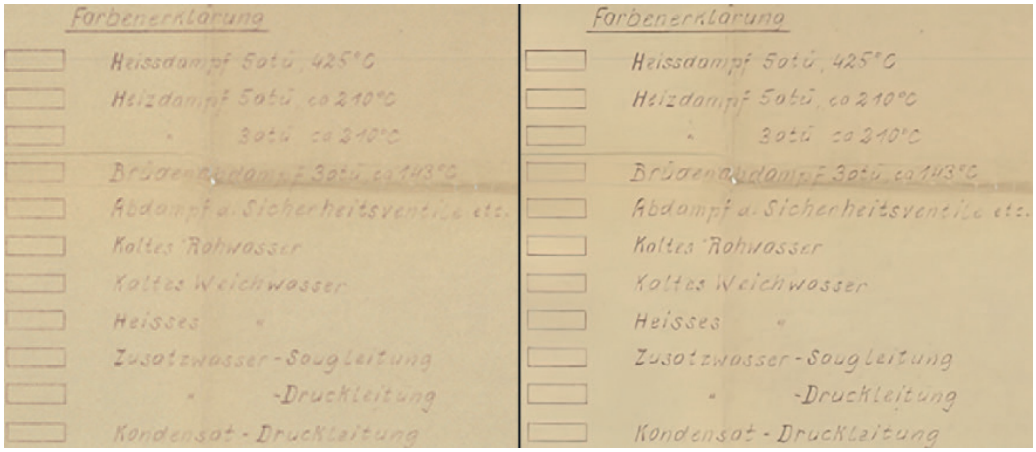

Figure 22: Subsample 5 at 100 DPI.

We can summarize the fundamental findings in following conclusions:

- If the original material is unreadable, even AI cannot assist.
- AI effectively handles borderline useful material, suggesting that rescanning may not be necessary in some cases.
- AI performs strongly and convincingly when the original material is already readable.
- The application of AI yields excellent results for printed text, with surprisingly successful improvements for manuscripts and stamps.
- AI removes noise universally, even when unnecessary. Attention should be paid to this feature in cases where noise reduction is undesired.
- In general, AI produces superior results compared to traditional zoom methods.

During the sample processing, we formulated several recommendations:

- The selection of the built-in zoom model is crucial. Since 2022, when similar research was conducted (Hribar, 2022), models have become available that avoid excessive detail invention and know when to refrain. Multiple options should be tested before finalizing the choice.
- We still advocate scanning with the highest possible resolution that is practical and economically feasible.
- All AI-processed images must undergo thorough review before release to the end user.
- Algorithms should not be pushed to their extreme performance limits; a 2x or 4x times magnification is the maximum expectation.

6 CONCLUSION AND DISCUSSION

Based on our preliminary study we can conclude that the use of AI and ML algorithms is becoming increasingly prevalent, with developers integrating AI support into software. Users often remain unaware of the solutions they employ and potential unintended consequences (Santiago, 2023).

Content creators sometimes embrace the latest and experimental methods to present visually appealing and technically flawless content. Algorithms for resolution enhancement, relying on AI or ML, perform automatic restoration interventions by inventing missing information based on learned patterns. While effective, especially with similar learning patterns, it's crucial to recognize that these algorithms don't "understand" content.

Further, pushing algorithms to extreme limits, where extensive invention is required, may lead to obvious and sometimes misleading errors. Lack of information doesn't always impede the invention process. Errors may also occur when the material doesn't align with the learning samples so archivists must be vigilant about unwanted artifacts that can mislead users, particularly in scaled images where AI-generated zooms may be indistinguishable.

The authors however propose appropriately marking AI-processed material or noting it in metadata. As automatic evaluation and selection processes preserving larger versions of files is most likely, but it can happen that larger files were AI generated. We advise that original files should always be retained due to potential shortcomings in enlarged image material.

In summary, archivists must possess sufficient knowledge of AI, enabling them to be critical to AI solutions and be able to share insights with content creators. However, recognizing AI's characteristics and legal implications can be time-consuming therefore establishing criteria for AI solutions on heritage and archival material is crucial for upholding principles and ethics. Human involvement in the material processing loop needs to remain essential as current narrow AI models still make many commonsense errors. Mechanisms to limit bold imaginativeness or hallucinations of AI are still under development (Anantrasirichai and Bull, 2022; Davis and Marcus, 2015).

REFERENCES

Anantrasirichai, N., Bull, D. (2022). Artificial intelligence in the creative industries: a review. In Artificial Intelligence Review 55, 589–656. Retrieved at https://doi.org/10.1007/s10462-021-10039-7 (accessed on 11. 3. 2024)

Chen, S.-L. (2013). VLSI Implementation of a Low-Cost High-Quality Image Scaling Processor. In IEEE Transactions on Circuits and Systems II: Express Briefs, 60(1), 31–35. Available at https://doi.org/10.1109/TCSII.2012.2234873 (accessed on 1. 4. 2024)

Chen L., Ye M., Milne A., Hillier J., Oglesby F. (2022). The scope for AI-augmented interpretation of building blueprints in commercial and industrial property insurance. WTW research network, Loughborough University. Retrieved at https://www.researchgate.net/publication/360383818_The_scope_for_AI-augmented_interpretation_of_building_blueprints_in_commercial_and_industrial_property_insurance (accessed 2.4.2024)

Del Giudice, F. (2021). Overview of business Archives in Italy. Business Archives in international Comparison: 96-105. Paris: International Council on Archives. Retrieved at_business_archives_in_international_comparison_-_2021.pdf (ica.org) (accessed on 28. 3. 2024).

Gidlöf, Sjöman (2021). Overview of business Archives in Sweden. Business Archives in international Comparison: 20-24. Paris: International Council on Archives. Retrieved at business_archives_in_international_comparison_-_2021.pdf (ica.org) (accessed on 28. 3. 2024).

Goodfellow, I., Pouget-Abadie, J., Mirza, M., Xu, B., Warde-Farley, D., Ozair, S., Courville, A. & Bengio, Y. (2014). Generative Adversarial Networks. In Proceedings of the International Conference on Neural Information Processing Systems, (2672–2680). Retrieved at https://arxiv.org/abs/1406.2661 (accessed on 28. 3. 2024).

Isikdogan, L. (2019). How Super Resolution Works. Video lecture. Retrieved at https://youtu.be/KULkSwLk62I (accessed on 23. 4. 2022)

Lasewicz, Rayan (2021). Overview of business Archives in the United States of America Business Archives in international Comparison: 122-126. Paris: International Council on Archives. Retrieved at https://www.ica.org/sites/default/files/business_archives_in_international_comparison_-_2021.pdf (accessed on 28. 3. 2024).

