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Flavio Carbone[1]
(Italy)

TEACHING ARCHIVAL SCIENCE TO ARMED FORCES: IS IT A MISSION IMPOSSIBLE?[2]

ABSTRACT

The paper focuses on the need to develop some theoretical and practical courses for military and civilian personnel deployed in military historical archives, with special attention to those under the Defence Ministry responsibility. The case-studies are the two courses organised in 2016 and 2017 by the Carabinieri Historical Office that made them available to people outside the military environment. The courses were a great success and gave rise to a small network of people interested in gaining specific archival knowledge. The organizers thus reached the goal of spreading archival proficiency.

Key words: *Carabinieri historical office; military archives; teaching activities; ministry of Defence; specialised training; historical archives.*

1   INTRODUCTION

The paper reflects on the personal experience gained during the time at the Carabinieri Historical Office over the period of 10 years, when in the capacity of a Historical Archives branch chief. The Office planned and executed two courses (in 2016 and 2017) on military archives; initially with the aim to improve the personnel's insights in the Italian Defence Ministry's operational area. A short summary was presented during the 27th International Archival Day conference in Trieste on 16th and 17th October 2017 (Carbone & Nemore, 2017).

Some proposals and conclusions will be given at the end of this paper.

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1   Lieutenant Colonel, FLAVIO CARBONE Ph.D., Comando Generale dell'Arma dei Carabinieri. Contact email: dottor.flavio.carbone@hotmail.com
Ph.D. Flavio CARBONE, born in Naples in 1968, attended the 197th course "Grifo" of the Military School "Nunziatella" in Naples beginning his military career. After the military academy training, he started the professional life as Carabinieri Officer. Laurea in Law and in Political Sciences, he is a Ph.D. in contemporary history by Rome University "La Sapienza". He obtained also the diploma v.o. as "Archivista-paleografo" in the Scuola Speciale Archivisti Bibliotecari and then a Ph.D. in archival sciences in the same university. From 2008 he is in charge of the Historical Archive of the Carabinieri inside the Historical Office of the Carabinieri General Headquarters. Since 2009 he is a member of the Committee of Military Archives inside the International Commission of Military History in which he is secretary general.

2   This paper reflects the personal experience held in 2016 and 2017 when, as Historical Archives branch chief within the Carabinieri Historical Office, the author was authorised to plan and execute two courses on military archives.
For the first time a military institution (Carabinieri General Headquarters) took the lead to spread and give some basic knowledge on archival science in the military environment. Second, the experience of the first course helped to build a new course opened to scholars, researchers and civil society interested in understanding the world of military archives. Third, one of the ideas behind the project was to build up a community around those archives less known and developed than others. The presentation focuses the attention on the project and on the results of those two courses which have been held with difference audiences.

2 THE ARMED FORCES AND THEIR ARCHIVES: THE SITUATION IN ITALY

The Italian Cultural Heritage Code and the legislation stated that the State Archives are responsible to collect the archival fonds coming from state institutions (article 41). Nevertheless, many public institutions have the right to maintain their own historical archives. Among the exceptions it is important to mention the Foreign Affairs Ministry and some archives under the Defence Ministry (Sandri 1969 and 1970).

Article 41 Para. 6 authorizes the Foreign Affairs Ministry, the Defence General Staff, the Army, Navy, Air Force General Staffs, and the Carabinieri General Headquarters to maintain their own historical archives. There are constitutional entities like the Presidency of the Republic, the two chambers and the constitutional Court who have full autonomy with regard to their archives (art. 42).

There are historical roots (in one case it predates the unification of Italy) to the most recent and solid connection with the laws of the Italian Republic (Carbone 2009). So those military institutions are authorized to collect and store historical archives (here, however, I will not speak about the non-current documentation regarding archival fonds transfer).

In different periods of their history, each General Staff and Carabinieri General Headquarters established special bureaus to promote the history of each armed force, to collect the documents as well as to select the archival fonds potentially useful for researchers of the military history (so called *histoire bataille*) and especially military operations where Italians were present (*inter alia* Sargeri 2006, Graziani 2006, Rossi 2006, Carbone 2006).

Before 1990 it was really difficult for a researcher to enter a military archive. The Carabinieri historical archives seemed to be quite secret (Pavone 1970). The situation changed a lot during the 90's when the Armed Forces decided to open the doors to different scholars and researchers (about Carabinieri Ricotti, 1993; in general, Carucci 1998)). From a research perspective, the archival fonds and documents have been relevant for different reasons (i.e., to study history of architecture, naval and aerial constructions, genealogy, et cetera) which offered new possibilities to historians and citizens alike to advance their studies.

For a long time, those archives (I am specifically talking about the last four institutions) have had some personnel with archival expertise, but this was the exception rather than the rule (Lodolini, 2006).

3 ARCHIVAL SCIENCES AND SOLDIERS: TOO FAR - TOO TECHNICAL?

Monitoring the Armed Forces Historical Offices (and their archives) since 2001, it was possible to verify that only one or two people in each office had an educational background in archival studies (Carbone 2012). The remaining personnel in those environments struggled to support the activities of their institutions and to conform to the requests of the researchers since they lacked sufficient knowledge (Lodolini 2012); the situation was completely different in the State archives where, in the past, the qualified personnel were more than enough proficient to guarantee all the activities connected with those cultural institutions (Fioravanti 2004).

There was (and there is) no request for specific expertise to bid those positions in the military archives. The main difficulties were strictly connected with the limitations posed by the selection of the personnel, who had no specific capabilities to fill the gap and to work efficiently to provide support to the external researchers. There was another limitation: the institutions didn't seem interested in giving specific and qualified

job descriptions. So, for most of the people working there, unfortunately, it was nearly impossible to fulfill all the requests coming from other institutions or citizens, especially because they had no proper training. This situation had an adverse impact on the full availability of the fonds because the selected personnel was not able to deal with all the researchers' requests. But this situation also points at the protection of individual rights, the safeguard of the cultural heritage, and the great problem of the relationship between the government official and the scholars (Giannetto 2004) as well as the collective and community memories (Vitale 2004).

Since 2008, the Carabinieri Historical Office has had a qualified archivist in its archival branch with the aim to promote limited actions trying to move other military archives to act together and launch common initiatives in the archival sciences' field, some of which failed. On the other hand, it was possible to get those archives involved in some initiatives with the full support of the Archival Science Chair at the Sapienza University (thanks to Professor Gianni Paoloni and his assistant Francesca Nemore). So, a series of three seminars have been organised on the topics of military archives (La pubblicistica in materia di archivistica militare: storia, attualità, prospettive on 16 June 2009; 2009-1999-1969 versamenti e acquisizione di documentazione negli istituti di conservazione delle forze armate, on 16 Novembre 2009; Memoria personale e tradizioni militari, on 24 June 2010). This proposal received a lot of attention among the students and scholars as well as military archives personnel.

Finally, it was possible to edit a revised collection of the speakers' notes used during the seminars, later published as "Archivistica Militare – Temi e problemi" (Rizzi et alia, 2012). In 2013, the book presentation was organised together with the 90th birthday celebration of Professor Lodolini at the University of Rome, on 27 June 2013. The results were really interesting; the audience gave special attention to military archives problems and some potential solutions popped-up. At that time, I was really surprised to see so much interest coming from so many colleagues, including officers of the armed forces and archivists. In what followed, new opportunities seemed to be very close to realisation on the military side, but then the economic crisis blocked many of the efforts. It was necessary to wait for another moment. *Inter alia*, in 2013, the Defence General Staff Historical Office published one repertory that focused on Carabinieri officers (1814-1871) (Carbone, 2013). It was a sort of test. Starting with these two books, a new project was launched establishing the editorial series "Istituzioni e fonti militari". The aim of the series is to show and to promote the work done in the military archives which includes publication of archival guides, archival inventories, books on the history of military institution or military archives' history and all related fields. New opportunities came in order to reinforce the communication of the archives and to promote military archives in the archival science community. The first volume of the series has been dedicated to the Army archives history (Trani, 2013). At this stage, 7 books (Gionfrida, 2014; Lazzerini, Precone, Venerosi Pesciolini 2016; Carbone, 2017; Greco, 2017; Trani, 2018; Crescenzi, 2019) have been published plus the first two in 2012 and 2013.

Those first steps highlighted the need to connect military archives and university institutions in order to find common solutions that will be of benefits to the military personnel, scholars and particularly to the students of selected courses held in Sapienza University (Carbone 2017).

4 THE FIRST COURSE ON MILITARY HISTORICAL ARCHIVES: A MILESTONE

Considering the efforts done by 2016, it was necessary to push the military institutions to fill the gap in the basic needs of the internal personnel through providing them with specialised and dedicated training in order to fix some of the common lines to manage historical archives.

Initially, the idea was to propose this training initiative to another military office, but it was not possible. So, the Carabinieri Historical Office decided to act autonomously and to set up the first class on the military historical archives.

The first focus was on the audience. Who should be the "students"? Basically, the audience would have been made up of military and civilian personnel serving in military offices. The idea behind was to have people interested in advancing in a specific professional field. Meanwhile, in those years, it was possible to build a network in order to reinforce future initiatives. In the summer 2016, it was decided to organise an intensive one-week course in November. There was enough time to do the course engaging people with different profiles. The course was divided in four modules according to the major goal and with the help of university professors and researchers: Archival Sciences, Archives Legislation, Military Historical Archives, and Carabinieri Historical Archives, with the total amount of 36 training hours.

Because of the need to train Carabinieri personnel, the course was designed to focus on the Carabinieri Historical Office and on the Carabinieri Historical Museum.

The idea was to give an overview, a sort of "flavour", of the archival organisation in Italy, and then to move to the real basic information on the archival science environment, putting above all the legislation in the field of archives to gain real understanding of the legal framework. Another two different modules were depicted to show the common bases and the main difference between the most important and organised military archives and a few others with a special focus on the Carabinieri historical archives. With this framework, the needs to guarantee minimal university standards and practical workshop sessions during the course had been agreed on and discussed with many attending lecturers. So, professors and researchers from the university Sapienza and from other universities presented a number of academic topics, while others were managed by different scholars or officers of Armed Forces; the workshops, however, were co-shared.

At the end of this course, and after the positive evaluation received from both the students and the teachers, that gave a balanced amount of scientific, specialised and military matters as well as thoughtfully created workshops, it was approved to make additions to the military and civilian personnel within the military archives.

That was the first time that a military organisation of the Defence Ministry was able to plan, organise and execute a training activity to teach some basic rules in the archival fields. This experience was very important for the trainees because they were given knowledge that equipped them with some key tools to improve their dealing with citizens and researchers who work regularly in the reading rooms of the military archives. During that week, the audience received a full immersion in archival science. Another interesting point of the course was to highlight different procedures used in the armed forces and the various results in the archival fonds and repositories. Finally, theoretical lessons were done together with a hands-on-session. The aim was to give the trainees some basic practical experience in the field.

At the end, five military personnel from the Carabinieri Historical Office attended the course, three from the Carabinieri Historical Museum, one from the Air Force Historical Museum, one from the Air Force Historical Office, and one from the Defence Staff Historical Office.

5   THE SECOND COURSE ON MILITARY HISTORICAL ARCHIVES: A NEW CHALLENGE

In 2017, among other projects and new opportunities, a new course was planned.

The level of ambition rose a little bit. The idea was still to expand the knowledge of the personnel who was in charge at the Carabinieri Historical Office and at the Historical MUSEUM, but we decided to be more open to other military entities and to the civilian sphere. Eight places were reserved for Carabinieri (four places for the Office and four for the Museum) and ten for military personnel (Army General Staff, Navy General Staff, Air Force General Staff and Defence General Staff, the Military Ordinariate for Italy and the Commissioner for honours to the fallen). The course was open to the audience of twelve external trainees with a bachelor's degree or university students in similar areas. At the end of the selection process, 27 (eight Carabinieri, eight from other military entities, eleven civilians) people attended and finished the course, passing the final exam.

The idea was to propose a training path to provide the theoretical and practical bases in order to work at a historical office or museum in the Armed Forces, where they collect and transfer archival fonds or documents. The training periods increased from 36 of the first course to 61 (and more) of the second one, thus reinforcing the cultural heritage workshops. The entire activity lasted 10 days with full lessons; 54 training hours were dedicated to standard lessons, 6 to workshops and 1 to the final exam.

In this regard, there was the opportunity to invite new speakers and to involve other institutions in the experience. At the end we achieved good results that assured us of how successful we were in overcoming challenges and building new relationships with other institutions and with trainees.

For instance, Professor Letizia Cortini presented the audio-visual heritage; a Carabinieri psychologist spoke about the relationship with researchers from a psychological point of view; Simona Greco, now administrator in the Central State Archive, presented the Forestry Administration archives, etc. To sum up, different speakers were recruited for different topics. Their common goal was to give a comprehensive overview of the majority of archives and of military historical archives institutions, and to present the audience with an understanding of the different stories and procedures involved in collecting and storing historical archival fonds.

Speaking from my experience as the course director, we collected many suggestions from the new audience and took into account their needs by adding a few fresh extra curricula activities to the course programme. At the end, the training hours increased from 61 to 66 including two visits (in the Carabinieri historical office repository and at the Carabinieri historical museum with a special attention to the documents and files stored) and one presentation offered by the Carabinieri Cultural Heritage Protection Unit, a specialised entity within the Carabinieri Corps able to fight the cultural heritage thefts and burglaries.

6   WHAT COMES FROM THE EXPERIENCE?

The outcomes of the quality evaluations coming both from the first and second course were really satisfactory. As I just mentioned, the second course had been adapted to the trainees' requests, with suggestions and proposals coming from the speakers and the attendees of the first course. The second course gave us more feedback because the audience was different and the teachers were new. From the perspective of the Carabinieri Historical Office, the inclusive approach achieved better results than the exclusive one. More people and institutions were involved.

Two weeks of training (with a full day engagement) represents a feasible solution in exploring specific fields.

A flexible program with different actors (some internal and external ones) helped a lot to give a different perspective on the difficulties and to understand the position of the researchers, scholars or even of the people interested in genealogical studies.

Again, one of the key elements for the success of those courses was to assure the right balance between university knowledge and military or internal experience.

After the second course, further steps were approved, but in 2018 it was not possible to launch a new initiative in this field. I expect to see new training activities in the future, although it is not possible to predict when.

Again, the two courses started building a new community of interest, which is also a reliable network for future common projects.

Finally, it is important to consider the challenge for the new generations of archivists. Military archives are small in dimension compared with a State archives repository. This represents a limitation in regard to the documents but it is, at the same time, an opportunity because it is possible to organize specialised workshops, round tables and seminars on the military documents and on the military archival fonds there. This is a very important point; often there is a lack of information about those archives, the archival fonds within and the type of documents that are stored in their repository. The two courses created the right environment to spread the information to external researchers and to offer new skills to archivists; knowledge that they had not obtained from their university courses.

In this sense, the experience was very welcome for the external students, especially for those who had finished their academic curricula recently. The small dimension of the class, the possibility to split the students in small groups, and to organise practically oriented activities, gave the opportunity to put in practice what they had studied in the academia, giving them the real dimension of the job and of what they should do in the future (Valacchi 2006). Furthermore, the hosting institution (Carabinieri Historical Office) is relatively small but the students were given an experience really close to the daily business and activities in that cultural environment. Finally, all the trainees welcomed and greatly appreciated the workshops, giving them the practical tools to solve everyday problems in an historical archive.

7 SOME PROPOSALS AND CONCLUSIONS

The experience of organizing special training courses was really satisfactory for the trainers and the trainees. The common experience opened the eyes of the military personnel for the archival science discipline and increased the positive stance towards the researchers. Their experience was very rich for many reasons: firstly, the possibility to manage a training activity is really enriching; secondly, we were able to spread the common understanding of the importance to study and develop the needs to know more and more in archival science; thirdly, it was a unique opportunity to share with the external actors (university professors, students, freelances specialists in cultural heritage field, archives' responsible personnel) our idea on the transformation of the historical archives in the military field.

So now, we can answer to the question from the beginning: Teaching archival science to Armed Forces: is it a mission impossible?

Teaching archival science to Armed Forces is not impossible. Honestly, it is not as difficult as someone could imagine. The perspective from bottom-up is less effective but the results were more than satisfactory. All the military and civilian personnel, who attended the course and was on duty in the military archives or museums, showed a real and concrete interest in the topics discussed during the lessons and they appreciated a lot the effort to insert some practical activities. The results of the efforts in that initiative should continue to build a community of interest and a new group of people within the military historical archives awareness of the importance of the archival science and of the need to support the researchers in their endeavours.

Those two courses represent a valuable experience for the youngest generations of archivists. First, it is important to keep in mind the richness of the cultural heritage in general and of the archives in specific. In this regard, there is a need for the well-trained archivists in small environments like the military archives, and the role they play should be more important than in the past. Second point is connected with the history of the military institutions; if there is no knowledge of their history, any restoration attempt of the original order can fail. The third point is the benefits in the long term activities; young archivists can get a real daily life experience by focusing on the most common problems that can be seen in the archives. The small dimension of the military archives is an incredible opportunity to develop their practical skills and to give them the framework to become archivists from the operational point.