Litt, G. (2017). ENHANCE! Upscaling Images with Neural Networks. Video lecture. Retrieved at https://youtu.be/RhUmSeko1ZE (accessed on 23. 4. 2022).

Paudel, A., Dhakal, R. & Bhattarai, S. (2021). Room Classification on Floor Plan Graphs using Graph Neural Networks. Retrieved at https://doi.org/10.48550/arXiv.2108.05947 (accessed on 1. 4. 2024)

Philips, J. & Tabrizi, N. (2020). Historical Document Processing: A Survey of Techniques, Tools, and Trends. Department of Computer Science, North Carolina, U.S.A.: East Carolina University, Greenville. Retrieved at https://www.scitepress.org/Papers/2020/101774/101774.pdf (accessed on 26. 3. 2024)

Plaziac, N. (1999). Image interpolation using neural networks. In IEEE Transactions on Image Processing, Vol. 8, No. 11, 1647–1651. Retrieved at https://doi.org/10.1109/83.799893 (accessed on 28. 3. 2024)

Rigele G. (2021). Overview of business Archives in Austria. Business Archives in international Comparison: 8-10. Paris: International Council on Archives. Retrieved at__business_archives_in_international_comparison_-_2021.pdf (ica.org) (accessed on 28. 3. 2024).

Rosenfeld, A. (1969). Picture Processing by Computer. In ACM Computing Surveys Vol. 1, No. 3, 147–176. Retrieved at https://doi.org/10.1145/356551.356554 (accessed on 12. 3. 2024)

Santiago, E. (2023). How AI Perceptions Have Changed in the Last Decade [Comparing New & Old Consumer Data]. Hubspot, 11. July 2023. Retrieved at https://blog.hubspot.com/marketing/artificial-intelligence-is-here (accessed on 30. 3. 2024)

Turton A. (2021). Editorial Note. Business Archives in international Comparison: 1. Paris: International Council on Archives. Retreived at business_archives_in_international_comparison_-_2021.pdf (ica.org) (accessed on 28. 3. 2024).

Yingfang C., Rui Y. (2021). Overview of business Archives in China. Business Archives in international Comparison: 20-24. Paris: International Council on Archives. Retreived at business_archives_in_international_comparison_-_2021.pdf (ica.org) (accessed on 28. 3. 2024).

Peter Pavel Klasinc[1]

ARCHIVAL SCIENCE BETWEEN SOCIAL AND NATURAL SCIENCES, STUDY PRESENTATION

Abstract

Purpose: *The purpose of this paper is to present research on classification of archival science among social science, but at the same time we want to find answers to whether archival science can also be classified among natural sciences.*

Method/approach: *The results of this paper are based on several methods. The first one is the comparative method of the study programs and profiles of the graduate students at the University of Ljubljana in correlation to the types of archival material which those specialists produced. Another method used in the paper is the method of studying different sources like websites, literature etc. including the experiential method.*

Results: *This paper presents the results of this research, which will place all three sciences in clear starting points related to archival science, archivistics and archival theory and practice.*

Conclusion: *The fact is that archival science is gaining ground as an independent, academic, multidisciplinary and interdisciplinary science; therefore, we must place it within clear starting points, which are typical for both social and natural sciences.*

Key words: *archival science, social science, natural science, archival material.*

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1. INTRODUCTION

In the introduction, we would like to emphasize the firm belief that archival science today is undeniably an independent, academic, multidisciplinary and interdisciplinary science. This fact has been confirmed by a decade long research activity and a long period of positioning modern archival science as a science both within professional and layman public. Nevertheless, from time to time we can come across individual professional articles in which archival science is referred to as an auxiliary historical science, even though the activities of archivists have been positioning archivistics as a science for a long time. We are convinced that the majority of these auxiliary sciences are used by archivists in competent archives in the professional processing of material and by employees in archival institutions as well as creators of archival material (Klasinc, 2023a).

We were led to prepare this paper by the observation that the process of establishing archival science as an independent, academic, multidisciplinary and interdisciplinary science is way too slow (Klasinc, 2023; Trivette, 2022), and it can therefore not be equally integrated into the social or natural sciences (Plazar & Klasinc, 2023). The basis for this paper provides *Table 1*, which shows the differences between natural and social sciences.

	Natural sciences		Social sciences
+	Accuracy	-	Inaccuracy
+	Correctness	-	Incorrectness
+	Determinacy	-	Indeterminacy
+	Independence	-	Dependence
+	Transparency	-	Opacity

Table 1: Differences between natural and social sciences (Ambrož, 2023, 18.)

Data in *Table 1* shall be understood in the context of scientific research work, or in relation to the so-called evaluations of research results (Henttonen, 2023). If, based on the data from *Table 1* we find and classify individual archival documents, we will arrive at different results after the analysis. More on that below.

2. PRESENTATION OF SOCIAL SCIENCES FROM THE PERSPECTIVE OF ARCHIVAL SCIENCE, ARCHIVISTICS AND ARCHIVAL THEORY AND PRACTICE.

For a brief presentation of social science in the broadest sense of the word, we will use data from the Faculty of social sciences of the University of Ljubljana (Uni Lj, 2024a). We could have of course chosen any other higher educational institution to present the social sciences, but the decision fell on the oldest and largest university in Slovenia. Among all faculties of social sciences within Ljubljana University, we chose the Faculty of Economics, Faculty of Law, Faculty of Education, Faculty of Social Sciences, Faculty of Administration, Faculty of Social Work, Faculty of Sports and Faculty of Arts.

The conclusion that archival science shall be positioned within social sciences is only partially true. In this paper we therefore want to prove that archival science can also be classified as a natural science. Below, we will justify the fact that in the study programs of individual faculties, we can find clear connections between studies and the subsequent work activity of graduates in connection with the creation of archival and documentary material, and in this way establish a connection with archival science, archivistics and archival theory and practice.

The Faculty of Economics (EF) educates future professionals who, after completing their education, generally create archival and documentary material in their work in large quantities, for example in financial and accounting departments, management, in trade or in international business contacts.

The same applies to the Faculty of Law (PF, 2008), where future experts study for the preparation of laws, recommendations, contracts, implementation works or legal opinions. For the creators of archival material, lawyers are important creators of individual documents, even those marked as confidential and used to prove various situations, which can add archival value to the documents. Among the material that is created in the legal field, we can distinguish between confidential and important documentary material, which is marked as inaccessible in the archives for a long period of time or is kept by the creators with a mark permanent.

The Faculty of Social Sciences (FDV, 2012) educates those who, in their future careers, will be closely related to the creation of archival and documentary ma-

terial, especially as employees of ministries, economic or non-economic institutions, state or private companies. We believe that the most material is created in this area, which we rightfully take into account when evaluating and selecting archival material. It is interesting to note that the Social Science Data Archive, a scientific research institution that supports research and education with an important data infrastructure, also operates within the faculty (FDV).