In conclusion, it is important to remember: the real owners of the archives are not the institutions, housing those archives, but the people. In this sense, the State has the moral and legal obligation to protect the history of its community and to guarantee full access to the fundamental rights.

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ARCHIVES AND ARCHIVISTS IN DIGITAL AGE: THE IMPACT OF DIGITIZATION ON THE HABITS OF ARCHIVAL WORKERS - THE CASE OF PICTURE POSTCARDS Aleksander Lavrenčič

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Aleksander Lavrenčič[1]
(Slovenia)

ARCHIVES AND ARCHIVISTS IN DIGITAL AGE: THE IMPACT OF DIGITIZATION ON THE HABITS OF ARCHIVAL WORKERS - THE CASE OF PICTURE POSTCARDS

ABSTRACT

Purpose: The purpose of this paper is to present findings of the research on changes in the habits of workers, who are employed in the archives.

Methods/approach: We checked if the archivists still send picture postcards from conferences and other meetings, and if they still archive the postcards. We tried to establish the numerical ratio between archived picture postcards and digital photos. We designed a questionnaire that was sent to various addresses.

Results: The review of the responses completed by respondents showed that the number of sent postcards will decrease slightly in the future, while the sending of digital photos and digital posts on social networks will increase.

Conclusions/findings: Changing habits should encourage archivists to change the practise of archiving collections and pay more attention to modern technology. At the same time, employees in the archives should still be the ones to keep the tradition of sending picture postcards, because they are bound by the obligation to protect cultural heritage, which includes raising people's awareness of maintaining habits as the preservation of intangible culture heritage.

Key Words: picture postcards, archives, picture postcard's collections, social networks, archival science and future

1 INTRODUCTION

This research was conducted to examine how digitization affects changes in the habits of archivists. We checked if participants of conferences and other meetings still send postcards. The questionnaires were sent to the addresses of the participants of the International Archives Day, organized by the International Institute of Archival Sciences that took place at the end of October 2019 in Koper. At last year's conference, we discussed the impact of social change on archives, including the impact of digitisation, while the conference in 2020 is focused on the topic »archives and digitization«. We are often unaware ourselves when we discuss the archives and digitization. It seems that we do not always recognize that we, archivists and other workers in the archives, are an important part of the archives, too. We could even say that we come second, right

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1   Aleksander Lavrenčič, archival councillor, Student, Alma Mater Europaea, Evropski center Maribor, Slovenska ulica 17, 2000 Maribor, librarian researcher, TV Archives, RTV Slovenija, Kolodvorska 2, 1550 Ljubljana, Slovenija, aleksander.lavrencic@rtvslo.si
    Aleksander Lavrenčič, historian and archivist, graduated in 1996 on Faculty of Arts, Ljubljana, and at Alma Mater Europaea – EC Maribor master's program Archives and records management in 2018. Employed as archivist in The Archives and Museum of the University of Ljubljana (1997). Since 1999 librarian in The Archives of Television Slovenia, since 2003 until 2012 Head of TV archives, since 2012 librarian researcher, works at the project EUscreen which aims to promote the use of television content to explore Europe's rich and diverse cultural history. Member of Slovene Association T. G. Masaryk for philosophical anthropology, ethics and for humanistic and social studies. Student of Archival Science Doctoral Program at Alma Mater Europaea – ECM.

after the archival materials. The research subject is seemingly straightforward, but it is, in fact, very important, as the research unveiled how changes in the age, that we call digital (and we are only at the beginning of this era) influences our habits. We began writing the article in one of the most critical periods of modern history - at the time of coronavirus pandemic.

The subject of our research seems very simple. We have explored a completely common practice that we all know well: we choose a postcard, pay for it, write an address on it, write down the text, sign it, ask our family members or friends to add their signatures or maybe a drawing, buy postage stamps, find a mailbox and, finally, throw the postcard in the mailbox slot. The postman then delivers the postcard to the addressee's home, the addressee reads it, cheers it and puts it away on a shelf or in a drawer. Some people collect postcards, others collect stamps, and still others stick postcards on the pieces of kitchen furniture. But each postcard has its own story, and we can find many of these in the postcard's collections. Different sciences treat postcards differently: art history, history, anthropology, literary sciences; the list goes on to military sciences, logistics and futuristic, library sciences, museology and archival studies, etc. (Millman, 2013). All these sciences have different views on postcards (Ferguson, 2006), postcards can be used even as a key sources in historical research on health care in the early 1900s (Hook, 2005, 386). And, finally, the most interesting question to librarians, museologists and archivists alike, is the eternal question of where to place postcards: do they belong to archives or museums, or perhaps to libraries (Radovanovič, 2002; Semlič & Šauperl, 2013). From the point of view of the archivists, we are not interested in what happened on a holiday, but sometimes we can be a little curious. We are interested in the story of how this postcard found its way into the archive. We can imagine one of millions of postcards preserved in public archives or in the archives of a private collector. Our research was not concerned with the most famous collections and the oldest collections, nor with the collectors. We tackled the question of whether the habit of sending postcards in their current form will survive at all.

But before we describe the results of the survey, we must clarify that most archives do keep postcard's collections (Semlič & Šauperl, 2013). These collections in Slovenian archives have already been partly digitized. The archives of Television Slovenia, public television service, keeps a special collection of postcards and photographs of different towns and places (Udovič & Omladič, 1988). Interestingly, there are many private postcards that were sent by co-workers from vacations or private and business trips and are preserved in the collection. These postcards were classified in the archive under the classification code of panoramas and they have been used as material for television news in the announcements of articles or as pictorial materials in broadcasts.

2 RESEARCH QUESTIONS

The idea of the subject for this research was born at the end of last year's conference of International Institute of Archival Science in Koper (2019), when we were informed about the topics of lectures for next year (2020), and when the conference participants went to buy postcards in the shop. We therefore became interested in the future destiny of buying and sending postcards, and what changes may be expected in the archives regarding the storage of interpersonal communication documents. In the survey, we asked archive workers for their opinion on how the habit of sending postcards will be maintained or changed in the digital age and how these changes will affect archival work.

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We stated the following hypotheses:

1. In the future, people will send fewer postcards;

2. Classic postcards will be replaced by digital photos;

3. The archives are ready for the changes that lie ahead.

We designed the questions in a way that, with the help of the answers, we would be able to monitor changes in the people's habits at different times and on different occasions, including the occasions when the archivists would send postcards from archival conferences and other meetings.

We asked the archival workers the folowing questions:

Do you send picture postcards?

Did you send picture postcards in these time periods? (until 1994, from 1995 to 2000, from 2001 to 2005, from 2006 to 2010, from 2011 to 2015, from 2016 to 2020)

Do you send digital photos to relatives, acquaintances, friends and co-workers?

Do you post digital photos on social media?

What problems do you encounter when you buy postcards?

Do you have a collection of postcards in your institution (archive, museum, library)?

Do you archive materials from social media?

Do you archive amateur digital photos (such as those taken by yourself or your co-workers - if they are not professional photographers)?

Do you think people will still send postcards in the future?

We ended the questionnaire with an optional question in which respondents were able to give an opinion on postcards (whether they like them, whether they are attracted to their visual image, if they currently collect them or did collect them in their childhood, how they enjoy receiving postcards in the mailbox, and whether they think that postcards are more genuinely personal and sincere than posts on social media).

We used "One Click Survey" online tool to create a survey questionnaire and process questions to different addresses. E-mail addresses were obtained from participants at various international conferences (International Archives Day in Trieste, Conference on Technical and Content Problems of Contemporary Archival Science in Radenci, Archival Practice in Tuzla, FIAT / IFTA International Television Archives Conferences and other international meetings), and from the official internet sites of the archives in the Slovenian public archives network. Questionnaires were also sent to students of archival science and documentation and doctoral students of archival sciences at the higher education institution Alma Mater Europaea - European Center Maribor. We have received 62 responses from addressees (approximately half of those addressed in Slovenia) by 17 July 2020.

2.1 Subject of the Research

There were three objects of the research: postcards, sending postcards, and their fate in the near and distant future. In the short presentation of the history of sending postcards, we will summarize only findings of Primož Premzl, and briefly present how the first customers sent postcards in the 19th century. At this point we also need to admit that we failed to find the quoted book describing the enthusiasm of German tourists for postcards at the end of the 19th century. According to the position of the book on the library shelves, we were convinced that it was the work of the English writer Jerome Klapka Jerome, but we could not find these excerpts in any of the studied works. We urge read-

ers to tolerate the weakness of our photographic memory, at least under conditions that prevailed in the Slovenian libraries during the first wave of coronavirus epidemic.[2]

The beginnings of the increasing use of postcards in the last quarter of the 19th century were associated with progress in many other fields and industries. In his book "*Pošta na slovenskih tleh*", Primož Premzl drew attention to the improvement of the situation for postal services, advances in printing technology, and the development of photography and tourism (Premzl, 1997, 381).

Premzl (1997, 381) mentioned Prussian printed postcards from 1869 as the first post-cards, while Sandra Ferguson mentioned these postcards as Austrian (Ferguson, 2006, 168). On the online encyclopaedia (https://sl.wikipedia.org/wiki/Razglednica) we found that the oldest postcard originated in England with the motif of the post office. Immediately after that Wikipedia mentions a French postcard with a motif of weapons from the Franco-Prussian War. The authors of this record should certainly be reminded of the error in the signed photographs, as the French postcard (the motif of the weapon and the inscription) is more than obviously shown as English. The other mistake from Wikipedia site is that Slovenian postcard from the series of plebiscite postcards is also incorrectly listed as a postcard from the 19th century.[3]

As a precursor to Slovene postcards, Premzl appointed to (1997, 382) Rogaška Slatina card from 1889. The Rogaška Slatina postcard from 1892 is considered to be the first known postcard modelled on the German ones. Most of the oldest preserved Slovene postcards were sent from various health resorts (Premzl, 1997, 382). Premzl pointed out that the decline in the popularity of sending and collecting postcards has already been influenced by technology. This first happened with the development and accessibility of telephone connections after the First World War (Premzl, 1997, 385). He also pointed out that the main credit goes to the collectors for preserving many postcards that are now part of archival or museum collections (Premzl, 1997, 396): *"Old postcards are now part of an invaluable cultural heritage. An important historical source for research in various fields (local, ethnological, national, political, etc.) are the pictorial and also the written part (text)"* (Premzl, 1997, 397). During World war I. were postcards painted by major artists. Motifs and themes were developed to impressive images (Danielson, 2013; Jacob & Van Ells, 2013).

2.2 Research Result

The analysis of the received answers pointed that eight percent of the respondents from the Republic of Slovenia send postcards regularly, 44 percent send postcards from vacations and trips, five percent from business trips and participation in conferences abroad. Just over a third (34 percent) of respondents "don't send postcards at all" (see Chart 1). We also received six responses with additional explanations (ten percent): *"I send something small, once a year from vacation"*, *"from vacation, trips, business trip or when attending a conference"*, *"only occasionally"*, *"increasingly rarely"*, *"Occasionally"*, and *"sometimes, not always"*.

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2 All readers are kindly asked to tell us which humourist perfectly described the 19th century postcard explosion. Memory loss reminds us of the importance of archives as guardians of memory – human memory is fleeting but the archival resources are permanent.

3 The editors of the website should, as soon as possible, correct the misspelled »French-Russian war« in the year 1870 into »French-Prussian war«.

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Graph 1: Do you send postcards?
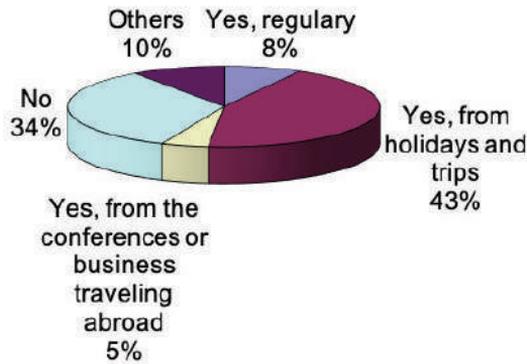
Respondents used to send postcards more frequently in the past (see Graph 2). To the question about sending postcards in different time periods (until 1995, then in the five years 1996-2000, 2001-2005, 2006-2010, 2011-2015 and 2016-2020), we received answers confirming that the habit of sending postcards was slowly disappearing. Until 1995, nine percent of respondents didn't send postcards, but these answers must also take into account those who were still too young during this period, so that the answers from the following years give us a better picture of the decline of postcards:

- by 1995, 91% of respondents sent postcards,
- between 1996 and 2000, 96% of respondents sent postcards,
- between 2001 and 2005, 89% of respondents sent postcards,
- between 2006-2010, 86% of respondents sent postcards,
- between 2011-2015, 70% of respondents sent postcards,
- Between 2016 and 2020, 62% of respondents sent postcards.

Graph 2: Did you send postcards in these time periods?
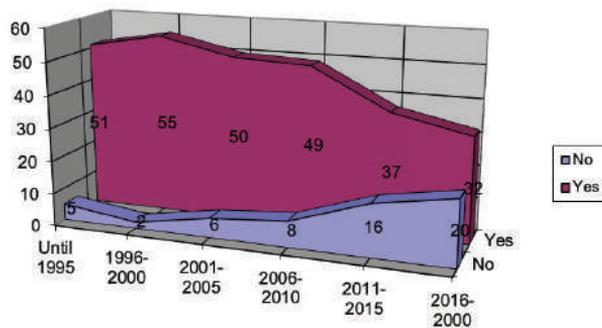
Looking at the graph, we can immediately notice that, in a quarter of the century, the share of those who do not send postcards has risen from four to 38 percent, and the declining trend has risen the most in the last decade. This was checked with the next question to see if we could expect an explicit decline in the number of postcards sent by holidaymakers in the future.

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Almost half of the respondents "used to send picture postcards", but today they "no longer send postcards" (48 percent). Thirteen percent of respondents said that they would send postcards "regularly", and a good quarter (26 percent) said that they would keep sending them for "as long as mail exists". No one circled the answer that they had "never sent" postcards.

Among the answers we received some additional explanations: *"I only send them for holidays", "maybe sometimes more often, but mostly from the (main) holiday once a year", "I send them less and less", "I do when I see a nice postcard, and I will continue sending them"," I do send them once a year "," occasionally "," still occasionally "," I used to send them, not any more today".*

Therefore, we asked the postcard senders what problems they normally encountered when deciding to buy and send postcards (see Graph 3). The first problem turned out to be "finding a shop, kiosk or newsagent with postcards", which was stated by exactly one tenth or ten percent of the respondents. The biggest problem mentioned by as many as half (50 percent) is that the "postcard stores don't sell postage stamps". Nearly a quarter of respondents (23 percent) then found it difficult to trace down a post office where they would sell stamps, and eight percent of them have trouble waiting in long lines at the post office. There are also growing problems with finding mailboxes, which was mentioned by 15 percent of the respondents. At the very end, another problem was set by the very lack of writing pencil when purchasing postcards. Sixteen percent of respondents, who send postcards, did not list any problems; same goes for the 29 percent of people, who do not send postcards. We also received these two additional answers: *"I want to write but sometimes, when it's least necessary, the pencil doesn't work", and "I have a hard time finding the motivation to write."*

Graph 3: I often encounter these problems, when I want to buy postcards:
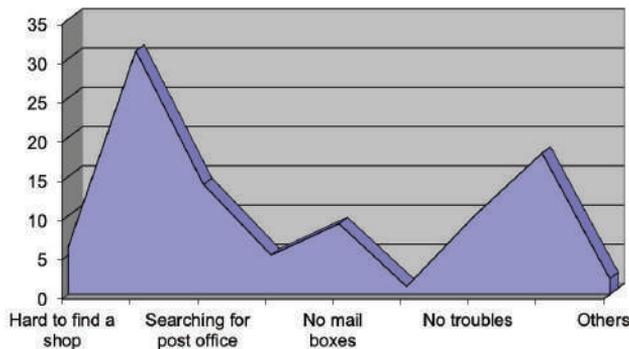
But these little inconveniences are unlikely to displace the long-standing habit of writing postcards. The old habit is more threatened by the change of general lifestyle. These changes are caused by modern technology, in that digitalisation of our everyday habits allows, among other benefits, for an easy and fast sending of messages and photos without the above-mentioned hassles. Therefore, when asked whether they send digital photos to relatives, acquaintances, friends or co-workers, 84 percent of respondents answered in the affirmative (see Chart 4). However, there are fewer people who post photos on social media. So far, this habit still has a ratio of 35 percent in favour of those who post photos, to 65 percent of those who do not post photos on social media. Among those, who post photos on social media, Facebook (30 percent) and Instagram (20 percent) have a convincing lead, followed by links on LinkedIn (8 percent), Pinterest, C and Strava (each network one percent).