The Faculty of Social Sciences (FDV, 2012) educates those who, in their future careers, will be closely related to the creation of archival and documentary material, especially as employees of ministries, economic or non-economic institutions, state or private companies. We believe that most material is created in this particular area, which we rightfully take into account when evaluating and selecting archival material. It is interesting to note that the Social Science Data Archive, a scientific research institution that supports research and education with an important data infrastructure, also operates within the faculty (FDV).

Other faculties of social sciences are in a similar position to the one mentioned above in relation to archival science, for example the Faculty of Education (PEF), where those who will create archival material about education are being trained, or where material is already being created, which experts who teach at this faculty have created during their work. The same applies to the Faculty of Social Work (FSD) which educates those who will create documents related to the social activity of the country and the activity of state institutions and healthcare, which will reflect the social state of society (housing issues, the situation of pensioners ...).

Compared to the previously mentioned higher education institutions, the Faculty of Administration (FU, 2021) is also important for archivists and their work in terms of the educational process. We believe that the experts who teach at the faculty are creators of important archival documents. At the same time, part of the study program is also aimed at educating students as future creators of archival material, since in the process of studying they acquire important knowledge about the functioning of state administration, public administration, and local administration and institutions of the European Union.

The Faculty of Arts (FF) educates a wide range of future experts in the fields of humanities and social sciences. The archival material, which is directly or indirectly created during the work of the faculty, represents an important starting

point for the presentation of national values and Slovenian identity, but at the same time directs the study fields to a new quality, which is important for Slovenian self-awareness. There is no independent study programme of archivistics at this faculty.

A special department is also organized within the University of Ljubljana - Archives and Museum Service, also called University Archives or Archives and Museum of the University of Ljubljana (Uni Lj, 2024) - whose operation is based on the decision of the Ministry of Culture of the Republic of Slovenia on its own storage of archival material. In practice, this means that the University of Ljubljana and its members - faculties - do not submit their material to the competent archive, i.e. Archives of the Republic of Slovenia, but according to the Act on the Protection of Archival and Documentary Materials and Archives and according to the instructions of the Archives of the Republic of Slovenia, they must keep it in their archives (MK RS, 1999).

3. PRESENTATION OF NATURAL SCIENCES FROM THE PERSPECTIVE OF ARCHIVAL SCIENCE, ARCHIVISTICS AND ARCHIVAL THEORY AND PRACTICE

As with the presentation of the social sciences from the perspective of archival science, archivistics and archival theory and practice, the presentation of natural sciences will also be based on the University of Ljubljana, where there are eight faculties that can be characterized as natural sciences. It can be said that these institutions educate students who will create archival and documentary material in their future jobs, i.e. when selecting archival material from documentary material, they will also undergo a professional evaluation. Archival material from the field of natural sciences is important, professional archival work therefore requires knowledge that only experts from faculties of natural sciences can acquire during their studies. It is indisputable that archival material created by creators in the field of natural sciences is related to the natural sciences. A quick look at the guides to archival fonds and collections published by the archives as independent publications shows that the archives also hold documents created by graduates in the field of natural sciences.

The Faculty of Biotechnology (BF) covers various fields of natural sciences, such as agronomy, agricultural policy and everything related to professional work at

the Ministry of Agriculture, the Chamber of Agriculture or even the work of the Ministry of Natural Resources and Spatial planning. We want to emphasize that public law entities in this area are legally obliged to hand over archival material to the Archives of the Republic of Slovenia or to competent regional archives, if the archival material is created by creators at the municipal level (e.g. agricultural cooperatives, institutes for the development of agriculture, etc.).

The same can be said for education at the Faculty of Civil Engineering and Geodesy (FGG, 2022), where archival material is created at the competent ministry or at municipal levels, municipal offices and departments. In any case, the material created by experts who have completed their studies at the Faculty of Civil Engineering and Geodesy can also be found with various creators of public-private partnerships (construction companies, etc.).

Graduates of the Faculty of Medicine (MF) are undeniably the creators of large amounts of archival material, as they are active in various institutions - the Ministry of Health, various hospitals, medical centres and elsewhere, where work is defined by medicine or healthcare and related activities.

The activity of the Faculty of Pharmacy (FFA, 2024) shows that archival documents, created by pharmacists, are primarily created by creators within the Ministry of Health and the Agency for Medicine, the Chamber of Pharmacy and individual pharmacies, and are kept in the competent archives, i.e. Archives of the Republic of Slovenia or regional archives. In principle, we do not find this type of material in archival fonds in the field of economy, since we usually do not classify pharmaceutical companies as businesses. At this point, there is also a question regarding the handing over of archival material to competent archives by business entities, but we will leave this issue aside for the time being.

Extensive archival material is also created by graduates of the Faculty of Electrical Engineering (FE) namely in the work of several ministries, various agencies, offices, nuclear power plants, other power plants and commercial electrical companies. The Archives of the Republic of Slovenia or regional archives are also responsible for such archival material. Based on our experience, we would like to present the management of the archival fond of Elektrarna (powerplant) Fala (today known as hydroelectric power plant Fala), which is kept in the Provincial Archives of Maribor and is one of the more extensive funds. Part of this material

is a large set relating to electrotechnical, construction, social and employment issues. The material was accidentally preserved in the attic of the old part of the Fala power plant building and contains documents from the period between 1906 and 1954. Before being handed over to the competent archive, it was arranged in the offices of the Dravske elektrarne company and handed over to the Maribor archive for further study, research, archiving and editing. work (Lešnik, 14).

4. GENERAL ASSESSMENT

When citing faculties in the field of natural sciences and social sciences, we found that the faculties train and educate experts who, after completing their studies, create documents at their workplaces, many of which can be described as archival material. These are documents that are important for science and culture as well as legal security and must be kept in a competent archive, i.e. Archives of the Republic of Slovenia, or six regional historical archives. Traces of the work of natural science and social science experts can be found in the inventories of archival fonds and collections, which are available both in classic book formats (e.g. guides to archival fonds and collections) as well as in digital format. The content that represents the creators of the documents - in our case, graduates of the discussed faculties of social and natural sciences - is part of the inventory of the archival fond. In this way, we also justify the definition of archival science as a multidisciplinary (description of the guide) or interdisciplinary (description of an individual fond) science.

With this contribution, we want to present the fact that better results in the professional processing of archival material can be achieve only if we are assisted by experts. If archivists insist that we have to make our own decisions about archival issues, we can also apply the Latin saying “Cuilibet in arte sua credendum” (Each man, in his own skill/art, must be given credit (must be believed)) to the knowledge of individual experts or graduates of the faculties in question. The most recent finding and presentation of this kind was at the opening of the exhibition of Mojca Horvat entitled “From townspeople to photographs, Archival materials of the Fala estate”, where the author of the exhibition emphasized that she had been helped by experts in the description of individual documents of the estate, among them many from the fields presented in this contribution (Horvat, 2024, 100).

At this point (not with the intention of criticism), we can assert that we cannot extract data from the historical description that would direct us to archival documents created by experts from the faculties described above. An easier way to search is to review individual lists of archival holdings, or to search with the help of information solutions, such as the search engine for archival material of the Historical Archive of Celje (*Figure 1*).

Figure 1: Search engine for archival material of the Historical Archive of Celje (ZAC, 2024.)

5. CONCLUSION

To conclude, we will present the archival science in relation to the social and natural sciences. In doing so, we note that we can easily discover so-called *common denominators* in the inventories of archival funds, which prove that there are many documents in the documentary and archival material created by experts from the faculties mentioned in this paper (the same applies to the other educational institutions). Based on this, we want to connect the results presented in *Table 1* (Ambrož, 2023, 18) with preserved archival or documentary material, which we can do on the basis of research-editing work, guided by the content of individual documents. We can conclude that archival material created within the natural or social sciences is undeniably precise, accurate, definite, dependent and transparent.

The general conclusion of this paper is that there are no obstacles for equal treatment of archival sciences in terms of the content of archival documents, regardless of whether they were created within natural sciences or social sciences. (Klasinc, 2019). Archival material represents the nation's memory. It is protected by law and is a cultural monument.

REFERENCES

Ambrož, M. (2023). *Metodologija raziskovanja v družboslovju, pragmatičen pristop k raziskovanju v družbenih vedah*. Maribor: Alma Mater Press.

Biotehniška fakulteta, Univerza v Ljubljani [BF]. (s. d.). Retrieved at https://www.bf.uni-lj.si/ (accessed on 30. 4. 2024).

Henttonen, P. (2023). Open questions of research on appraisal, *Atlanti, 33*(1), 119–126.

Horvat, M. (2024). *Od urbarjev do fotografij, arhivsko gradivo gospostva Fala s širšega območja Ruš, Lovrenca na Pohorju in Selnice ob Dravi*. Maribor: Pokrajinski arhiv Maribor.

Klasinc, P. P. (2019). Archival science – today. *Atlanti+, 29*(1), 10–18.

Klasinc, P. P. (2023). Archivistics, archival science and artificial inteligence. *Atlanti+, 33*(2), 25–38.

Klasinc, P. P. (2023a). Implementacija arhivskih pomožnih ved v arhivsko teorijo in prakso. *Atlanti,33*(1), 149–178.

Trivette, K.J. (2022). Archival Science? Existential questions and proposed answers. *Atlanti+,32*(1), 50–62.

Plazar, N. & Klasinc, P. P. (2023). Research of doctoral students in archival science at AMEU Maribor, classification of archival seminar work by students of Archival sciences at AMEU Maribor. *Atlanti+, 33*(2), 101–108.

Ekonomska fakulteta, Univerza v Ljubljani [EF]. (s. d.). Retrieved at https://www.ef.uni-lj.si/ (accessed on 30. 4. 2024).

Filozofska fakulteta, Univerza v Ljubljani [FF]. (s. d.). Retrieved at https://www.ff.uni-lj.si/ (accessed on 30. 4. 2024).

Fakulteta za družbene vede, Univerza v Ljubljani [FDV]. (2012). Retrieved at https://www.fdv.uni-lj.si/ (accessed on 30. 4. 2024).

Fakulteta za družbene vede [FDV]. (s. d.). *Arhiv družboslovnih podatkov.* Retrieved at https://www.adp.fdv.uni-lj.si/ (accessed on 30. 4. 2024).

Fakulteta za elektrotehniko, Univerza v Ljubljani [FE]. (s. d.). Retrieved at https://www.fe.uni-lj.si/ (accessed on 30. 4. 2024).

Fakulteta za farmacijo, Univerza v Ljubljani [FFA]. (2024). Retrieved at https://www.ffa.uni-lj.si/ (accessed on 30. 4. 2024).

Fakulteta za gradbeništvo in geodezijo, Univerza v Ljubljani [FGG]. (2022). Retrieved at https://www.fgg.uni-lj.si/ (accessed on 30. 4. 2024).

Fakulteta za socialno delo, Univerza v Ljubljani [FSD]. (s. d.). Retrieved at https://www.fsd.uni-lj.si/ (accessed on 30. 4. 2024).

Fakulteta za upravo, Univerza v Ljubljani [FU]. (2021). Retrieved at https://www.fu.uni-lj.si/ (accessed on 30. 4. 2024).

Lešnik, S. (2017). *Vodni stolp v Mariboru in gradnja elektrarn na Dravi*. Maribor: Pokrajinski arhiv Maribor.

Medicinska fakulteta, Univerza v Ljubljani [MF]. (s. d.). Retrieved at https://www.mf.uni-lj.si/ (accessed on 30. 4. 2024).

Ministrstvo za kulturo RS [MK RS]. (1999). *Dovoljenje za zagotovitev varstva lastnega arhivskega gradiva.* Retrieved at https://www.uni-lj.si/assets/Sluzba-za-pravne-zadeve/Arhivsko-muzejska-sluzba/Dokumenti/Dokumenti-landing-page/Dovoljenje-Ministrstva-za-kulturo-RS-Univerzi-v-Ljubljani-za-varstvo-lastnega-arhivskega-gradiva.pdf (accessed on 30. 4. 2024).

Pedagoška fakulteta, Univerza v Ljubljani [PEF]. (s. d.). Retrieved at https://www.pef.uni-lj.si/ (accessed on 30. 4. 2024).

Pravna fakulteta, Univerza v Ljubljani [PF]. (2008). Retrieved at https://www.pf.uni-lj.si/ (accessed on 30. 4. 2024).

Univerza v Ljubljani [Uni Lj]. (2024). *Univerzitetni arhiv*. Retrieved at https://www.uni-lj.si/univerza/univerzitetni-arhiv (accessed on 30. 4. 2024).

Univerza v Ljubljani [Uni Lj]. (2024a). Retrieved at https://www.uni-lj.si/ (accessed on 30. 4. 2024).

Zgodovinski arhiv Celje [ZAC]. (2024). *Iskalnik po arhivskem gradivu ZAC*. Retrieved at https://vodnik.zac.si/ (accessed on 30. 4. 2024).

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  Purpose: Archival science and Museum science in museums are working in close cooperation. In the process of…

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  Results: Description of archival records has an important role in museum archives and storage rooms, since it allows employees to…

  Conclusions/findings: Museum and Archival science work closely together in museums and they need each other… Due to this, it is possible for the archivist and curator documentarist to look for common solutions in the field of record/documentation management and storage.