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Graph 4: Do you send digital photos?
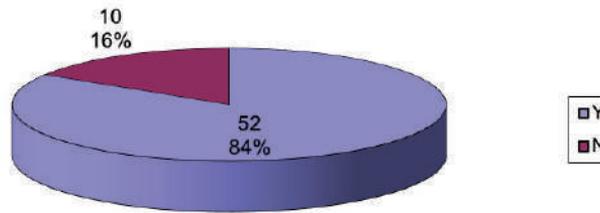
We put the question of whether the institutions (archives, libraries, museums etc.) archive materials from social media and amateur digital photos, and whether the mentioned institutions keep postcards in special collections. Most respondents (69 percent) confirmed that they keep postcards in a special collection, 13 percent said "no", six percent of respondents were "unaware of this", and five percent of respondents were "not employed in an archive, library or museum". There were some other answers too: *"By chance one was preserved", "I keep it in my own archive", "we keep postcards in a photo collection", and "we keep a collection of photos and postcards".* These responses have convinced us that it was perfectly correct to ask the participants in the survey if their institutions do keep amateur photographs in their collections; that is, those photographs taken by themselves or their co-workers (in cases where the latter are not professional photographers). Most respondents (58 percent) confirmed that they did keep such photos, some respondents skipped the question, and some stated that they were "not aware of it because they were already retired", and one participant explained that they "archived them if potentially suitable for a project" (see Graph 5). We can especially thank this last answer in that it confirms that a photograph of a good quality that may be used for viewing at an exhibition, display in an anthology or elsewhere, also meets the criteria for permanent archiving.

Graph 5: Do you archive amateur digital photos?
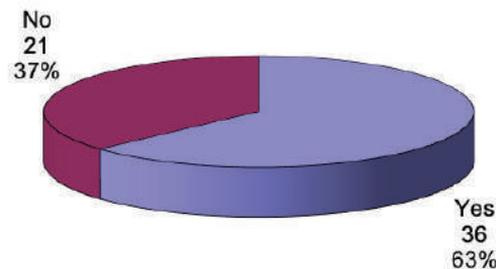
The current situation in archiving materials from social media is worse. Slovenian archives are still late in determining the criteria of archiving social media materials, and only fifteen percent of the participants in the survey confirmed that they do archive materials from social media in their institutions (see Chart 6).

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Graph 6: Do you archive social media records?

Yes
9
19%

No
38
81%
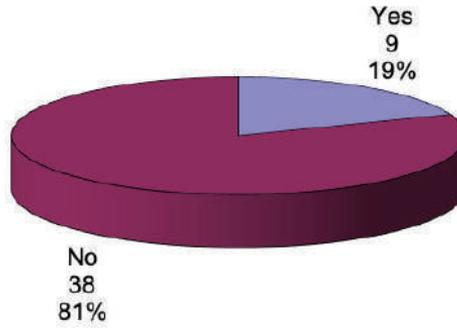
The participants were asked about their opinion on whether the habit of sending post-cards would be kept in the future or not. Half of the respondents answered that "it would be", while ten percent of the people answered that they "would not be sending post-cards in the future". In addition, 44 percent of respondents believed that, in the future, people would only send "digital postcards", and 42 percent believed that people would "post photos on social media" (see Chart 7). We received some additional responses, with regard to which we are especially grateful for the reminder that the future is a rather open concept. We should probably divide the issue into slots of ten, twenty, fifty or a hundred years into the future. Even though one of the respondents answered that people would send less and less postcards, we also received this answer: *"For as long as they can be bought, I will keep on sending them"* and *"maybe in the future sending classic postcards will become relevant again"*. In addition, we also received a response that was critical of postal services: *"I sincerely hope so. But I'm afraid not, because post-al services are becoming less and less postcards friendly; some of my postcards never reached the addressees. "*

Graph 7: Do you think that the postcards will be sent in the future?

Others
6
6%

Yes
31
33%

Phots will be
published on
social media
26
27%

No
6
6%

Digital photos
will be sent
27
28%
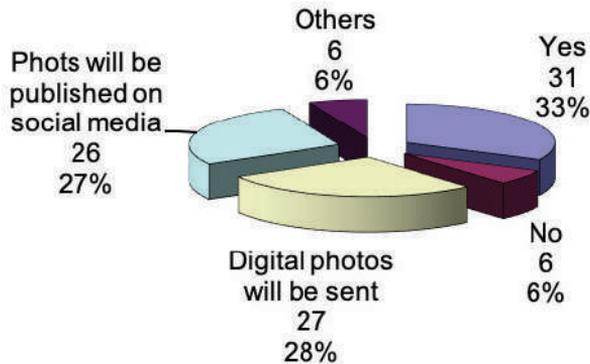
At the end of the survey, we added an optional question asking the respondents for an optional opinion on postcards (do you like them, are you attracted to their visual image, do you collect them or did you collect them as a child, how do you enjoy postcards in your mailbox, or do you think they are more genuinely personal and honest than posts on so-cial media). Even though the question was optional, we received as many as 38 answers.

Some were shorter than the others. Since postcards are an important part of archival and museum collections (archives or museum items), and will, of course, remain so for as long as there are archives, museums and libraries, regardless of whether the people will still be sending them or not, we publish the answers in full and in original record:

- *Postcards show a more genuine and honest attitude towards the recipient than sending large amounts of digital footage or posting on social media when we share our intimacy with people we barely know;*

- *Plenty of success;*

- *I have always liked postcards, but unfortunately there are not many good motives; they are too kitschy;*

- *Postcards are "ql", but the senders must make an effort and write something original on them and not just a nice greeting from Banja Luka, we have a nice time;*

- *I like interesting, beautiful, artistic postcards with imaginative motifs, I look forward to receiving postcards, they definitely seem more personal to me. The sender must think harder when sending postcards to special friends;*

- *I like them. Both, the image that is shown, as well as the record and stamp (which hasn't always been on a postcard in last years). I used to collect them as a child. Now I am collecting them again, because others have finally started sending me postcards as well;*

- *I like postcards, their purpose is to send them and make the recipient happy. I hope this tradition won't be completely lost in the digital age. I always buy at least 3 postcards for home and for my own archives. I encourage the young ones to send postcards;*

- *I really like postcards and this way of receiving greetings from elsewhere directly to my mailbox and not just through social media. I am a big fan of postcards and I've kept them for many years. Nice memory. I always send a postcard to my home address as a souvenir;*

- *They are genuine and sincerer, dedicated to the person, family and show respect to someone;*

- *From the 4th class of elementary school to a few years after employment, I sent a huge number of letters and postcards, at one point I had more than 50 correspondents from all over the world. The feeling of getting a letter from somewhere far away, admiring a handwritten address, a stamp, a postmark and opening an envelope in anticipation of the news was invaluable to me. It was similar with postcards - to find out from the title page from which country the postcard is from, to admire the (un) originality of the photo, to design and guess who remembered you somewhere far away, on holiday ... I didn't really gather postcards in a special collection, but I kept them, and I still keep many of them today. I attached them to the door of my room and some, the growingly yellowed ones are still there; the most valuable are those sent to me by a dear friend who died in a car accident ten years ago. When I look at these postcards at the door, I still have the illusion that he is still here, just lying there somewhere on the shores of Loch Morlich having a nice time;*

- *They are more genuinely personal than sending photos over the phone or posting on a social media, mainly because it also takes a little more effort to send classic postcards and send them to those you really want to greet; A special feeling when receiving a postcard from abroad;*

- *Of course, it's great to get a classic postcard, but I don't think it's more "personal" if we send a digital photo or post it on social media, it's a photo we took ourselves. So, it's more personal. However, the texts on the classic postcards usually only followed the generally accepted pattern. So, anyway, more personal is the handwriting;*

- *Well, I look forward to receiving them, but the same is valid for phone calls, e-mails, … other forms of news from loved ones, friends, …*
- *I still keep the postcards I've got;*
- *Postcards are a wonderful thing, especially if they are really beautiful and with them you express attention to everyone you like to remember;*
- *Yes;*
- *I always enjoy postcards, they are more authentic than the social media;*
- *They are really more authentic, I'm looking forward to them, maybe we'll start sending them again … The holiday season is approaching …*
- *Like most people, I really like to receive a postcard. That is why I try to send postcards as well;*
- *I look forward to postcards, they are more authentic and personal;*
- *All the best about postcards. It is a pity that they were replaced mainly by posts on social media;*
- *Postcards are, of course, more personal and more durable. I've always cheered them on in my mailbox, so I used to send them from vacation until a few years ago, but now I'm lazy in that regard. However, this poll encouraged me a bit to send a postcard, because it simply has a certain charm. Anyone who gets a physical postcard in this digital age especially appreciates it in my opinion. Even greeting cards on holidays have unfortunately become a rare treasure;*
- *I look forward to them, but at the same time I'm too lazy to send them;*
- *I have saved all the postcards I have received so far;*
- *I like them, I don't collect them, I enjoy them in my mailbox, they are more authentic (you must put in a little more effort than just a few clicks);*
- *I especially like old postcards, and the newer ones are those that attract with a motif or are well designed. I hope that modern forms of communication will not completely displace them, but they probably do not have much chance of survival. Personally, I still enjoy postcards in my mailbox and therefore send them myself, especially from trips around the world;*
- *I have always liked postcards and I would be sorry if they fall into oblivion … I think they are much more authentic and personal, as I usually choose the one that best suits the recipient! In addition, they are written by hand. They still make me happy, but they practically don't arrive in mail anymore;*
- *I used to send postcards from various trips and have collected them. They are a pictorial source of times past;*
- *I still enjoy postcards, this is a genuine personal reaction to the event, I collected them as a child;*
- *They are a fond memory of the holidays;*
- *Postcards are more authentic and personal, I collect them and always look forward to them when I get them in my mailbox;*
- *I buy a postcard wherever I am. Of all the mountaint peaks I have conquered, I have them. And that with a mountain stamp. Postcards are and always will be something special, something that touches you when you find it in your mailbox;*
- *I think the addressees tend to be less appreciative and consequently there are fewer senders;*

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- *I send postcards from holidays and trips. Often (if I like the motif), I also buy one for my own collection. I started doing this as a child. Postcards, which come to my mailbox less and less often, I sincerely rejoice, as they are more personal, and they definitely require more than mms from the sender.*
- *I collect postcards of places I visit (as a souvenir).*
- *As an employee at the archives, I would like it if the postcards contained the date of the photo and the name of the place;*
- *Postcards are beautiful ... and they have their own charm. However, we send less and less of them because digital media is more at hand;*
- *Indifferent, it is essential for me to get ideas from them for my trips, travels, which I can also get from social media;*
- *Analogue ones are different from digital postcards. It takes more effort to send them than digital pictures. But I'm looking forward to both, analogue as well as digital, as they have the same purpose.*

We didn't receive enough answers from abroad - only seven valid ones - which means that we didn't have enough answers to produce a reliably detailed analysis. However, we can compare the results of the survey with those obtained in the survey in Slovenia. One third of the participants in the survey send postcards from holidays and trips. Even abroad, we can see a declining trend in the habit of sending postcards in the 21st century. Before 2000, postcards were sent by another 83 percent of survey participants, between 2001 and 2005 by 67 percent, and later this share dropped to 40 percent. 60 percent of participants used to send postcards, but they do not send them anymore. 40 percent of participants say they will continue to send the postcards in the future, too. They also face the biggest inconveniences when they try to buy post stamps. One-third of respondents said they couldn't get stamps at the place where they bought postcards, and as many as two-thirds (67 percent) pointed out the problem of finding post offices where they sell stamps. 20 percent of respondents don't send postcards, and 20 percent say they have no problem buying and sending postcards. Among the participants employed in the archives and related institutions, three-quarters answered that they keep postcards in a special collection. One of them answered that they keep postcards "in the archives", but "not in a special collection". 83 percent of respondents send digital photos to relatives, acquaintances and co-workers, and the same number of them post photos on social media, mostly on Facebook (80 percent), followed by Instagram, LinkedIn and Twitter (20 percent each). 60 percent of participants confirmed that they archive materials from social media, and they all confirmed that they archive digital records made by themselves or their colleagues in the archive. Half of them are convinced that people will still send postcards by regular mail in the future, but seventeen percent believe that this habit will disappear. About a third of respondents believe that classic postcards will replace digital postcards, and one third that people will post digital photos on social media. Among the additional answers at the end of the survey, we received the following:

- *I'm looking forward to postcards;*
- *I was always happy when I received a postcard. Postcards are more authentic and more personal than posts on social media;*
- *I still like to send and receive postcards, especially from holidays, vacations and business trips.*

We also received a warning that it wasn't possible to enter the name of the country in the survey. Apparently, there was a technical problem as the question was originally there; the results, however, showed us that it was somehow dropped by mistake.

3 CONCLUSION

A postcard is a small object, which can be an important source in research. It is part of cultural heritage and postcards as such are kept in archives, museums, libraries and other institutions. However, they will change form in the future. Crucial questions in our research about these changes are:

- Will people send postcards in the future?
- Will digital photos replace classic postcards?
- Are archives ready for the changes that lie ahead?

The results of the survey confirmed our claim that people would send "fewer postcards in the future". In addition, most respondents believe that digital photos will replace classic postcards. The changes will have a noticeable impact on the work in the archives: new collections will be created. We are pleased that our research has confirmed that the employees in the archives are prepared for the coming changes in the future. This means that the archives will be able to preserve the material cultural heritage for future generations. We can only be concerned about (too) late responses when archiving materials from social media. However, the preservation of the intangible cultural heritage should also be considered. This intangible heritage includes individual habits, along with the habit of sending postcards. Therefore, we urge you to preserve this beautiful habit and pass it on to future generations.[4]

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4   Finally, I would like to add a brief note. I am curious to see how many postcards I will receive from you in the mailbox. So, do take some time and good will and send a picture postcard to: Aleksander Lavrenčič, Maistrova 1 1270 Litija, Slovenija, Thank you!

ARCHIVES AND ARCHIVISTS IN DIGITAL AGE: THE IMPACT OF DIGITIZATION ON THE HABITS OF ARCHIVAL WORKERS - THE CASE OF PICTURE POSTCARDS Aleksander Lavrenčič

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Luka Hribar[1]
(Slovenia)

BLOCKCHAINS AND E-RECORDKEEPING SYSTEMS

ABSTRACT

Purpose: To describe the characteristics and the functionality of blockchains and investigate a possible integration of blockchains into e-recordkeeping systems.

Method/Approach: Analysis of scientific and professional literature including primary and secondary sources, and use of descriptive and comparative methods. Brief presentation of two pilot projects from the field of e-archiving. Identification of critical and unresolved issues.

Results/Discussion: The field of blockchains is developing rapidly and is not comprehensively addressed. The definition of a blockchain is not yet fully established. Excessive early expectations regarding the use of blockchains are already fading. There are three types of blockchain integration in the e-recordkeeping systems: storage of (cryptographic) metadata on the chain; storage of complete records on the chain; storage of records related to the virtualized representation of goods and services. The terminology is still evolving. The standardization process is at an early stage of development, the first international standards have already emerged. Archives and other stakeholders verify approaches with pilot projects.

Conclusions/Findings: Blockchains try to solve the problem of trust with the help of technology. Compared to traditional databases, which in some cases blockchains try to replace, they lack some functionality. Due to the design, which is usually based on multiple autonomous and distributed nodes, blockchain management presents new challenges. Developers are designing complex systems that combine the use of public and private blockchains and classic databases. As with most new technologies, the full extent of possible use and abuse is still unclear. To realize the potential of blockchains, issues of privacy, security, efficiency, scalability, and legal problems will need to be addressed. It is also necessary to check the compliance of solutions with the guidelines, recommendations, and standards for e-recordkeeping systems. Analysis of pilot projects shows that they are maybe not yet fully compliant. The first models appear to help designers decide if/when and what type of blockchain to use for a specific e-recordkeeping problem. The continuation of intensive work in this area would be beneficial. Research on the knowledge and acceptance of blockchain technology by the general and professional public has not yet been fully addressed, especially in relation to issues that go beyond the scope of cryptocurrencies.

Keywords: e-recordkeeping, e-repository, blockchain, trust

1   Luka Hribar, PhD student of Archival Sciences at Alma Mater Europaea – ECM, Maribor, Slovenia, luka. hribar@gmail.com
Luka Hribar manages information and communication technology at the National Gallery of Slovenia. He has been involved in the digitalization of the gallery's art collection and documentation from the very beginning. His field of interests in connection to archival science are blockchain technology and artificial intelligence.

1 INTRODUCTION

Digital information technology poses significant risks that e-records can change in e-recordkeeping systems, both intentionally and unintentionally. Today, public confidence in the credibility of records is based primarily on institutional reputation. At a time when technologies for counterfeiting e-records are becoming increasingly widespread, trust in the authenticity of e-records will have to be increasingly based on organizational, security, and technological measures (Hajtnik, 2019). The essential properties of e-records are described using metadata, which is included in the system as additional information. Metadata is key to ensuring that e-records survive and remain available in the future (Hajtnik & Babič, 2018). Hajtnik (2019) states that the presumption of authenticity must be supported by evidence that the record is in its original form and its essential properties have not been altered or damaged.