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- For citation of sources accessible online, the above instructions shall used sensibly. However, it is necessary to add “Retrieved at” and an online link to the source or a doi link, followed by the date of access in brackets (e.g. (accessed on 15/05/2022).

8. SUBMISSION AND COPYRIGHT

The author can submit contributions that have not yet been published in another publication or are not in the process of being published in other publications. The author is fully responsible for the content of the article and the proofreading of the text. The contribution for publication should be compiled in accordance with the journal's instructions and scientific guidelines regarding the content, style, and structure of the article.

The author should send a grammatically and linguistically suitable text to the editors. **Texts that do not comply with the journal's instructions will be returned to the author by the editors and will require adjustments and corrections.**

The editor and technical editor review the appropriateness of citations and references in accordance with the journal's guidelines and decide whether:

a) the article can be sent to the review process,

b) return the article to the author and request appropriate modifications and only then forward the article for peer review.

All moral and copyright rights in case of publication belong to the author. In case of material copyrights, these are transferred to the publisher of the magazine - the International Institute of Archival Sciences Trieste - Maribor and Alma Mater Press by the author for all time, for all cases, for unlimited editions and for all media, non-exclusively, temporally and spatially. The author signs the permission to publish the article in Atlanti+ magazine, which must be submitted when submitting the article.

The author submits the article together with a signed permission to publish the article in electronic form to the email address of the journal's editorial office (if there are several authors, the permission must be signed by all authors).

9. PEER REVIEW PROCEDURE:

The editorial board reviews all received submissions. If the articles are not prepared in accordance with the instructions and standards of the journal, the editorial board requests corrections and adjustments from the author. If the article is neither scientific nor professional, the editorial committee decides on publishing it or not.

Scientific and professional articles that have been written in accordance with the instructions and guidelines of the journal and the editors are included in the anonymous (double-blind) peer review process. Reviewers are selected by the editorial board.

The following components are looked at by the editorial board:

- **content**: general interest of the content, innovation...,
- **methodology**: adequacy of used methods, sampling, confirmation/rejection of hypotheses and assumptions...,
- **the structure and form of the contribution**,
- **consistent citation and citing of sources, notes, pictorial and graphic sources**...

According to the reviewer, the author either corrects or adjusts the article.

Anonymity of authors and reviewers during the review process is guaranteed. Articles will only be published if they have received a positive evaluation during the review process.

After the review, the reviewer determines the typology of the article and decides whether the article:

a) May be published as submitted to the editors,

b) Can be published after the author has made minor required corrections,

c) Needs to be corrected and sent to the editorial board for another review,

d) Unsuitable for publication.

10. TYPOLOGY

Based on the reviewer's opinion, the editorial board determines the typology of the article. The typology for managing bibliographies within COBISS is as follows:

1.01 Original scientific article

1.02 Review article

1.03 Short scientific article

1.04 Professional article

11. FINAL TEXT AND PUBLISHING PREPARATION

The author must send the final text via e-mail (in MS Word format) within the deadline set by the editors to the editors' e-mail address.

The editorial board prepares the text for publication and reserves the right to change the format of contributions and major design changes in agreement with the author.

The reviewers consider the following:

- Content: general interest, innovation …,
- Methodology: suitability of used methods, sampling, hypothesis confirmation or rejection.
- Paper structure,
- Citations and references: citing consistency, references etc...

According to the reviewer's opinion the author corrects or supplements the article.

The anonymity of authors and peer reviewers during the review procedure is guaranteed. Articles are published only if they receive a positive review.

EXAMPLES OF CITING SOURCES

The table contains examples of citing sources for easier illustration of citing each type of source in different formats for a contribution in Atlanti+ journals:

- The first column indicates the source type.
  The list of used sources must be placed at the end of the article; the sources must be listed as shown in the second column (titles books/magazines/documents are written in italics - see the individual case)
- Explanations and more important highlights are written in the third column.
- The fourth column shows how each type of source should be cited within the text (e.g. Melik (1995, 15) notes that...; Stoler et al. (2020) claims..., (Vilfan and Žontar, 1973, 154) etc.)

BOOK Surname, first name. (year). Book Title: Subtitle. Place of publishing: Publishing house. Surname, first name. (ed.). (year). Book Title: Subtitle. Place of publishing: Publishing house.		Write the title (and subtitle) of the book in italics. In the case of two or more authors, we add the word „and“ before the last author.	
TYPE OF SOURCE	CITATION IN THE LIST OF SORUCES	EXPLANATION	CITATION IN THE TEXT
Book One author	Melik, J. (2011). Osnove prava in pravne države za arhiviste. Ljubljana: Arhiv Republike Slovenije.		(Melik, 1995);
Book Two authors	Vilfan, S. and Žontar, J. (1973). Arhivistika. Arhivski priročniki: zvezek 2. Ljubljana: Arhivsko društvo Slovenije.		(Vilfan and Žontar, 1973)
Book Three or more authors	Stoler, A. L., Gourgouris, S. and Lezra, J. (2020). Thinking with Balibar: A Lexicon of Conceptual Practice. New York: Fordham University Press.	**Three authors:** For the first citation in the text, write down the surnames of all authors, for all subsequent citations only the first author and add “et al.” (the international abbreviation for “and others”). **More than three authors:** When citing a source, write down all authors in the list of sources used. When citing in the text, write down the last name of the first author and add „et al.“.	(Stoler et al., 2020)
Book With editor(s)	Žontar, J. (ed.). (2000). Pravo, zgodovina, arhivi. 1. Prispevki za zgodovino pravosodja. Ljubljana: Arhiv Republike Slovenije.	In the list of sources, instead of the authors, we indicate the editor(s) and add an explanation in parentheses that they are the editors: „(ed.)“. When citing in-text tags, with the remark editors, “ed.” is not added.	(Žontar, 2000)
Book Without author/ editor	Publication manual of the American Psychological Association (6th ed.). (2010). Washington: American Psychological Association.	In the text, we cite the first few words of the citation in the list of sources used (usually the beginning of the title or the entire title). When quoting in the text, write the title or the beginning of the title in quotation marks.	(Publication manual, 2010
Annual report of an organisation	Vrhovno sodišče Republike Slovenije. (2020). Otvoritev sodnega leta 2020. Ljubljana: Vrhovno sodišče RS.	If it is information about an organization or its work, the author can be just the organization itself.	(Vrhovno sodišče RS, 2020)
Dictionary Large number of authors/editors	Slovar slovenskega knjižnega jezika [SSKJ]. (1994). Ljubljana: DZS.	In the text, we cite the first few words of the citation in the list of sources (usually the beginning of the title or the entire title)	(SSKJ, 1994)
Thesis	Kosi, M. (2016). Izhodišča za invalidom uporabno digitalizirano arhivsko gradivo (Master thesis). Ljubljana: Fakulteta za varnostne vede.		(Kosi, 2016)

ELECTRONIC BOOK Surname, first name. (year). E-Book Title: Subtitle. Place of publishing: Publishing house. Retrieved at http://xxxxxxxxxxx (accessed date of access). Surname, first name. (year). E-Book Title: Subtitle. Place of publishing: Publishing house. doi:xxxxxx/xxxxxxxxxxx (accessed date of access).		We cite them in the same way as printed books, except that we add a web link or a doi mark after the bibliographic data. The web link and the doi (Digital Object Identifier) must be written in bold, not underlined. Examples of citing sources for different numbers of authors are explained in the examples for books.	
TYPE OF SOURCE	CITATION IN THE LIST OF SORUCES	EXPLANATION	CITATION IN THE TEXT
E-book	Stichelbaut, B. (2015). Forgotten and lost? : 1914-1918 : a guide to the archives : archival research of aerial photographic collections of the western front. Ljubljana: Založba ZRC. Retrieved at http://www.dlib.si/details/URN:NBN:SI:doc-HO-1BAQNR (accessed on15. 2. 2022).	For bibliographic data and phrase „retrieved at“ we add a web link.	(Stichelbaut, 2015)
E-book with DOI	Stalla-Stichelbaut, B. (2015). Forgotten and lost? 1914-1918 : a guide to the archives : archival research of aerial photographic collections of the western front. Ljubljana: Založba ZRC. Doi: 10.3986/9789612548315 (accessed on 7. 4. 2022).	After the bibliographic data, we add “doi:” and the appropriate label..	(Stichelbaut, 2015)
Annual report of an organisation in e-form	Vrhovno sodišče Republike Slovenije [VS RS]. (2019). Letno poročilo o poslovanju sodišča za leto 2019. Ljubljana: Vrhovno sodišče Republike Slovenije Retrieved at http://www.sodisce.si/mma_bin.php?static_id=2020042009043956 (accessed on 27. 2. 2020).	If it is information about an organization or its work, the author can be the organization itself. If the name of the organization is long and the source is cited several times in the text, an abbreviation can be introduced in the first citation, which is then used in all subsequent citations. The abbreviation must also be given next to the name of the organization in the list of used resources.	(VS RS, 2019)
E-dictionary or encyclopaedia	Fran: Slovarji Inštituta za slovenski jezik Frana Ramovša ZRC SAZU. (2016). Ljubljana: Inštitut za slovenski jezik Frana Ramovša ZRC SAZU. Retrieved at http://www.fran.si/ (accessed on 2. 2. 2022).	When quoting in the text, write the title or the beginning of the title in in quotation marks.	(Fran, 2016)
E-version of a thesis	Pfajfar, V. (2018). Digitalizacija arhivskega gradiva. Metodologija in standardizacija postopkov (Magistrsko delo). Logatec: Alma Mater ECM. Retrieved at: https://d.cobiss.net/repository/si/files/2013301/106382/Pfajfar_Vanja_md_2018.pdf/terms (accessed on 6. 2. 2023).		(Pfajfar, 2018)

BOOK CHAPTER Surname, first name. (year). Chapter Title: Subtitle. In Initial of editor's name. Surname of the editor (ed.), Title of the book: Subtitle (pgs. first page of chapter - last page of chapter). Place of publishing: Publishing house.		In the list of sources used, the authors, year and title of the chapter are listed first. Then, after the word "In" (it stands for the introductory phrase, to indicate where the chapter is published), we provide information about the book and the pages on which the chapter is published. Write the title (and subtitle) of the book in italics. Examples of citing and citing sources for different numbers of authors are explained in the examples for books.	
TYPE OF SOURCE	CITATION IN THE LIST OF SORUCES	EXPLANATION	CITATION IN THE TEXT
Chapter in a book With editor(s)	Melik, J. (2000). Organizacija rednih sodišč v prvi Jugoslaviji. In J. Žontar (ed.), Pravo-zgodovina—arhivi: 1. Prispevki za zgodovino pravosodja (pgs. 173–183). Ljubljana: Arhiv Republike Slovenije.		(Melik, 2000)
Article in conference proceedings With editor(s)	Semlič Rajh, Z. (2018). Standard ISO 15489-1:2016 in vrednotenje : kaj prinaša novi standard. V A. Škoro Babič (ur.), 6. Simpozij Arhivi v službi človeka - človek v službi arhivov, (pgs. 43–51). Maribor: Alma Mater ECM.		(Semlič Rajh, 2018)

ARTICLE IN ELECTRONIC PROCEEDINGS Surname, first name. (Year). Article title: Subtitle. In Initial of editor's name. Last name of the editor (ed.), Title of the e-collection: Subtitle (pgs. First page of the chapter - last page of the chapter). Place of publishing: Publishing house. Retrieved at http://xxxxxxxxxxxx (accessed on date of access).		Write the title (and subtitle) of the collection in italics. We cite them in the same way as printed chapters, except that we add a web link or a doi tag after the bibliographic data. The web link and the doi (Digital Object Identifier) must be written in bold, not underlined. Examples of citing sources for different numbers of authors are explained in the examples for books.	
TYPE OF SOURCE	CITATION IN THE LIST OF SORUCES	EXPLANATION	CITATION IN THE TEXT
Contribution in the e-proceedings of the conference with the editor(s); pages of the article in the e-proceedings are indicated	Jelenc, Bogomil. 2017. Elektronsko pisarniško poslovanje, prvi korak k elektronskemu arhiviranju. In N. Gostenčnik (ed.), Tehnični in vsebinski problemi klasičnega in elektronskega arhiviranja. Digitalno in digitalizirano. Arhivsko gradivo včeraj, danes in jutri : zbornik mednarodne konference, Radenci, 5.-7. april 2017, Radenci, April 5-7, 2017 (pgs. 305-316). Maribor: Pokrajinski arhiv Maribor. Retrieved at http://www.pokarh-mb.si/uploaded/datoteke/Radenci/radenci_2017/22_jelenc_2017.pdf (accessed on 15. 9. 2022).	For bibliographic data and phrase "Retrieved at" we add a web link. The link must be written in black font and not underlined. If the pages in e-proceedings are numbered, we list those pages, too.	(Jelenc, 2017)
Contribution in the e-proceedings of the conference no editor; contribution pages in the e- are not listed in the proceedings	Huth, G. (2016). Appraising Digital Records. In Appraisal and Acquisition Strategies: Proceedings of the 10th Inter-national Joint Conference on Knowledge Discovery, Knowledge Engineering and Knowledge Management. London: SCITEPRESS. Retrieved at https://dokumen.pub/appraisal-and-acquisition-strategies-9780931828003-0931828007.html (accessed on 24. 10. 2022)	The editor is not listed, so this information is not included in the citation. The pages are not listed in the e-proceedings, so this information is not available.	(Huth, 2016)