Cryptographic methods, as one of the technological measures, best address the problem of integrity and partly solve the problem of authenticity. By implementing a one-way hash function, we can be sure of the integrity of the record. Asymmetric cryptography, which is used in digital signing, at the same time ensures integrity and, moreover, through the mechanisms of the public key infrastructure provides some essential methods of ensuring authenticity. However, most of the metadata generated as a result of these methods is still stored in a similar way to the original e-records. This means that cryptographic (and other) metadata (hash values or so-called fingerprints of documents, digital signatures and time stamps...) is stored within the information system (or added to documents) where e-records themselves are stored. At best, the storage of these metadata is entrusted to a third, authorized, independent person or organization, which by itself can present a weak link in the chain of trust. Researchers have long found that centralized trust is problematic (Barometer, 2017). Despite the use of verified cryptographic methods, altering an e-record (and thereby destroying its integrity and authenticity) is still possible if it is owned by only one person or organization.

Instead of trusting a third party, blockchain uses a mechanism of cryptographic evidence. Any transaction (the exchange of data) is protected by a digital signature and is transferred to *all* nodes. As a rule, there are as many copies of data as there are active nodes in the system, which also means big data redundancy. Figure 1 shows the fundamental difference between the centralized and the distributed system. Such a system also does not have a central weak link. If one (or more) nodes fail, the system will continue to operate. The connections between the nodes are significantly more numerous in a distributed system than in a centralized one, thus increasing the number of possible interactions between nodes. Due to the need to ensure that all copies of the data in each of the nodes are identical, the complexity of the distributed system is significantly greater than the centralized one.
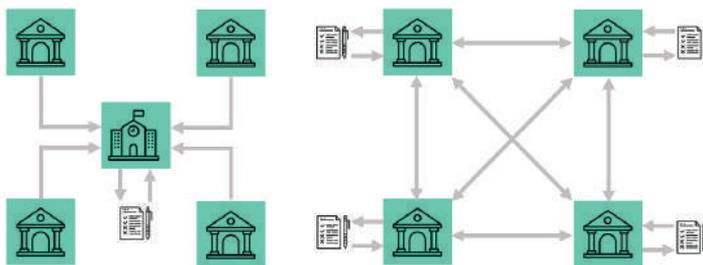

**Figure 1: The difference between centralized and distributed system.
(Source: Belin, 2020, modified)**

1.1 Research limitations

We presume that the greatest limitation of this research is the fact that blockchain technology is rapidly evolving and current findings are quickly becoming obsolete. Although many scientific contributions are being made that focus on individual blockchain elements, comprehensive in-depth discussions on the subject are scarce. One of the problems we faced in preparing this paper is also the still-emerging and maturing terminology. Researchers also mostly focus on the oldest of the blockchains, which is the basis of the Bitcoin and/or Ether cryptocurrency, and its characteristics in discussions. However, development has already produced some new solutions that try to eliminate the perceived weaknesses of the first blockchains. Pilot projects, especially those that have chosen public and established blockchains as their core, are also negatively marked by the speculative nature of cryptocurrencies.

2   BLOCKCHAINS

2.1 Purpose and history of Blockchains

Blockchains' beginnings date back to the end of October 2008 when the author, known under the pseudonym Satoshi Nakamoto – there are also assumptions that it is a group of individuals – published a paper (Nakamoto, 2008) in which he detailed the innovative system of electronic money Bitcoin that operates on the principle of a peer-to-peer network and allows online payments without the need for a broker or central authority. The first block in the chain was created on 3 January 2009, the first transaction between two users took place on 12 January 2009, and the first purchase of goods using this cryptocurrency took place in May of the same year (Skaza, 2020). Many activities in the digital environment are related to the trust of central authority (communication systems, social networks, etc.) that our data is being processed by approved and regulated rules. The most revolutionary novelty of the blockchain is that it does not need a central authority to control or regulate fair cooperation between users. Through various technological mechanisms and incentives, it convinces users to follow the rules and play fair.

2.2 Blockchain definition

According to Lemieux (2016b), there is as of yet no generally agreed upon blockchain definition. Often it is described as a distributed ledger that keeps a growing list of accessible records, which are cryptographically protected against tampering. Walport (2016) states that blockchain is a type of database that combines records into blocks. Each block is chained to the next block using a cryptographic signature. The elements of the chain can be used as a record book, which is shared by everyone with granted rights. By adding new blocks, older blocks are more difficult to change, creating resistance to tampering. Blocks are replicated in copies within the nodes of the network and any disputes about the state of the system are resolved automatically by applying agreed-upon rules. For Vitalik Buterin (2015), author of the widely used Ethereum blockchain, in which in addition to transactions we can also store software code, blockchain is: "a magic computer that anyone can upload programs to and leave the programs to self-execute, where the current and all previous states of every program are always publicly visible, and which carries a very strong cryptoeconomically secured guarantee that programs running on the chain will continue to execute in exactly the same way that the blockchain protocol specifies."

2.3 Properties and operation of Blockchains

Blockchain is technologically similar to a distributed database. Its main purpose is to record digital transactions and belongs therefore to a group of technologies also called *Distributed Ledger Technology* (DLT). Data stored in a blockchain is generally distributed between nodes in complete copies. Nodes can be personal computers, tablets, mobile phones, or even devices of the Internet of Things. The functions of the nodes are to: **verify transactions**; participate in the **construction of new blocks** where transactions are recorded; keep a **copy of the blockchain data** and maintain a **consensus of the blockchain's state**. As a general rule, all nodes perform all of the above tasks. There are also so-called light nodes that do not carry out all tasks and are partly dependent on the full nodes.[2]

The main characteristics of the blockchain are:

- **Distribution.** The system consists of many equivalent nodes that are autonomous in their operation. In this way, the whole is not dependent on a single (crucial) node that could fail.

- **No need for central authority.** As a rule, no node is more important than the other. The state of transactions (block data) is agreed through consensus mechanisms/algorithms.

- **Immutability.** Each block contains hash value (fingerprint) of the contents of the previous block. Any attempt to modify data in previous blocks intentionally or unintentionally is immediately detected. Stored and linked hash values are those elements that *combine data blocks into a chain.*

Several transactions are recorded within each block. Blocks can only be added, editing is not possible or allowed. The header in each block contains hash value of the header of the previous block, a timestamp, some random (called *nonce*) value (if necessary for the purpose of the consent mechanism), and data from the root block, which is of course the only one that has no predecessor since it represents the beginning of the chain. Figure 2 shows a simplified blockchain scheme.
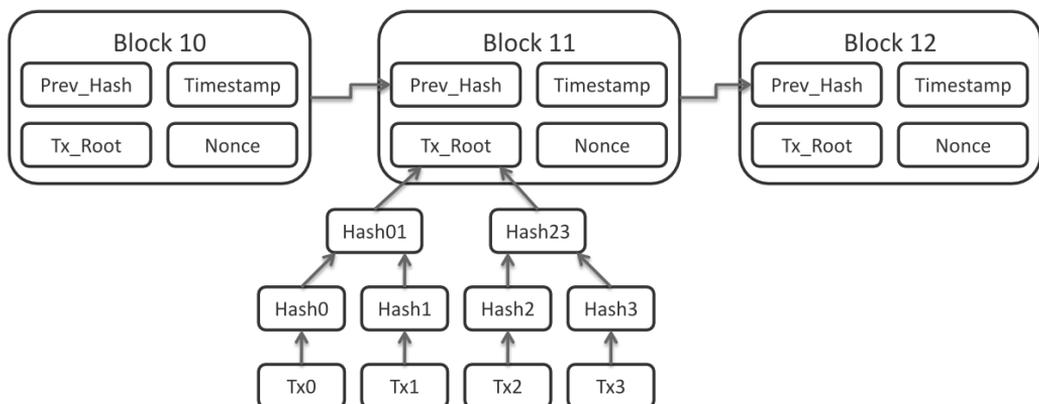

Figure 2: Simplified blockchain scheme. (Source: Bitcoin Block Data, 2020)

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2 Chapter is based on Walport, 2016; Kostanjšek, 2017; Yaga et al, 2018 and complemented by the author of this paper.

A consensus mechanism (there are some variations that differ in their suitability for specific purposes) assures that all transactions in the block are verified and that a new block can be created and linked to the previous block only after the current block has reached the required size or some other criteria (e.g. time interval) is met that is crucial in protecting the credibility and function of the chain. The nodes that perform these processes are sometimes called miners, mints, or publishing nodes, depending on the applicable consensus mechanism. Nodes are typically rewarded for their work, most often in the form of a cryptocurrency, tokens, or commission that the chain charges for transactions.

Blockchain developers and researchers soon realized that the blockchain could also be a code execution environment, not just a collection of records. The code that can be executed by blockchains is often referred to as *smart contracts*. Smart contracts are contracts whose terms are written in computer language instead of legal language (Walport, 2016). The blockchain is an impartial intermediary in a distributed system that executes such code. Smart contracts can be checked and implemented in the same way the digital transactions are being checked. As a rule, any action carried out within the contract will be carried out and checked by all nodes in the network. In this way, we achieve fair implementation of the contracts without the need for third-party trust (Kostanjšek, 2017).

2.4 Areas of application and maturity of technology

Although blockchains have been most frequently used in the field of cryptocurrencies, this is not the only area where attempts have been made to implement the technology. We can quickly find areas where pilot projects are being launched: banking and investment sector, insurance sector, legal services, creative industries (music, film, publishing – mainly in connection with copyright protection), energy and raw materials, transport and logistics, ICT services, distributed storage systems, anti-counterfeiting systems, systems to prove the existence of something at a given moment, etc. Developers focus primarily on industries where the need for trust in a central institution may potentially be a source of problems.
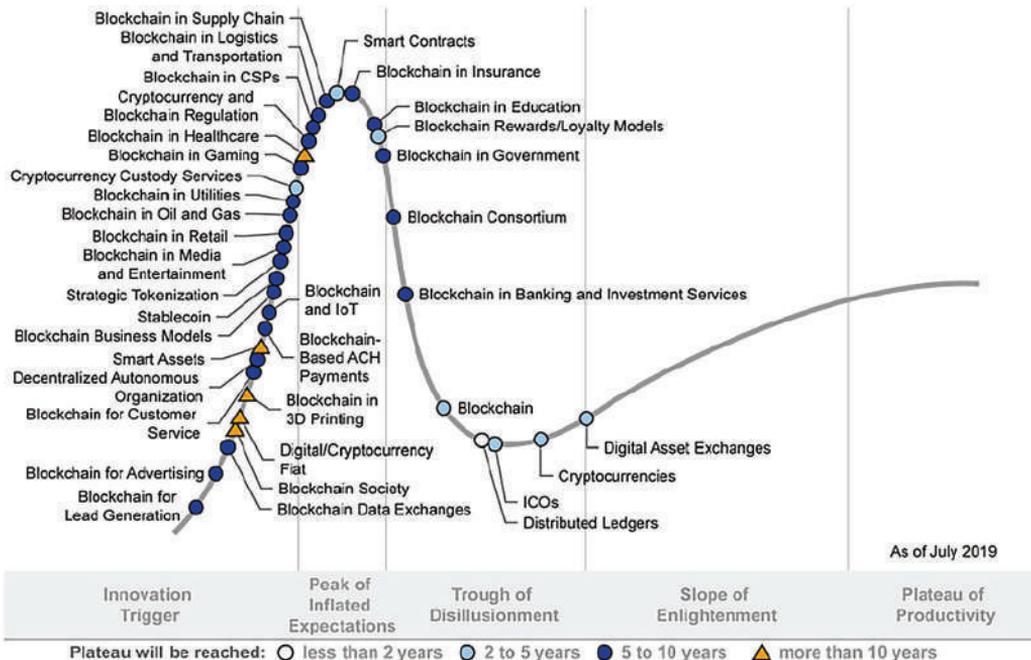

Figure 3: Blockchain hype-cycle. (Source: Gartner, 2019)

Gartner, one of the world's leading research and consulting company, predicts that blockchain technology will have a significant transformational impact on organizations' operations over the next five to ten years. In a survey conducted, 60% of the CIO said that they expected a certain level of acceptance of blockchain technologies over the next three years. At the same time, they are raising concern about the lack of clear principles in technology management and acceptance (Gartner, 2019). In Figure 3, which shows the blockchain hype-cycle, we can see that it is past the peak of inflated expectations and is currently located in the trough of disillusionment area, meaning that the cycle is slowly entering the phase of understanding. The question of whether or not the block-chain will reach the plateau of productivity and to what extent, remains open.

2.5 Blockchain typology

What most distinguishes blockchains from conventional databases is the built-in resist-ance to erasing or altering stored records (Galiev et al, 2018). Soon after 2009, when the first public blockchain with public permissionless access was created and served as the basis of the Bitcoin cryptocurrency, developers also began developing blockchains whose purpose would not solely be confined to cryptocurrencies. Depending on their characteristics, they can be classified in a few different ways.[3] Most frequently, the discussion around blockchains had been limited to blockchains that understand the **cryptocurrency** transaction as their underlying transaction, however, chains that car-ry out **token** transactions have soon begun emerging. Tokens represent the right to a service provided by the system in which the blockchain is used. From the perspective of addressing the very principles of the operation of blockchains, this difference is not essential (however, it is very important in connection to taxation if the chain deals with financial transactions) and will not be explained in more detail in this paper.

Classification according to **accessibility and need for identification** is also observed:

- In a **public** blockchain access to the network of chain nodes is available to all inter-ested users.
- In a **private** blockchain access to the network of chain nodes is limited to certain par-ticipants.
- In a **permissionless** blockchain there are no restrictions on the identity of transaction participants. Users may be (pseudo) anonymous.
- In a **permissioned** blockchain transactions can only be carried out by identified users.

The chains also differ according to the consent-finding mechanism/algorithm. On a public permissionless blockchain, for example, there are generally many nodes competing for the publication of the next block in which transactions or data will be stored. A key aspect of blockchain is the ability to determine which node will publish the next valid block. In most public permissionless blockchains, nodes that publish a new block (space for new transactions) are rewarded in form of cryptocurrency, tokens or they collect commissions that the network can charge for each transaction. Transaction fees also solve the problem of spamming through unnecessary or uneconomic use and protect against network over-loading attacks. Nodes that publish a new block are rewarded for a very clear reason: the possibility of winning rewards encourages nodes to be on-line, to be connected to the network and to verify and validate transactions on the blockchain. This initiative is the key reason public blockchains operate. In private or permissioned chains, this problem is not as pronounced as it is mostly in the interest of known stakeholders that the system

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3 Chapter is based on Okada et al, 2017; Galiev et al, 2018; Lemieux, 2016b; Lemieux et al, 2019 and com-plemented by the author of this paper.

works. Poorly involved members can be identified and appropriate action taken. The consensus mechanism must therefore solve two fundamental problems: to determine **which node has the task of creating a new block** and **resolve a dispute** that can happen if several **nodes justifiably wish to publish a new block at about the same time.**

Figure 4 in red shows blocks that are not valid. Transactions located in these blocks must be transferred or retransmitted into valid green blocks (longest chain).
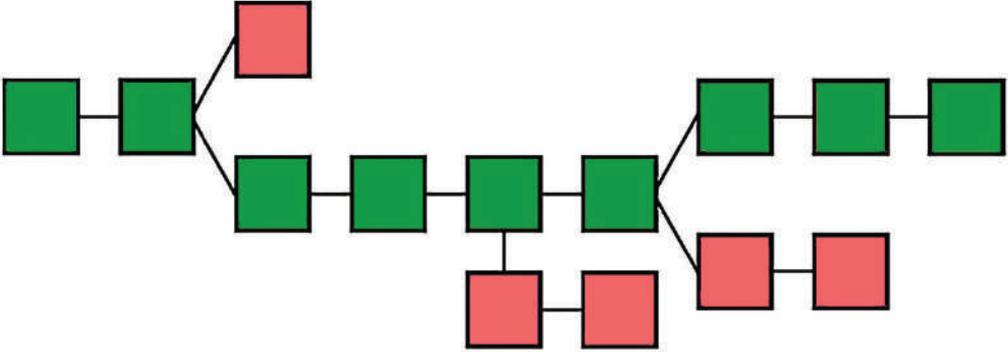
Figure 4: Possible temporary state of a blockchain. (Source: Singh, 2020, adapted)

A dispute that arises in the event of a possible (in each competition two or more participants may achieve exactly the same result without breaking the rules) simultaneous publication of a new block is usually resolved by choosing the chain that most nodes see as the longest. Information about the state of the system can only travel at a finite speed so there is a different perception of the state of the system. The winner in this case is chosen on the basis of geographical distribution or the delay of their network connections (of otherwise matched competitors). Nodes must also be able to re-submit orphan transactions to the next applicable block.