ARTICLE IN A PRINTED MAGAZINE/JOURNAL/ DAILY NEWSPAPER Surname, first name. (year/date). Article Title: Subtitles. Title of magazine/journal, year (issue), first page of the article - last page of the article.		In the list of sources, the authors, year and title of the article are listed first. Then we state the title of the magazine/journal, the year, the number and the pages, where the article is published. Write down the title and year of the magazine/journal in italics. For the titles of magazines/ journal in English, we capitalize all words except prepositions and conjunctions. This does not apply to titles of books and articles in English. Examples of citing sources for different numbers of authors are explained in the examples for books.	
TYPE OF SOURCE	CITATION IN THE LIST OF SORUCES	EXPLANATION	CITATION IN THE TEXT
Article in printed journal with the year and the number.	Košir, M. (2002). Arhivistika – pot do samostojne znanstvene discipline. Arhivi, 25(1), 295–301.	Write down the title and year of the journal in italics; write the magazine number in brackets.	(Košir, 2002)
Article in printed journal with the year and without the number.	Žontar, J. (1995). Zgodovina arhivistike na Slovenskem. Arhivi, 18. 13–17.	Write down the title and year of the magazine in italics.	(Žontar, 1995)
Article in printed journal without the year and without the number	Eastwood, T. (2002). Reflections on the Goal of Archival Appraisal in Democratic Societies. Archivaria (54), 59–71.	Write the title of the magazine in italics; write the magazine number in brackets.	(Eastwood, 2002)
Article in daily newspaper	Petrovec, D. (16. 1. 2017). Vrhunska znanost in črn otrok. Dnevnik, 67(12), 14.	In the list of sources, we indicate the exact date of the article; when quoting in the text, we mention only the year	(Petrovec, 2017)
An article in a daily newspaper without an author	Pomisleki glede prodaje NLB. (30. 3. 2017). Dnevnik, 67(74), 3.	In the list of sources, we indicate the exact date of the article; when citing in the text, only the year is mentioned. In the text, we quote the first few words of the citation in the list of sources (usually the beginning of title or full title). When quoting in the text, write the title or the beginning of the title in quotation marks.	(»Pomisleki glede prodaje NLB«, 2017)

ARTICLE IN THE ELECTRONIC VERSION OF THE JOURNAL/DAILY NEWSPAPER Surname, first name. (year/date). Article Title: Subtitles. Title of journal/daily newspaper, year (issue), first page of the article - last page of the article. Retrieved at http://xxxxxxxxxxxx (accessed on date of access). Surname, first name. (year/date). Article Title: Subtitle. Title of magazine/magazine, year (issue), first page of the article - last page of the article. doi:xxxxxx/xxxxxxxxxxxx (accessed on date of access).		We cite them in the same way as articles in printed journals, except that we add a web link or a doi tag after the bibliographic data. The web link and the doi (Digital Object Identifier) must be written in bold, not underlined. Examples of citing sources for different numbers of authors are explained in the examples for books..	
TYPE OF SOURCE	CITATION IN THE LIST OF SORUCES	EXPLANATION	CITATION IN THE TEXT
Article in the electronic version of the journal	Duranti, L. (2010). Concepts and principles for the management of electronic records, or records management theory is archival diplomatics. Records Management Journal, 20(1), 78–95. Retrieved at: http://dx.doi.org/10.1108/09565691 011039852 (accessed on 13. August 2022).	For bibliographic data and phrase „Retrieved at“ we add a web link. The link must be written in black font and not underlined. Follow the access date in parentheses for the link. Write the title of the magazine in italics.	(Duranti, 2010)
Article in the electronic version of the journal with DOI	Flynn, S. J. (2001). The Records Continuum Model in Context and its Implications for Archival Practice. Journal of the Society of Arhivists, 22(1), 79–93. Retrieved at: https://doi.org/10.1080/00379801 20037522 (accessed on 31 July 2022).	After the bibliographic data, we add „doi:“ and the appropriate label. (doi – Digital Object Identifier) Write the title of the magazine in italics.	(Flyn, 2001)
Article in the electronic daily newspaper	Suhodolčan, B. (8. 3. 2023). (Pismo Bralca) Sončne elektrarne in cena električne energije. Večer. Retrieved at https://vecer.com/pogledi/pismo-bralca-soncne-elektrarne-in-cena-elektricne-energije-10328522 (accessed on 10. 3. 2023).	In the list of sources, we indicate the exact date of the article; when citing in the text, only the year. Write the address of the online newspaper in italics	(Suhodolčan, 2023)
Article on the online information portal	Širok, M. (6. 3. 2023). EU odločanje o prepovedi prodaje vozil z motorji na notranje izgorevanje preložil na nedoločen čas. MMC RTV Slovenija. Retrieved at https://www.rtvslo.si/evropska-unija/eu-odlocanje-o-prepovedi-prodaje-vozil-z-motorji-na-notranje-zgorevanje-prelozil-na-nedolocen-cas/660104 (accessed on 8.3.2023).	In the list of sources, we indicate the exact date of the article; when citing in the text, only the year is mentioned. We write the address of the information portal in italics, which we state as it is written on the website - do not copy the start of an online connection.	(Širok, 2023)
Article on the online information portal, author indicated by abbreviation	B. V. in K. S. (8. 3. 2023). ZN: Afganistanke najbolj zatirane ženske na svetu. MMC RTV Slovenija. Retrieved at https://www.rtvslo.si/svet/zn-afganistanke-najbolj-zatirane-zenske-na-svetu/660403 (accessed on 9. 3. 2023).	The abbreviation given as the author, is listed and cited in the order in which it is written with the article. In the list of sources, we indicate the exact date of the article; when quoting in the text, we mention only the year.	(B. V. in K. S., 2023)

Password in the dictionary, encyclopaedia on the website	Institut za slovenski jezik ZRC SAZU [Fran]. (2022a). Hibrid. Retrieved at: https://fran.si/iskanje?View=1&Query=hibrid (dostop 20. 1. 2022). Institut za slovenski jezik ZRC SAZU [Fran]. (2022b). Teorija. Retrieved at: https://fran.si/iskanje?FilteredDictionaryIds=130&View=1&Query=teorija (accessed on 3. 9. 2022).	When citing entries from dictionaries or encyclopaedias, we use the institution that published the dictionary/encyclopaedia as the author, and indicate the year in parentheses. For Internet resources, we use the year of the last website update. If we have several passwords and the same year, separate them with a, b, c. We write the title of the password in italics.	(Fran, 2022a) (Fran, 2022b)