Solving the first of the problems, that is which node has the task of creating a new block, is a fundamentally harder problem. For the most part, all nodes wish to get chosen and would like to publish newer and newer blocks whether or not there is a need for them since they want to collect the prize. As a result, developers have devised ways to prove that the nodes are *worthy* of the task entrusted. The two most common algorithms are *Proof of Work* (PoW), used by the Bitcoin blockchain, and *Proof of Stake* (PoS). The latter is planned to be implemented on the second best-known blockchain, the Ethereum blockchain, as a replacement for PoW.

Proof of work is characterized by the fact that nodes solve a mathematical puzzle that relates to data in the transactions contained in the block (so transactions must be checked first – to put in the necessary work). The first node to solve the puzzle can publish a new empty block and collect the prize. The algorithm also adjusts the difficulty of the puzzle so that the addition of new blocks runs at regular intervals and at least roughly corresponds to the current network needs to store transactions. In this way, the excessive formation of blocks is effectively prevented. The PoW algorithm has proven to be very reliable, however, it also has a problem with energy efficiency. Solving a difficult mathematical puzzle requires a lot of energy. Operations on the Bitcoin blockchain are believed to consume as much energy as a medium-sized country (Vries, 2018). Energy waste is an extremely effective protection against forgery of blocks. A bad actor would have to use an enormous amount of energy to carry out a so-called 51% attack that theoretically could interfere with past transactions in the blocks.

Due to energy inefficiency, developers are looking for ways to replace PoW with an effective but less energy-consuming approach. **Proof of Stake** is based on the idea that the more the user invested in the system, the more likely he would want the system to succeed, and less likely he would want to undermine it. The stake is often in the form of a cryptocurrency or tokens, which the node sends to the system via a specific transaction to a specific address and thus locks the stake until certain conditions are met. The greater the stake the greater the probability that the node will be selected as the issuer of the next block. To keep the system from giving too much advantage to the richest, further approaches have been put in place: a random choice (with a probability weighted according to the stake); voting in several rounds; token ageing systems and delegate systems. Since the PoS model is less energy-consuming than the PoW model and as such spends fewer resources, some blockchains have decided that the reward for creating new blocks can be smaller – in the form of collected transaction fees only. PoS based systems are sometimes designed in such a way that all of the available cryptocurrency or tokens are already distributed among users at the start of the blockchain operation. This approach can also be a weakness since it can lead to allegations of an unjust initial division.

In addition to PoW and PoS models, developers also experiment with *Proof of Authority* (PoA), *Proof of Elapsed Time* (PoET), Round-robin method and others. In private or consortium blockchains none of these proofs have to be implemented. Stakeholders (node owners) can mutually agree on which nodes will take over the task of new block creation. For the most part, an impartial, fast, and computationally efficient model for determining the nodes that issue new blocks, especially in connection to consortium blockchains, tend to be implemented.

If we try to outline the development of blockchain technology chronologically, we can distinguish between three generations (Franks, 2020). The first generation dealt exclusively with financial transactions, whereas the second generation of blockchain technology has also become a runtime environment. For example, Ethereum has introduced the Solidity programming language in which smart contracts are written. The third generation seeks to address interoperability issues and also introduces Blockchain as a Service (BaaS).

All the giants of the IT industry already offer BaaS. Currently, IT systems developers are able to choose between three major platforms:

- Ethereum (public blockchain), which is the most generic platform governed by Ethereum developers;
- Hyperledger Fabric (consortium blockchains), which is modular and governed by the Linux Foundation;
- R3 Corda (consortium blockchains), specialized DLT platform for the financial industry, governed by the enterprise software firm R3.

2.6 Blockchain standards

The standardization process of blockchain technology is at a very early stage of development. The first proposals to initiate the process date back to 2016. First standards are already published. **The International Standards Organisation (ISO)** is an independent, non-governmental international organization that develops international standards. The main technical committee on the blockchain field (TC ISO 307) was established in 2016. It currently has 44 participating members and 13 observers. Two standards have been released so far (ISO/TR 23244: 2020 and ISO/TR 23455: 2019) and further eight are being developed. **The International Telecommunication Union (ITU)** is a specialized agency of

the United Nations for Information and Communication Technologies. The agency's core group on the use of distributed ledger technologies (FG DLT, 2017) was established in May 2017. One of the priorities of the group is the creation of an evaluation framework to support efforts to understand the strengths and weaknesses of the DLT. **IEEE** (Institute of Electrical and Electronics Engineers), a technical expert organization for technology advancement, has also launched a number of ongoing initiatives related to the development of standards in connection to the use of blockchain technology (IEEE Blockchain, 2020).

National authorities often prepare their standards in compliance with global standards (ISO, ITU...). The US **National Institute of Standards and Technology (NIST)** so far issued an internal report *NISTR 8202* (Yaga, 2018). The report is a concise technical review, examines, and identifies a possible wider use for blockchain technologies other than cryptocurrency.

In 2017 widespread use of the Ethereum blockchain triggered a flood of *Initial Coin Offering* (ICO) to finance a wide range of projects. The **Ethereum community** quickly grasped the value of interoperability and introduced several of its own standards. The ERC-20 (Ethereum Request for Comment) documents mainly contain the rules for issuing tokens in the Ethereum ecosystem. The Ethereum Enterprise Alliance also operates within the Ethereum ecosystem and aims to develop standards-based open-source specifications that can be trusted and applied globally.

3   DISCUSSION

3.1 Trust as the foundation of society

It was said that trust is a 'social bond' and society could not function without it (Lemieux et al, 2019). Trust essentially means the ability to act without the full knowledge or information required to act – trust fills this gap (Duranti & Rogers 2014). If we ignore different views on the nature of trust, there is a growing global consensus that a crisis of trust exists today (Barometer, 2017). In addition, many people feel decreasingly trusting in centralized authorities in any form (MacNeil, 2011). Decentralization has also proved to be unreliable (Collomosse et al, 2018). Blockchain technology is offered as a solution to the global crisis of trust. However, blockchain technology does not eliminate the need for establishing trust. Instead, it offers a new way to compensate for the lack of information from other sources, in order to extend trust to something or someone and act accordingly. Many believe that consensus mechanisms are a key component of the disruptive potential of blockchain technology – trust is placed in algorithms and the impartiality of technology (Hofman et al, 2019).

3.2 Typology of blockchain application approaches in e-recordkeeping systems

It is important to determine whether the chain itself is solely a storage of records or whether it is part of a larger system (Okada et al, 2017; Lemieux, 2017; Lemieux et al, 2019). By analyzing case studies Lemieux (2017, 2019) identified three emerging typologies of blockchain solutions and characterized them as: mirror type, digital record type, and tokenized type.

Mirror type: With this type, documents are not created or stored on a chain. The blockchain is only in the function of storing cryptographic (and other) metadata of documents (digital fingerprints, digital signatures, etc.). The blockchain serves as a mechanism for confirming the integrity and partly also the authenticity of documents by verifying the equality of cryptographic data associated with the documents and copies of these metadata stored on the blockchain. It can be said that this approach mirrors current good practices to improve the credibility of records.

Digital record type: For this type complete documents are stored on a blockchain, not just metadata. The blockchain must be tailored to this approach. In particular, it must be able to store a much larger amount of data and be able to synchronize all that data between all nodes. With this approach, we should pay great attention to the issues of protecting sensitive data (if the blockchain network is publicly accessible) and the issue of ownership of e-records.

Tokenized type: This is the most innovative type that is characterized by the fact that we store records and tokens on the chain. Tokens often symbolize ownership of assets to which the records relate: e.g. land, real estate, property... With this type, we can also extend the usage of blockchains to products of the financial industry such as futures, derivatives, etc.

It should be noted that the oldest and by far the most widespread blockchain, which is the basis of the Bitcoin cryptocurrency, offers the possibility of including other types of data right from the beginning. This is possible by using the OP_RETURN field in the transaction where 40 bytes of data can be stored (Apodaca, 2017). Although this is not much, a number of projects are using it for storing fingerprints of documents. This is particularly important because it indicated to early developers the possible ways of expansion and development.

3.3 Pilot projects in the field of Archives

Projects that try to use blockchain technology in the private sector are plentiful. CoinGecko (2020), which maintains a database of public blockchains, lists over 7.500 different blockchains covering a wide range of applications. At the national level or in areas of public administrations, the attitude towards this technology is more restrained. But according to Lemieux, et al (2019), almost every country in the world is considering or already using blockchain technology to keep records.

ARCHANGEL is a project that explores the transition from institutional proof of trust to a demonstration of trust by using DLT to ensure the integrity and proof of origin of the digital records entrusted to archives. The project includes the British National Archives, the University of Surrey, and Tim Berners-Lee's Open Data Institute.
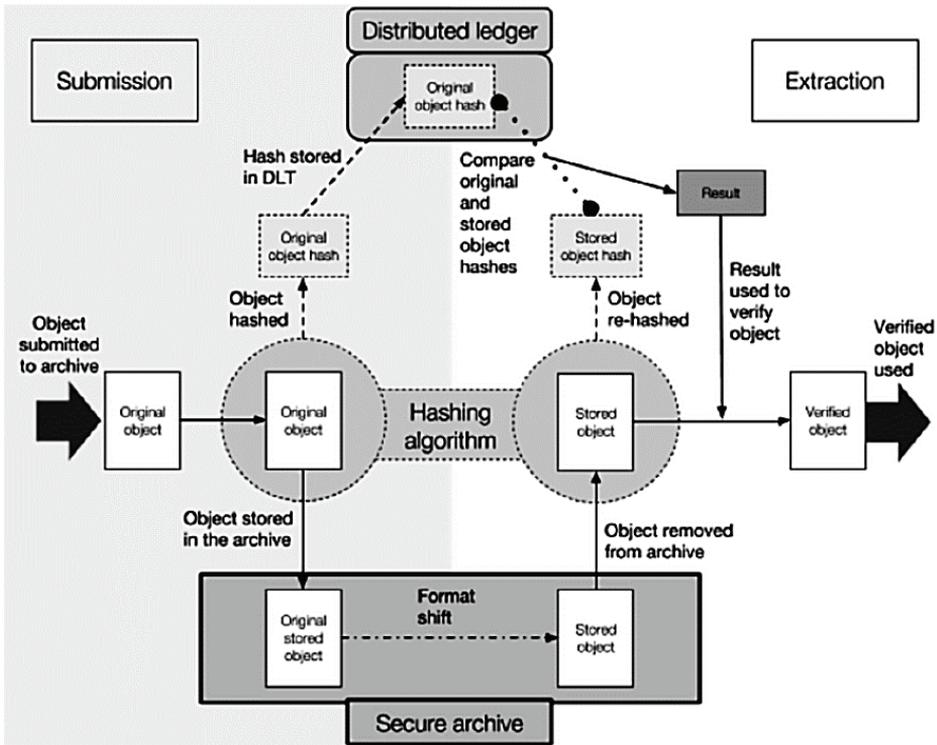
**Figure 5: Schematic representation of the Archangel system design.
(Source: Colomosse et al, 2018)**

Archangel combines the techniques of computer vision and artificial intelligence to obtain fingerprints of documents entrusted to the National Archives. The prototype version uses the Ethereum platform and smart contracts to store the hash values of stored documents (Collomose et al, 2018; Lemieux et al, 2019). Figure 5 shows a schematic representation of the system design.

InterPARES Truster is a project led by researchers at the University of Zagreb that are addressing the issue of the long-term preservation of digital signatures. The problem with the digital signature is that over time the digital certificate used in the signature expires or the certificate issuing body ceases to exist (even time stamping does not completely solve this problem). When this happens, the signature can no longer be completely reliably confirmed. To solve this problem, the research team proposed the TrustChain system for long-term preservation of metadata of digitally signed documents using blockchain technology. Any interested individual or institution may request the addition of a record to the blockchain, but only authorized nodes can enter a new record in the chain (after confirming the validity of the document's digital signature). In addition to cryptographic metadata, document metadata is stored in the system to facilitate queries. The architecture of the system is shown in Figure 6. The TrustChain system cannot extend the lifetime of the digital certificate itself, however, it allows checks to determine whether the signature remained unchanged from the time of entry into the system. That indirectly and practically means that the signature can be trusted (because it was verified when entering the chain). Since the digital signature contains the name of the owner, it can also be used to confirm the creator/provider of the document (Bralić et al, 2017; Lemieux et al, 2019).

Authors of this system are developing an update – TrustChain 2.0 – where they hope to alleviate some of the limitations of TrustChain 1.0. The most obvious limitations of the 1.0 system are, firstly, that it can confirm the validity of digital signatures (or seals) only if they were valid and confirmed at the time they were ingested (problems with expired certificates are already apparent in our daily lives) and, secondly, that validation of digital signatures (or seals) can only be performed by the validation node (problematic with confidential documents) (Bralić et al, 2020).
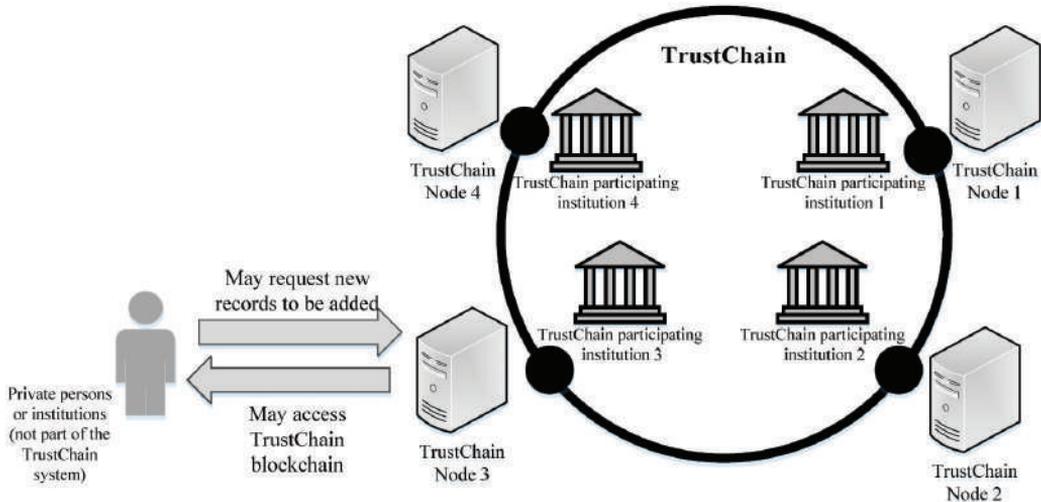
Figure 6: The architecture of the TrustChain system. (Source: Bralić et al, 2017)

3.4 Unresolved Questions

Blockchain features, such as immutableness, distribution, and a lack of need for a central authority, can also be disadvantages when considering their use in relation to e-recordkeeping. In the following, we will summarize and complement some of the observations gathered by Okada et al (2017), Yaga, et al (2018), and Lemieux et al (2019). These considerations apply mainly to public blockchains. For private or consortium blockchains, many of the following questions and concerns are unnecessary. But private chains lose the essential characteristics they are defined by in the element of trust. Collusion is much more likely in private blockchains. Some think (Martinus, 2019) that private chains do not even make sense, because in such cases it is much better to use familiar and verified approaches using traditional databases. However, there are views that many national, regional, and academic organizations will likely choose to prefer private, or at least consortium blockchains where roles and responsibilities are easier to define and control (Bhatia et al, 2020).

The most obvious "weakness" of each blockchain is the inability to correct invalid data. There are always cases where this is justifiably necessary – users make mistakes. As existing transactions on the blockchain cannot be changed, the problem is being addressed by subsequent cancellation transactions. Such Errata needs to be actively monitored, which introduces a new very complex component into the system. A system that includes blockchains and the right to be forgotten (right to data erasure) needs to be carefully planned ahead (Hofman et al, 2019). Data erasure can for instance also be achieved by using smart contracts that can render required records cryptographically inaccessible (Bhatia et al, 2020).

With regard to immutability, it should also be made aware that in systems where entire documents (not just metadata) are stored on the blockchain, they can pose a major threat to users (Matzutt et al, 2018) if they also find unauthorized content; node owners – each with a full copy – could be criminally prosecuted. Theoretically, every miner on a permissionless public Blockchain could be a data controller within the scope of the EU General Data Protecting Regulation (Hofman et al, 2019).

In a distributed system of autonomous users it is very difficult to introduce changes to protocols and to introduce updates. The nodes are autonomous and have to agree to the changes. If there is no consensus, a chain fork (Yaga et al, 2018) occurs, when some nodes insist on old rules and some adopt new ones. If changes are backward compatible, we are talking about *soft fork*, if they are not, a *hard fork occurs*, which results in two functioning but mutually unrelated and incompatible blockchains.

Developers and researchers have not yet answered the question of what happens when all coins or tokens are mined or minted (incentive lost) or transaction commissions suddenly becomes prohibitively high (users can no longer afford transactions). The latter is a frequent occurrence on public permissionless blockchains. Deadcoins.com (2020) lists 1.928 orphan or dead blockchains. How do we reliably archive a blockchain? When blockchain is shut down, we cannot be completely sure of its state anymore.

In systems using blockchains to store hash values, a discrepancy may develop between the fingerprint of the document stored in the chain and the fingerprint of the document kept in the local e-storage system. This may happen because the document in the classical e-recordkeeping system was subsequently changed or amended (perhaps justifiably). What information will users trust? Thinking about this problem also leads us to the complex and unresolved issue of legal validity and ownership of records on the blockchains.

In the case of public blockchains it is often stated that there is no central authority. That statement is not completely accurate. Blockchain developers are connected in strong communities and can make significant changes through technical approaches. Not all technical changes are welcomed by all users, some can seriously impair projects that relies on certain features of a particular blockchain. Developers in a practical sense represent a concrete representation of central authority.

An important authoritarian role is also observed in economically strong node owners (Lemieux, 2016a), who can afford large investments in the form of energy or other resources to control a large portion of active nodes. This is observed when changes on public blockchains need to be implemented.

Another issue in connection to blockchains that is not yet well resolved is the processing rate of transactions. In the most established blockchain, which is the foundation of the Bitcoin cryptocurrency, new blocks are on average created every ten minutes (Median Confirmation Time, 2020). A transaction that is sent into a block, strictly cryptographically speaking, becomes valid only when the block is connected to the next one, so in this case after ten minutes. But many users wait even longer, for multiple blocks, to harden the cryptographic link. Improvements in later implementations of blockchains shortened this time. On the Ethereum blockchain the average time of a new block formation is around twelve seconds (Ethereum Average Block Time Chart, 2020). While it is possible to expect speed improvements in this area, blockchains seem slow compared to traditional databases where transactions are executed in a few milliseconds.

The projects created over the last few years have tried to overcome these weaknesses and limitations through a wide variety of techniques. Developers design systems that combine the use of public and private chains, and classic databases. Blockchains can be interconnected, leading to systems that include side-chains and sub-chains.

4 CONCLUSIONS

Information science experts must closely monitor the development of technologies used to create, manage, and store e-records. Over the past few decades, several such changes have been introduced. Technical innovation, such as blockchains, can trigger significant and long-term changes in business structures and, consequently, in the way in which the economy and society are organized and managed. Rules in the digital world, especially in the area of blockchains, are governed by technology *and* written rules that can be legally assessed. In the case of systems containing elements of distributed ledgers, careful consideration should be given to this complex entanglement. As with most new technologies, the full range of potential uses and abuses is still unclear. It should be made aware that when introducing new information technology we do not immediately perceive all the problems and changes that they create, leading to new professional doubts and ambiguities (Novak, 2009). Before the full potential of blockchains can be realized, issues of privacy, security, efficiency, and scalability will have to be resolved and legal problems addressed.

Any serious implementation of blockchains into the e-recordkeeping system will therefore require compliance with guidelines, recommendations and standards. Lemieux points out (2019) that the first analysis of the designs of different blockchain systems indicates that they do not meet archival standards. Researchers have already noted in 2016 that claims related to the use of blockchain technology to store e-records are in many cases exaggerated (Lemieux, 2016b). Lemieux also emphasizes that there is little awareness in blockchain development communities regarding archival requirements and standards.

A report by the National Institute of Standardization and Technology (Yaga et al, 2018) states that all too often organizations try to adapt the problem so that it could fit in the blockchain technological paradigm, rather than treating blockchains in the same way as any other technological solution available at the moment. Yaga et al (2018) further states that the introduction of blockchains is most meaningful in systems where: there are many participants who do not wish to trust central authority; the nature of the interactions between them is transactional with assets that are limited (money, securities, virtualized representations of physical goods or intellectual property...); an impartial and automated mechanism for resolving ownership disputes is required; there is a need for monitoring real-time transactions and transfer them to permanent storage.

Human society has changed dramatically in recent decades; socially, politically, and economically. These changes are also due to phenomena such as participatory culture, peer-to-peer networks, and trust through computing (Findlay, 2017). The emergence of a technological paradigm such as blockchain is of no surprise. Blockchains are entering information systems of many industries, sometimes complementing existing solutions, sometimes trying to replace them. The first models (Peck 2017; Wüst & Gervais, 2017; ACT-IAC, 2017; Chand, 2018; Hochstein, 2018; ACT-IAC, 2019; Franks, 2020) that help developers of IT solutions to decide when/if and what type of blockchain to use are also emerging. It would be advisable to continue intensive work in order to understand what is at stake in the transformation that is taking place. Moreover, research on the knowledge and acceptance of blockchain technology by the general and professional public has not yet been fully investigated, especially with regard to issues that go beyond cryptocurrency. Institutions that are considering to implement blockchain technology as an element of their e-recordkeeping systems should state their requirements towards DLT developers as early as possible (Bhatia et al, 2020).

Accumulation and dissemination of knowledge is one of the fundamental activities of archival science (Novak, 2010), which is a highly complex, interdisciplinary, and multi-disciplinary field (Semlič Rajh et al, 2013). The study of blockchains touches on archival theory, practice, and techniques. In the paper on the study of archival science Klasinc (2011) notes that archivists will not be able to avoid intensive encounters with the theory and practice of information science.

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Bogdan Florin Popovici[1]
(Romania)

"YET ANOTHER ONE?!" SOME CONSIDERATIONS ON INSTANTIATION ENTITY IN 'RECORDS IN CONTEXTS' MODEL

ABSTRACT

This paper seeks to compare the use of different, but apparently synonym terms, like Instantiation, Manifestation or Representation, terms used in different models and projects in library, archives and digital preservation. For the comparison, we reviewed the definitions and examples in several authoritative documents, like PREMIS, FRBR, Records in Contexts etc. This exercise revealed that similar words may have different usage in different context, which make it hard to use one term to communicate the same meaning for everybody. The conclusion is that, at least for the time being, Records In Context model of archival description needed to use a new term and to define its scope of use within the framework of the descriptive model, since it present specific features and aim to be general, carrier-neutral.

Keywords: *Records in contexts, PREMIS, digital preservation, archival description, FRBR, PAAST*

1 INTRODUCTION

During working meetings of the Experts Group for Archival Description (EGAD), under the auspices of the International Council on Archives, in the process of identifying the relevant entities, several existing models have been analysed. For one specific case, it was agreed to use a "new" term (i.e. "not used in other archival-related standard"), as it was easier to model a new entity that fits to the needs of the model than to create potential confusions with other models' entities. However, I was inclined ever since to have a closer review of such other entities, similar with the one used in "Records in Contexts" model (hereafter, RiC).

Despite the fact a certain amount of time was devoted to the issue of Instantiation, a question that bothered me was if it was really necessary to employ a new term to label this entity, while some other terms, apparently similar, already existed. *Manifestation* (in FRBR or PAAST) or *representation* (in PREMIS) seem quite similar with Instantiation. Hence, the purpose of this paper is to comparatively examine these terms and check their suitability.

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1   Bogdan-Florin Popovici graduated the Faculty of Archival Science In Bucharest (Romania) (1999). He holds a Ph.D. in History (2004). He attended several training programs in Europe (France, Italy). He works with the National Archives of Romania, Brasov County Division (since 2009), as archivist and, since 2013, as head of Division. He has been actively involved with ICA/Committee on Best Practices and Standard, respectively Experts Group for Archival Description (2008-). He participated at several international professional meetings (Slovenia, Italy, Oman, Russia, Hungary, Mexico, South Koreea, Spain), both as a speaker and as a professional trainer. He is also involved in translating professional standards into Romanian. Contact: bogdan.popovici@arhivelenationale.ro.

2 THE CASE

Despite having as a condition of its existence the attribute of "fixity", a record passes through a lot of changes in its being, mainly of context, but sometime also of form and appearance. It is, as the Australian archival scholars called it, the Records Continuum. Sometime, these transformations do not change significantly the record, one observer being still able to call it "the same" record[2]. In other situation though, such a change may lead to a new record, related with the initial one. From the perspective of an archivist, describing records that encompass transformations may mean repetition of bits of description, that are shared by each instance.

Here are some examples. We may have:

- a charter from 15th century, which is described by archivist. We also have a microfilm copy of this charter, that needs to be described. No matter if we consider that it is "the same" record or not, some descriptive values are identical (for example informational content), while others are not (e.g., carrier).

- A historian's personal paper. Among the documents, there is a transcription of a 18th century record. When describing it, we may re-use parts of the description of the original document for describing the focus of the historian's record.

- a 14th century record which embeds an extended *transumptum* of an older charter. When compiling a document chronological edition, that *transumptum* will be used as a placeholder for the original document, which is missing today; the *transumptum* will be the document, in its abridged form.

- a letter, that was in the same time produced as paper record and as a DOCX file, which, for preservation reasons, was then converted to PDF. The informational content (the message) is the same, but each instance has its own characteristics.

- a paper original, which is digitized, then the paper original is destroyed. Within that organisation, it is considered "a copy in the form of original"; and so, we may have a nice digital record from 1950...

Many similar cases are met in archival practice. In all the examples, there is "something" which is not the original document, but a different entity, that may be called a "copy", a "reproduction", a "variant", a "transformation" etc. Describing each one of these implies inevitably to use some shared elements (form, appearance, content), in addition to specific elements of each of that "something". In some cases, the two related documents may be considered "the same", while for others they are regarded as being different; the odd situation is that all sides are right, depending upon the context.

These cases are not new and in practice they were found, and descriptive method of referencing was used for long time. While referencing may be used within digital tools for archival description, the question is whether that "something" does not reveal the existence of a new entity, tight connected with record, but with its own attributes.

The Records in Context Conceptual Model calls this "something" an *instantiation* and considers it as one entity of archival description.

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2   For another contribution to the topic see our paper presented in Kazan (Russia) and published in Romania (Popovici, 2019).

3 THE "INSTANTIATION"

"Records in Contexts", as a conceptual model for archival description, has not yet been released formally as a "definitive" version (EGAD, 2019). Despite that, for the purposes of present paper, we shall analyse the concepts considering the present status of development.

Traditionally, "record" or similar terms were used to define "archival materials", but RiC splits it into several different entities. A first separation is within the archival material types, where RiC individualizes record, component of a record and aggregation of records as Record, Record Component and Records Set entities. Archival material as such is labeled Records Resource. A second differentiation is made between Records Resource, as intellectual entity, and its physical presence, as Instantiation.

The current definition for Instantiation in RiC is *"The inscription of information made by an Agent on a physical carrier in any persistent, recoverable form as a means of communicating information through time and space"*, while record is *"Information inscribed at least once by any method on any physical carrier in any persistent, recoverable form by an Agent in the course of life or work Activity."*

As resulting from the definition, an instantiation is a *sine qua non* condition for the birth of record; if no instantiation exists, we cannot talk of a record (e.g., a radio broadcast or a "signature" on water surface). However, the original instantiation may disappear in time, and record may only be preserved either a copy or a notice (e.g., *transumptum*). It means that, although the record does not exist in its original instantiation, the message in context may be considered to survive through its new, derived, instantiations, which is a new record, but functionally equivalent.

A record may have multiple instantiations. They can be simultaneous (e.g., a scanned record, generated in one step as TIFF and JPG), or successive in time (a paper record, microfilmed, then digitized). The latter re-instantiated record, depending on the context, can be considered the same (functionally equivalent of the original instantiation) or a new record. For example, the microfilm in the Archives is considered as a surrogate for the original, and many users find this is quite "the same" record (while it is obvious it is a new record, with different date and carrier). However, a police officer would hardly consider a photocopy of the driver licence as being the original.

In case of Records Set (e.g., file, series or even fonds), the original instantiation is a sum of each component record's instantiation. But in the case of re-instantiations, a reshape may occur. For instance, a file is a collection of records on paper; despite being treated as a whole, each of them keeps also individuality of carrier, form etc. After a digitisation, all the records in the physical file may be assembled in one PDF file, in which case their individuality as items can be disputable. Reciprocally, a ledger (one physical item) can be re-instantiated digitally as a JPG file for each page. The new instantiation may be, therefore, a fragment or a sum of previous instantiations.

By their nature, Instantiations are the main target of preservation. Either analogue or digital, Instantiations implies a carrier and/or a form of encoding that may require an intermediation device (from paper, vinyl disk and magnetic tape to digital file format). This aspect is important within the comparison with other models and explains why digital preservation focuses on instantiation related issues.

Existence of an intellectual entity and its instantiation were contemplated in other models too. The labels used were different. In the following we shall examine some of them.

4 THE "REPRESENTATION"

PREMIS *(Preservation Metadata: Implementation Strategies)* is an international standard seeking to offer support for practical implementation of metadata in digital preservation processes. Started in 2003, the project has become one of the basic intellectual tools for digital preservation worldwide.

The PREMIS Data Model defines 4 entities: Object, Right Statement, Agent and Event. For the purposes of the present paper, the entity of interest is Object, which is defined as "a discrete unit of information, subject to digital preservation". Object has 4 subcategories: Intellectual Entity, Representation, File or Bitstream. The Intellectual Entity is defined as *"distinct intellectual or artistic creation that is considered relevant to a designated community in the context of digital preservation"*. A Representation is *„the set of files, including structural metadata, needed for a complete rendition of an Intellectual Entity"*. One Intellectual Entity can have one or multiple Representations; in fact, it will always have at least one Representation. A File is considered a *„named and ordered sequence of bytes that is known to an operating system"* and it designates what is commonly understood as "file" in a computer systems, while Bitstream goes deeper in the structure of a File, indicating *"the contiguous or non-contiguous data within a file that has meaningful common properties for preservation purposes"* (PREMIS Data Dictionary for Preservation Metadata, 2015, pp. 7-8). The conceptual view is represented in the quoted resource like this:
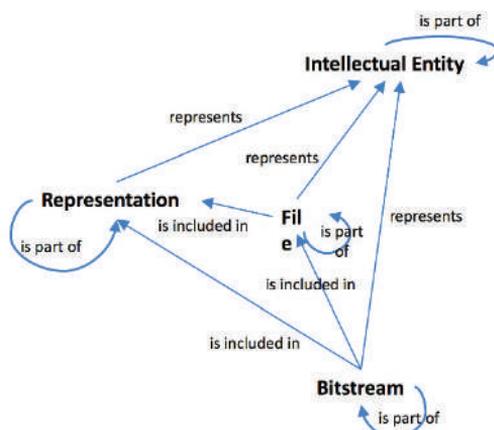
Figure 1 Subcategories of Object and their relations in PREMIS (apud PREMIS)

In a practical example, the image of a mountain would be the Intellectual Entity, as an intellectual creation and unit of information. The image as a digital photograph is saved on the card in 2 files, in format JPG and RAW, both of them being Representations of the picture.

Beside digital Representation, in the latest version of PREMIS (v.3), it is accepted that an Intellectual Entity may also have non-digital Representations. In the examples above, a charter, a transcription, a *transumptum*, the letter printed are all Representations of their original record (which are the Intellectual Entities), either physical or digital. Moreover, as indicated in PREMIS Data Dictionary, the Intellectual Entity may not be only regarded at a granular level, but also encompassing large components, like archival fonds or series. While the inclusion of non-digital Representation is rather non-consistent just yet (for instance, it is clear that non-digital Representation may not include Files, as depicted in the Figure 1 above), it seems that Representation, in its core characteristics, is similar to Instantiation.

5 THE "MANIFESTATION"

One term heavily used in cases of multiplication of the content in various instances is *manifestation*. Despite the common term, the meaning seems inconsistent among various documents.

A). FRBR

Functional Requirements for Bibliographic Resources is a user-centred conceptual model for describing objects of interest for librarians/users of bibliographic information (IFLA, 1998, p. 2). Unlike PREMIS, that embraces physical entities later in its development, FRMR was addressing physical and digital as a core option from the beginning.

The model comprises several entities, from which four of them in the first group (Products of Intellectual & Artistic Endeavor) are relevant for the present paper. **Work** is defined as "a distinct intellectual or artistic creation". **Expression** is "the realisation of a work, wither intellectual or artistic", which may take a variety of forms (textual, sound, musical notation, images or a combination of them). These two entities are purely abstract. **Manifestation** represents the physical embodiment of an expression of a work (that is, information put in a container or on a carrier). It is normally associated with a particular medium, such as a printed volume, photographic print or film reel. **Item** is the copy (exemplar) of a manifestation, that is, a physical instance. A manifestation may have more than one item, but one item can only have one manifestation. (IFLA, 1998, pp. 17-24). *"A manifestation represents all the physical objects that bear the same characteristics of intellectual content and physical form. In actuality, a manifestation is itself an abstract entity, but describes and represents physical entities, that is all the items that have the same content and carrier."* (Tillett, 2003, p. 10)

B). DIGITAL PRESERVATION – BROWN

Reflecting the findings of several projects and of the practical activity in the field, Adrian Brown approaches, in an influential book, some practical issues in digital preservation. Due to the methodologies used in this process, it is inevitable an analysis of the concepts associated with various "embodiment" of a record.