OFFICIAL AND OTHER SOURCES			
TYPE OF SOURCE	CITATION IN THE LIST OF SORUCES	EXPLANATION	CITATION IN THE TEXT
Law/Act official publication in the Official Gazette of the Republic of Slovenia	Zakon o varstvu dokumentarnega in arhivskega gradiva ter arhivih (ZVDAGA). (2006, 2014). Uradni list RS, (30/06, 51/14).	In the list of sources used, we indicate the original law with all amendments (year and number of the published amendment). When quoting in the text, we write only the year of the original law/act. If we quote the law/act in the text several times, we can also decide to use an abbreviation. Write „Uradni list RS“ (“Official Gazette of RS”) in italics.	(ZVDAGA, 2006)
Law/Act official publication in the Official Gazette of the Republic of Slovenia with officially revised text and changes	Kazenski zakonik (KZ-1-UPB2). (2012, 2015, 2016). Uradni list RS, (50/12, 54/15, 6/16, 38/16).	In the list of sources used, we indicate the year and number of the publication of the officially revised text and all changes published after this publication (year and number of the published change). When quoting in the text, we write only the year of the officially revised text. If we quote the law/act in the text several times, we can also decide to use an abbreviation. Write „Uradni list RS““(“Official Gazette of RS”) in italics.	(KZ-1-UPB2, 2012)
Amendments and additions to the law/act official publication in the Official Gazette of the Republic of Slovenia	Zakon o spremembah in dopolnitvah Zakona o varstvu dokumentarnega in arhivskega gradiva ter arhivih (ZVDAGA--A). (2014). Uradni list RS, št. 51/14.	If we want to note in the text when exactly a certain change in the law/act was adopted (e.g. amendment of one of the articles), we must quote and cite exactly this amendment to the law/act.	(ZVDAGA-A, 2014)
Law in book form usually with commentary by the group of authors	Pirc Musar, N., Bien, S., Bogataj, J., Prelesnik, M. in Žaucer, A. (2006). Zakon o varstvu osebnih podatkov (ZVOP-1): S komentarjem (with commentary). Ljubljana: GV založba.	We cite the law/act in book form only if we cite a published commentary in the text.	(Pirc Musar et al., 2006)
Court decision/ sentence	Ustavno sodišče RS. (2014). Odločba št. U-I-70/12 z dne 21. 3. 2014. (The Constitutional Court of the Republic of Slovenia. (2014). Decision no. U-I-70/12 of 21 March 2014.)	When citing a decision/sentence of the court in the list of sources, it is not written in italics texts.	(Ustavno sodišče RS, 2014) (Constitutional court of RS, 2014)
Standard	International Organization for Standardization (ISO). 2016. ISO 15489-1:2016: Information and Documentation - Records Management. Part 1: Concepts and Principles.		(ISO 15489-1:2016)

OTHER ELECTRONIC PUBLICATIONS		When stating the year or the date of the source in parentheses, we never state the date of accessing the source from the Internet, but the information about the publication of the source or its last change. If this information is not available, instead of the year we write the abbreviation „n.d.“, which means „no date“, in brackets.	
TYPE OF SOURCE	CITATION IN THE LIST OF SORUCES	EXPLANATION	CITATION IN THE TEXT
Website/subpage of the organization without year or date of publication	Government of the Netherlands (s. d.). About the government. Retrieved at https://www.government.nl/government/about-the-government (accessed on 5. 1. 2023).	If it is information about an organization or its work, the author can be the organization itself. If there is no information about the year of publication or the last change of the website, we use the abbreviation “n. d.”. The title on the website is written in italics.	(Government of the Netherlands, n. d.)
Website/subpage of the organization with the year of publication indicated	Vrhovno sodišče Republike Slovenije [VS RS]. (2020). Pravilnik o hrambi spisov in drugega dokumentarnega gradiva. Retrieved at https://www.sodisce.si/mma_bin.php?static_id=2020110511401387 (accessed on 5. 3. 2021).	If it is information about an organization or its work, the author can be the organization itself. In parentheses, we indicate the year of the last modification of the website, which is indicated at the bottom of the page. Write down the online title in italics. If the name of the organization is long and the source is cited several times in the text, an abbreviation can be introduced in the first citation, which is then used in all subsequent citations. The abbreviation must also be given next to the name of the organization in the list of used resources.	(VS RS, 2020)
Website/subpage of the organization with the indicated publication date	Ministrstvo za kulturo. (7. 3. 2023). Kultura za prihodnost: serija posvetov o viziji kulturne politike. Retrieved at https://www.gov.si/novice/2023-03-07-kultura-za-prihodnost-serija-posvetov-o-viziji-kulturne-politike/ (accessed on 9. 3. 2023).	If it is information about an organization or its work, the author can be the organization itself. In the list of sources, we indicate the exact date of publication; when citing in the text, only the year is mentioned. Write down the online title in italics.	(Ministrstvo za kulturo, 2023)
Online video (such as. YouTube)	International Council on Archives [ICA]. (1. 3. 2022). Artificial Intelligence in Archival Appraisal & Selection Webinar - Day 2 [Video]. Retrieved at https://www.youtube.com/watch?v=VO-AiLS3CQ_k (accessed on 15. 5. 2022).	We add an explanation of what kind of source it is in square brackets after the title. In the list of sources, we indicate the exact date of the publication; when citing in the text, only the year is mentioned.	(ICA, 2022)
Online presentation	Duranti, L. (5. 10. 2015). Archival Diplomatics of Digital Records [Presentation]. Retrieved at http://www.interpares.org/display_file.cfm?doc=ip1-2_canada_dissemination_ls_duranti_um_2010.pdf (accessed on 9. 6. 2021).	In square brackets after the title, we add an explanation of what kind of source it is. In the list of sources, we indicate the exact date of publication; when citing in the text, only the year is mentioned.	(Duranti, 2015)

ARCHIVAL MATERIALS Title of the document. (time of creation of the document). signature and fund or collection, technical unit number, name of institution or archive.			
TYPE OF SOURCE	CITATION IN THE LIST OF SORUCES	EXPLANATION	CITATION IN THE TEXT
Archival material in physical form	Poročilo o sodni stavki. (15. 3. 1923). SI_ZAC/0609 Okrožno sodišče Celje, a. š. 15. Zgodovinski arhiv Celje.	In the list of sources, we indicate the exact date of publication; when citing in the text, only the year is mentioned	(Poročilo o sodni stavki, 1923)
Archive material in digital format (or available in digital format)	Poročilo o sodni stavki. (15. 3. 1923). SI_ZAC/0609 Okrožno sodišče Celje, a. š. 15, Zgodovinski arhiv Celje. Retrieved at https://vac.sjas.gov.si (accessed on 15. 2. 2023).	In the list of sources, we indicate the exact date of the publication; when citing in the text, only the year is mentioned	(Poročilo o sodni stavki, 1923)

IIAS since 1985

"Archivistica amor noster, semper et in aeternum"