Describing processes and entities, A. Brown uses several terms, as "manifestation", "version" or "representation". Manifestation is defined as "specific data object that instantiates an information object. Multiple manifestations can exist for any given information object" (Brown, 2013, p. XIV). Later, the author emphasizes a very important feature: *"it is critical to distinguish between manifestations, being technical representation of the same information object and different editorial version of an information object"* (p. 216). The example given covers different ways that the same information object[3] (a book) can be physically stored:

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3   Defined, in the book, as in OAIS, as "a conceptual object of preservation... realized as meaningful information by interpreting a data object through its associated representation information".

Table 1.1 Alternative representations of a book	
Version	**Technical representation**
Physical	1 printed volume (comprising 12 chapters and 700 pages)
Word 2000	12 DOC files
Word 2007	12 DOCX files (each containing various XML files)
Digitized masters	700 TIFF files
Digitized access copy	1 PDF file
e-Book	1 EPUB container file (containing various XML, XHTML and image files)
Web	12 HTML files, 1 CSS file and 15 GIF images

Figure 2 Manifestations (apud Brown)

Adrian Brown also scrutinizes the origins of term "manifestation" within the realm of digital preservation. His conclusion is that term "almost certainly evolved independently within a number of different initiatives" (Brown, 2013, p. 215) and he gives no indication that the term might have been borrowed from library conceptual model.

C). DIGITAL PRESERVATION – INTERPARES PAAST

Another relevant document for using the term "manifestation" is PAAST, a product resulted from last InterPARES Trust project. Preservation as a Service for Trust (PaaST) presents functional and data requirements for digital preservation (Interpares_Trust, 2017). In this project usage, Manifestation is *"A concrete, physical implementation of an Intellectual Entity capable of communicating information as originally intended"*, while an Intellectual Entity is *"an artifact that is intended to communicate information"*, a record being one type of Intellectual Entity.

In PAAST model, an Intellectual Entity is digitally encoding its specification in an entity called Binary Encoding. The Binary Encoding has 2 type of parts: Digital Component (that is, *"an ordered string of bits that encodes numbers, characters, signs, symbols, sounds, images or other graphics in a digital form that is both suitable for storage and appropriate to instantiate an Intellectual Entity"*) and Manifestation. This perspective is consistent with previous InterPARES findings, which discussed about the stored and manifested records: "Stored record *is constituted of the digital component(s) used in re-producing it, which comprise the data to be processed in order to manifest the record (content data and form data) and the rules for processing the data, including those enabling variations (composition data)"* and "manifested record *is the visualization or instantiation of the record in a form suitable for presentation to a person or a system"* (Duranti & Thibodeau, 2006, p. 39), (Duranti, 2016, p. 8).

Manifestation, from PAAST view, enables Intellectual Entity to be instantiated. For example, a record (Intellectual Entity) is digitally encoded as a PDF file (record stored); manifestation is what would be rendered on/readable from a screen by a human reader (that is, the message conveyed reached to interested party)[4]. Therefore, a PAAST Manifestation is a physical materialization of an Intellectual Entity, which is not stored and preserved, but exists on an output device (Interpares_Trust, 2017, p. 23)

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4   This is an intentional simplification for our paper; PAAST specifies that Manifestation may be under the form of a Runtime version (when the manifestation is intended for a machine) or of a rendering (when the IE is output in a form accessible to humans).
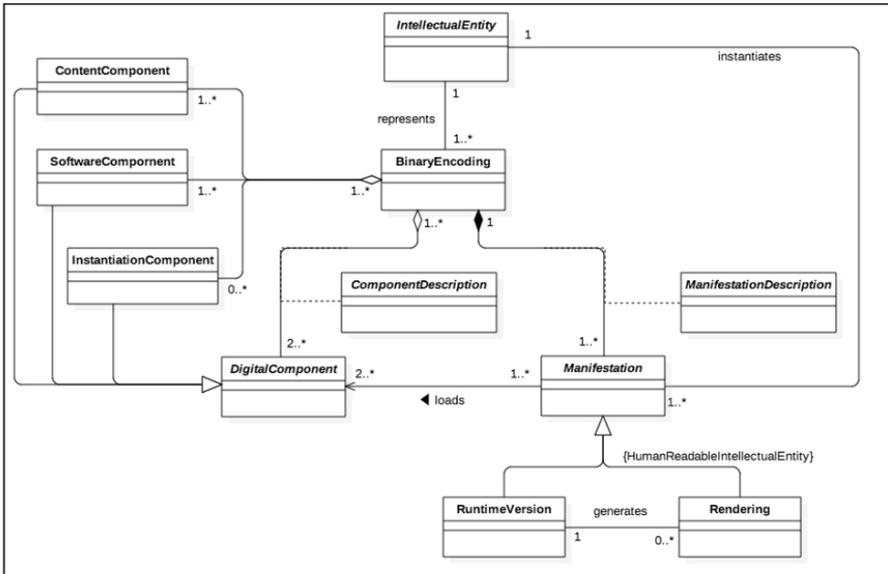
Figure 3 Composition of an Intellectual Entity (apud PAAST)

6 SOME CONCLUSIONS

Reviewing some of the meaning of terms describing physical embodiment of an intellectual entity, a first remark can be the semantic proximity. "Manifestation" is used in several documents, and it seems it has similar, but not identical meanings. On the other hand, visible mainly at A. Brown, manifestation can both "represents" or "instantiates" a piece of information, employing the same wording as in RiC (Instantiation) or PREMIS (Representation). This emphasizes again that the meanings for Manifestation, Representation and Instantiation are close, though not necessarily fully overlapping.

As a scope, FRBR is the closest to RiC, since it aims to encompass all "information objects" without a dedicated view on physical or digital objects. PREMIS is (tentatively) close but, in our opinion, the presence of non-digital Representation is not yet very elaborated, and it is rather peripherical than central to the model (which focus on digital preservation). On the other hand, FRBR has certain features that makes it less suitable for use in archival description and so, in using its entities to describe archival ones. Usually, archivists' interest towards abstract entities, like Work or Expression may be considered rather low, since record is rarely regarded as an intellectual or artistic product, but rather an instrument or a by-product of a practical activity (as definitions cited above indicate). As about Manifestation, as it was noticed, *"As entity, the manifestation is the set of all physical objects that shares..."* (Tillett, 2003, p. 10). But creating many copies of a record is barely the norm. Where many copies exist, they may fulfil different functions in different contexts, and this makes them unique, even if the information content and physical form may be identical. A similar distinction was made in PREMIS, where the term "Representation" was used specifically to avoid the term "manifestation" as it is used in the FRBR. *"In the PREMIS model, a Representation is a single instance of an Intellectual Entity held in a preservation repository"*. (PREMIS Data Dictionary for Preservation Metadata, 2015, p. 12), unlike FRBR. This brings PREMIS_Representation very close to RiC_Instantiation.

The term Manifestation used in digital preservation seems to have different meanings for different authors. For A. Brown, according to the definition, Manifestation is data object and it is synonym with Representation. The same word, used in PAAST refers to the actual communication of information, while data object is the Binary Encodings. Using the term Manifestation in RiC would implicitly lead to misunderstandings, since there is no apparent consensus of using the term.

PREMIS_Representation, and Manifestation as it is used by A. Brown seem to be to very close to RiC_Instantiation. It is about the mean used to inscribe information for conveying it, not about the information conveyed to the user (which is abstract before inscribed). Any Intellectual Entity can have multiple representation/manifestation/instantiations. Brown underline the fact that manifestations are "technical representation of the same information object" and they are different than editorial versions of the same information object (Brown, 2013, p. 215), with the example of a cropped photo, which is regarded as a new conceptual object). In similar way, a record instantiated cannot be changed or modified, so a re-instantiation is a new entity, which can (or not) be considered as functional equivalent with the original.

It needs to be emphasized that RiC_Instantiation aims to be carrier/medium independent; it needs to describe both analogic and digital inscription of records, while PREMIS_Representation/Manifestation were shaped for digital realm. Expanding the understanding of PREMIS_Representation open to path to synonymity to RiC_Instantiation, but in this moment it is not clear if there are some fine differences between RiC/Manifestation or Representation or not. So, for now, it may be a good option to use new term, in order to satisfy the description needs. But very likely, in the future, a convergence of meaning will lead to a unification of concepts.

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István Hegedus[1]

HOW ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING CAN HELP RETHINK ARCHIVES?

ABSTRACT

Although artificial intelligence is the product of science-fiction literature, it currently represents a significant branch of computer science dealing with intelligent behavior, machine learning, and machine adaptation. It has become a discipline that attempts to answer real-world problems. Artificial intelligence systems are nowadays widely used in economics and medicine, design or military. The role of archives is changing world-wide. In this grandiose transformation, archives need to be at the forefront of their own future, so that they can steer, guide, and not lose out. The vast masses of information in archives provide an excellent platform for the exploitation of artificial intelligence. The mass of data can be a great help not only for research but also for policy preparation and in some areas of public administration in the not too distant future.

Keywords: *big data, machine learning, artificial intelligence, computational archival science*

1 INTRODUCTION

The vast masses of information in archives provide an excellent platform for the exploitation of artificial intelligence. The mass of data can be a great help not only for research but also for policy preparation and in some areas of public administration in the not too distant future. Although artificial intelligence is the product of science-fiction literature, it currently represents a significant branch of computer science dealing with intelligent behavior, machine learning, and machine adaptation. It has become a discipline that attempts to answer real-world problems. Artificial intelligence systems are nowadays widely used in economics and medicine, design or military.

Globally there is a threat to the funding of local and central archives. In particular we need to be able to demonstrate the value of archives, in terms of both economics and also their broader cultural and evidential worth. (Moss and Thomas, 2019)

There are extraordinary values in the data, in the incomprehensible amount of information around us. And I think that using and exploiting them is key for everyone. Focusing on archival data, in terms of archival data, we are actually talking about the most important data accumulated during our civilization, which preserves the "wisdom of the past," a very significant detail of human knowledge and experience. (Bőgel, 2015) The possibility of data processing and use is growing exponentially. It is enough to think of areas such as health data or different aspects of the use of marketing data. There is no doubt that data alone is not worth much, its true value is given by the myriad variations in processing. Processing a massive amount of data not only in other areas, sectors, but also in the archival field (as one of the origins of humanity's data assets) can give a new push to development and progress, increasing the role and influence of archives. We all see that larger trends affecting the whole profession. The archivists are "subjects" of a great shift from 'print-based industrial society' to 'tech-based internet society' (Theimer, 2018).

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1   István Hegedűs, Head of Department, National Archives of Hungary – Preservation and Digitization Department, Budapest, Hungary, email: hegedus.istvan@mnl.gov.hu.

Like many other professions, archivists and other archivists need to recognize as soon as possible that machines and applications of machine learning will take away many tasks from them. At the same time, more and more other, more sophisticated and higher-quality, more valuable tasks are opening up. You can do jobs in less time that you would never have dreamed of before. The issue of creating lists and brochures, linking archival materials, will certainly be easily done by a machine learning system with artificial intelligence algorithms. Similarly, the organization and systematization of collections and the prioritization of relevant content will be accelerated. Tasks such as analyzing archival data and building a road to analyzability, on the other hand, promise new tasks. In summary, what doesn't seem like an easy and routine task today will definitely be in the future. The tasks that now consume most of your time as co-workers will be replaceable with robots and automated processes using machine learning applications.

2   BIG DATA, AI, ML AND ARCHIVES

Undoubtedly, more and more information and data (both printed and electronic) are generated by state institutions and public collections. It is clear that in these areas, as in the case of human research, there are more and more tools to organize this data into more serious databases, to link more and more connections, to provide different queries, to provide more complex but easier-to-use systems for the community. Just as public collections and archives are forced to handle and navigate the ever-increasing amount of data, so is the need to build increasingly flexible and robust IT infrastructures. The biggest challenge in using Big Data is how to save it in the best and most complete form at a given time.

Institutions use only 20% of their data in practice, with the remaining 80% omitted from both operational and decision-making procedures. Closer collaboration between Big Data and machine learning could bring a breakthrough in this area in the future. What is Big Data? According to a Forbes article, it is an area that is looking for ways to handle, analyze, and turn large amounts of data into useful information. (Sinur, 2019) And according to the relevance of the information released, it is able to provide feedback, which can also increase the usefulness and accuracy of the process in the future. The main question, in our case for archives as well, is how artificial intelligence, more commonly known as machine learning, can support this process and turn it into something that is more useful than data analysis, establishes direct correlations, and even makes suggestions. to better organize master data. The importance of AI or ML lies in the fact that it is able to establish relevant correlations, related threads, small differences between two separate data groups and submit them for further analysis.

According to Bruce, Malcolm and O'Neill (2017) the creative industry is now estimated over £84 billion to the UK economy. The driving force behind the industry's continued success is the growth in digital content consumption. In partnership with Nesta, the Arts & Humanities Research Council (AHRC) and the Arts Council England, and funded through the Digital R&D Fund for the Arts, they organised the ArtsAPI project brought together an innovation lab for digital culture; a design research team at the University of Dundee; and leading semantic data specialists. This transdisciplinary R&D project investigated the connections that underpin the 'relational value' that art organisations generate and the 'impact network' they sustain. As a methodology they used Social Network Analysis. They could enable to develop an IT tool, they call ArtsAPI. The ArtsAPI tool demonstrated the complexity of working with email data and presented the ethical dimensions surrounding such activity. It is however possible for arts organisations to harness creative activity within their own ecosystems, recognising the drivers that create and sustain their networks, allowing them to make more strategic decisions to create robust business models. But it was just one example from many.

As Anthea Seles (2020) said in an ICA webinar, there is a question for archivists about how much access we may wish to allow researchers access to public records and data. We should not fall too much into the possibilities of AI, it is important to pay attention to connected data sets, the semantic web. Companies, which have often digitized entire collections in exchange for a free copy, have realized that tremendous information and value lurks in historical collections. Exploiting these values will always take precedence over collections, so it's time to put on your gloves.

3 OPPORTUNITIES OF MACHINE LEARNING IN ARCHIVES

Archives are the oldest example of the human effort to gather together all information and data. Despite the common goal of collecting data or information, archives and ML datasets are different. Identifying these indicate ML researchers to see the possible diversity of data collection practices and build languages and algorithms which can communicate with the archival systems. (Eun Seo Jo and Timnit Gebru, 2020)

The process of digitization and computerization has, of course, had a very strong impact not only on archives but also on libraries in recent decades. In his study, Péter Király (2018) examined the treatment of data management, data management and data publication as an independent subfield, integration with data science, and the impact of the decentralized web and the semantic web. The presentation of the meetings of the Computational Archival Science in archival data science also appears as a significant part of his article. Among the areas of future archival research, he also includes: "... the application of analytical methods (e.g. text mining, emotion analysis, network analysis) to archival material; analysis for archival processing, such as access to records, identification of personal data, estimation, filing, description of records; scalability in archival services (e.g., identification, retention, metadata creation, integrity checking, normalization, verification, linked data, entity recognition, anonymization, scrapping); new archival forms such as web, social media, audiovisual repositories, blockchain; IT infrastructure for archive-based research and collection development and storage; big data and archival theory and practice; digital care and preservation; crowdsourcing and archives; big data and memory / identity construction; specific big data technologies (such as NoSQL databases) and their applications; archival big data corpora and reference collections; linked data and archives; big data and provenance; preparation of big data research data from archival material; legal and ethical issues."

The article by Eun Seo Jo and Timnit Gebru (2020) is also important in terms of how archives, libraries, and other institutions that collect data on humanity's past can collaborate with researchers in machine learning. Which is also important because the former areas have already dealt with and regulated various ethical, representational and transparency issues.

Other important and interesting areas of research and development are Computational Archival Science as a discipline, which actually combines Big Data and AI / ML directions and methods in order to create the most complete and relevant databases possible from our existing data. A great example of this is either the Morgenthau Holocaust Collections Project or the Computational Treatments to re-member the Legacy of Slavery project (Marciano and Greenberg, 2020). According to Lilley and Moore (2013): "There are some fundamental barriers to the use of big data approaches in arts and cultural institutions. The first is related to the funding environment. The sector currently largely addresses data from too limited a perspective. Too often, the gathering and reporting of data is seen as a burden and a requirement of funding or governance rather than as an asset to be used to the benefit of the artistic or cultural institution and its work. This point

of view is in danger of holding the sector back. It arises partly from the philosophy of dependence, subsidy and market failure which underpins much of the cultural sector including the arts and public service broadcasting. ... The second major obstacle is the limited strategic understanding of or indeed interest in the use of data at senior levels in the cultural sector."

Péter Király, an IT and librarian researcher has another interesting idea about processing medieval documents already published online. In his manuscript he express his intention to develop a multi-level tool which can import data, process natural language, analyse semantically, search in documents and has a statistical part too. His hypothesis is that document types correlates with the semantic character and relevancy of a text. If he could classify documents, researchers could select the appropriate tools and information context of the semantic analyses. (Király, 2015) Related to this, based on the research results of the last two years, researchers have also obtained interesting results in the field of biotechnology by analyzing archival medieval texts. (Connelly et al. 2020)

Goudarouli, Sexton and Sheridan (2018) ask the main question, what is needed nowadays to ensure the reliability and openness of archives? In their view, extremely high quality researchability and research support, experimentation and collaboration with private and public partners is the answer. By researching continuous innovations, it is possible to understand and make methodologies and ethical requirements processable, evaluable and applicable. They can be used to implement and implicate digital developments that make new forms of document management and archival contexts more transparent, acceptable, and applicable to current and future users (government and citizens).

4   MACHINE LEARNING IN PRACTICE

In 2019, the Arts & Humanities Research Council (The Challenges of Big Data, n.d.) funded 21 research programs worth £ 4.6 million, all of which carry out human research in the Big Data field. Digital Transformations aims to exploit the potential of digital technologies to transform research in the arts and humanities. The theme aims to ensure that arts and humanities research is at the forefront of tackling crucial issues such as intellectual property, cultural memory and identity, and communication and creativity in a digital age. They say, that there is huge potential to develop new ways of working to enhance access and creativity, but the digital age also raises complex questions of responsibility, identity, privacy, and data security that need to be addressed. Engineers, computer scientists, and developers are providing the infrastructure for these changes but innovation within the arts and humanities will be essential to exploiting their potential to transform methods of organising, interpreting, and using knowledge. Probing these research issues will engage a broad range of partners in creative and cultural industries e.g. theatre companies, national institutions, galleries, publishing, law, and media companies. The results of research into digital transformations will be of significant benefit to individuals, policy makers, business, cultural organisations, and researchers.

In the UK, there are several parallel projects in the National Archives that are closely linked to the Big Data and AI / ML sciences. The National Archives are undertaking (Digital projects at The National Archives, n.d.) several different initiatives to explore the potential of machine learning technology like: eDiscovery tools for appraisal and selection; Transkribus Handwritten Text Recognition (HTR); PhD projects in sensitivity review and understanding large scale web data, or cleaning crowdsourced data. It is crystal clear that OCR redefined and changed how we think about text-data. It has a revolutionary impact on historical, ethnographical research. The next step is Handwritten Text Recognition (HTR). Recognizing handwritten texts undoubtedly has a great future, but

here perhaps there is an even greater responsibility for the human team who can teach machines to recognize certain types of written documents, as Dunley (2018) shows in a brief example from The National Archives.

In 2017 The National Archives organised a hackathon, where 35 of their colleagues took part. Different teams put their learning into practice and experimented with a wide range of data, tackling various problems faced in the preservation of sand access to digital records. With the help of that event they identified 2 major research field for further investigation. (Bell, 2018)

There were an important news at Nature, in 31 October 2019, when in an article by Davide Castelvecchi (2019) that Venice 'Time Machine' project was suspended because disagreement of international partners. The project was launched as a collaboration between EPFL, the State Archive of Venice and the Ca' Foscari University of Venice. In 2014, all three organizations signed a non-binding memorandum of understanding on how the work would be conducted.The project sought to digitize documents that stretch over 80 kilometres of shelves in the state archive. The reason of suspension was that the agreement didn't specify the type of licensing that would regulate researchers' use of the digitized data - which must also comply with Italian law. We must add, that the rule of law and the details of agreements in a consortium is crucial.

Another example from Australia, the Digital State Archives at NSW State Archives was challenged to explore the application of machine learning to records management with a specific focus on digital disposal. There was two research projects or pilots in 2017 and 2018 with the primary goal of how well the in-house NSW State Archives machine learning model fitted to Corporate and Ministerial Services at the Department of Premier and Cabinet's e-documents. They had a specific purpose to develop an AI tool with which give a useful product to their jurisdiction network. (Humphries, 2018)

In an article by Ryan P. Smith (2017) presented a project from Smithonian Institute. Originally it was a science paper in the Biodiversity Data Journal where scientists examine "deep learning" algorithms to identify differences and similarities between two similar families of plants with rates of accuracy well over 90 percent. They used 8000 samples in the first trial. They wanted to know how the system could catalogue the plant specimens, and the accuracy was over 90 per cent. ML could turn a major time sink into at most a few days of rapid automated analysis.

There was a fine experiment back in 2018 between BBC and The National Archives, when BBC R&D has been developing AI to help programme makers and schedulers search the BBC's archive, which was being used to help BBC Four curate an evening of archive programming. They classified the BBC programmes and add special features of BBC 4, so the AI had to select from 270 000 the top 150 for processing. The candidate programmes were split into scenes using an algorithm. The project was a resounding success in research terms - the techniques and technologies we use have wider application in developing products, services and tools that enable easier access to archive programmes, and the reuse of our archive in new and creative ways. (Cowlishaw, 2018)

5   PROJECTS OF NATIONAL ARCHIVES OF HUNGARY

On April 8, 2019, the Hungarian National Archives and the Russian State Military Archives (RGVA) concluded an agreement about archival documents in accordance with the work plan of the Hungarian-Russian Intergovernmental Archival Cooperation Committee for 2019, kept in the Russian State Military Archives. The agreement contains the digitization of the so-called registration cards or master sheets (in Russian: учётная карточка) of

persons of Hungarian nationality registered as prisoners of war in the Soviet Union and then the migration of the digital obejects to the National Archives of Hungary.

According to the agreement, by the end of December 2019, a total of about 682,131 copies of registration cards will be sent to the Hungarian National Archives, which means a total of 1,364,262 digital recordings, as the registration cards are double-sided. Copies of documents handed over to the Hungarian National Archives also include a Cyrillic database in Russian, which contains the most important information on the registration cards that can be linked to each person: surname and first name of the person registered as a prisoner of war, birth data, place and time of capture. the nationality of the prisoner, the reason and time of leaving the camp, and, if the person has died in the prisoner of war camp, the date of his death and the reason for it. These cards contain only the data of persons who were registered in some form in a Soviet labor or concentration camp.

It should be emphasized that this card system contains data on Hungarians captured by the Red Army, not only those captured during their actual military service during the frontal fighting, but also those who were interned as civilians and then deported to the Soviet Union after 1941.

Processing work will begin in January 2020. It is planned that the online database will be gradually available from Summer 2020. The full data upload will be completed by the end of 2020. The processing of the database in Russian and the digital collection pose significant challenges for both Hungarian historians and the archival profession. The identification of the persons on the cards will be an important task, as the data sets on the cards were in most cases filled in by Soviet soldiers who did not speak Hungarian, and the data collection was handwritten in all cases. The National Archives of Hungary examining the possibility of involving citizens in the control and recording of data.

For the success and efficiency of the project, the application of HTR and ML technologies in the case of prisoner of war cartons is under developing.

6 CONCLUSION

The role of archives is changing worldwide. In this grandiose transformation, archives need to be at the forefront of their own future, so that they can steer, guide, and not lose out.

What might the profession of archivist become in the future? Filing and file protection functions will be performed by machines, semi-professionals and paper specialists. Archival science will be used as a methodology rather than as a stand-alone discipline (interdisciplinarity will increase). Its primary function will be research, research support and education (as well as other professions in the field of public collection), in addition to identifying the collections to be preserved and digitized. The location of the application will not be tied to an institution and a physical collection, hence the institutional models will be completely transformed and merged. Institutional differences between museums, libraries, archives will disappear. Matching collections will be available digitally in one place, even if they will be physically stored elsewhere. The links between digital objects will be made not only by the curators but also by the users themselves, which may even influence their institutional placement.

Archives have not been in the graveyard, and new technologies can bring new opportunities and an accompanying recognition of the importance of what we do. The future in which the skills are needed but require to be adaptive and to embrace new circumstances and challenges. (Brown, 2018) The archive should have a full focus on the user (be it the researcher or an institution of the administration) and serve the development

of the content. Sustainable and automated processes should be introduced as much as possible. Technology needs to be used even smarter and more rationally.

The future is definitely digital. If the thinking of the profession does not change, it does not adapt to the constant changes, then in addition to the otherwise unavoidable risks, we may also face others, not to mention the more complex and uneconomical effects.

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Vlatka Lemić[1]
(Croatia)

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ABSTRACT

Time Machine, the largest and most ambitious project ever created at the intersection of culture heritage and information science, is structured around the development of a large-scale digitization and computing infrastructure capable to map 5,000 years of European history, aims to revive historic data into (virtual) reality. By transforming kilometres of archival fonds, abundant museum collections and various geo-historical data sets into distributed digital information, big data of the past can become common resource for the future that will start and influence various cultural, economic and social shifts.

Regarding huge involvement of archival and cultural heritage sector in this project, as well as possible impact to archives, author presents Time Machines ecosystem, objectives, operation, exploitation avenues and outreach from archives perspective.

Key words: *Time Machine project, big data of the past, cultural heritage, digitalization, information infrastructure*

1 INFORMATION SOCIETY & ARCHIVAL COMMUNITY

The development of digital technologies and the information society are generally considered to be the main driver of cultural, social, economic and other changes in the contemporary environment (Lemić 2019, pp 34). We live in information age which treats information as most valuable resource, while in the same time constant growth of information and daily production on new data far surpass capacities of any human being. Beside the great rise and expansion of technology sector, professions deal with management, processing and use of data also becoming increasingly important for global information and knowledge society, while cooperation and networking in developing and maintaining strategies, policies, tools and solutions that can be globally shared and used are widespread work models in emerging digital era.

Such trends significantly influence archival profession in operational, legal, organizational, technical and many other aspects, changing principles and activities, competencies and corpus of knowledge, as well as setting new standards and priorities. Contemporary archives are expected to be an administrative service regarding records management and preservation, as well as the providers of new information services that should ensure better availability, visibility and presentation of archives and archival sources to the public by using new technologies (Lemić 2019, pp 34). Their engagement

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1   Vlatka Lemić, Ph. D, University of Zagreb, info.icarushr@gmail.com
     Assistant professor Vlatka Lemić, Ph. D. works at University of Zagreb as Head of Archival Office. She is an archival counselor and professor at the Archival Studies Department of the University of Zagreb. She is actively engaged in various international projects and initiatives in the field of information and archival sciences, culture and digital humanities (Creative Europe, Time Machine, DARIAH, AERI). She is vice president of ICARUS, president of ICARUS Croatia, member of ICA EURBICA Executive Board and EGSHAH and Time Machine Ambassador.

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is particularly expected in relation to open access to a archives, and the availability and usability of data/information their hold. This situation is also widely recognized within archival proffesion by outlining that "archive institutions have the task of providing increasing amounts of information, online through the digitization of archives created on traditional media, at a time when public expectations about the speed and efficiency of information retrieval are constantly rising" (ICA 2014, pp 1).

Modern archival science position within information science field closely connects archives with technology, building a bound that lasts for decades and is getting stronger by time, from the introduction of machine readable records, reproduction techniques and computers till contemporary digital archives. On the global scale, this interaction can be traced through the International Council on Archives (ICA) activities and initiatives from the second half of the 20th century until today: from various studies and guidelines dealing with ICT development; diverse expert groups and programs dedicated to non-conventional records and application of technical solutions; various projects considering digital content issues (like the partnership in UNESCO PERSIST programme[2]) to the beginnings of 21 century, described at ICA documents as „challenging environments for archive work" which „has created one vast market place for the creation, exchange and use of information"(ICA 2014, pp 2).

In recent years, ICA considerations of contemporary challenges also includes political issues such as „the Open Government, Big Data and Access to Information agenda that placed archives at the heart of public policy" (ICA 2014, pp 1) and technological changes (including cloud computing and social media) that support the generation of huge quantities of information (ICA 2014, pp 1). Concretely, it is emphasized that „ the creation of 'born digital records' on a spectacular scale, and the mass digitization of archives originally in other formats, is changing fundamentally the relationship between archives and records creators as well as between archives and public users" (ICA 2014, pp 1-2). In order to meet this challenges, ICA proposed key objectives of its action which are directed toward repositioning archives as essential in good governance, administrative transparency and democratic accountability; monitoring and influencing the development and use of new technologies and building capacity in the records and archives profession (ICA 2014, pp 6). The annual International Archival Week events, introduced by ICA in 2019, also support this orientation with campaign themes "Designing the Archives in 21st Century" and "Empowering Knowledge Society" which are designed to convey messages around the globe of archival profession (data and information managers, document managers and archivists) importance to the information society ("ICA International Archival Week", 2020).

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2   PERSIST – the Platform to Enhance the Sustainability of the Information Society Transglobally. Available at https://www.ica.org/en/networking/about-unescopersist

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Picture 1: You Tube channel of National Archives of Australia with presentations from the conference „Lost in the Cloud: Saving Humanity's Digital Documentary Heritage" organized by UNESCO Memory of the World, National Archives and ICA in October 2018[3]
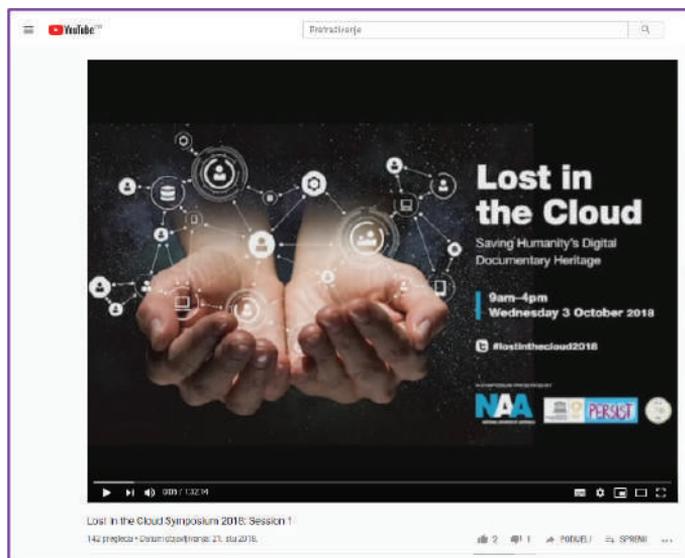
2   EUROPEAN ARCHIVES LANDSCAPE AND CULTURAL HERITAGE DIGITAL TRANSFORMATION

The European archival landscape insight provides a long list of cooperation and networking activities at all levels, particulary regarding development and implementation of professional standards, the transfer of knowledge and the creation of a common information infrastructure. This work is outlined in various reports, documents, policies, studies and projects ranging from the Recommendation R (2000) 13 on the European Policy on the Access to Archives till the Brussels Declaration on the Digital Access to Archives; as well as, from DLM Forum to Archives Portal Europe (APE) activities.

The majority of recent cooperation initiatives and programs in the framework of the EU professional structures is focused on challenges the archives are faced with in the digital era, especially those considering the changing role of the archives in connection with digital record management and e-government, on-site versus online access, the use and re-use of public sector information, digitization, the funding and other ongoing issues (European Commision 2012, pp. 4-5). Beside various professional organizations, the public archives activities are coordinated by official EU bodies, like European Board of National Archivists (EBNA) and the European Archives Group (EAG), which provide archival expertise and perspective in the joint European information infrastructure framework and the implementation of the adopted strategies. Such actions are, for example, making archives in Europe more widely available via the Archives Portal Europe, developing methods for digital preservation in the eARK (Archives and Preservation of Knowledge) project or the CEF eArchiving Building Blocks initiative, while recent issues of their interest include the role of archive services in the EU digital agenda and the digital single market, e-archives and data protection issues (Lemić 2019, pp 36-37).

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3   Picture is taken from National Archives of Australia. Lost in the Cloud: Saving Humanity's Digital Documentary Heritage Symposium available at https://www.youtube.com/watch?v=ajg6asBr0cY&feature=youtu.be (accessed on 12.08.2019)

Picture 2: Archives Portal Europe homepage[4]

At the same time, archives form an integral part of cultural heritage sector, which thanks to Europe reach history and cultural diversity, consisting of a number of professional organisations, networks, infrastructures and platforms in various areas and domains. In last decade they increasingly coordinate their work on building digital capacity in the cultural heritage sector by giving momentum to existing policies and developing of common practices and shared solutions, which is also supported by corresponding EU activities, like establishment of the Expert Group on Digital Cultural Heritage and Europeana (DCHE) foe example.

Majority of European countries actively support digitisation and digital preservation of cultural heritage and provided access to the corresponding digitised resources, through various set of actions – ranging from policy initiatives and legislations like the Recommendation on the digitisation and online accessibility of cultural material and digital preservation (2011/711/EU) and the New European Agenda for Culture, programmes such as the European Year of Cultural Heritage 2018 or the European Framework for action of Cultural Heritage till building of the Europeana, Europe's digital platform for cultural heritage which acts as European cultural hub. Majority of these activities are focused on development of digitisation technologies, digital preservation and innovative cultural projects that will make cultural heritage accessible to all and enhance its visibility.

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4   Archives Portal Europe is available at https://www.archivesportaleurope.net/home (accessed on 10.08.2020)

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Following these trends, in 2019 the Declaration of cooperation on advancing digitisation of cultural heritage was launched with aim to facilitate and promote joint work and better use state-of-the-art digital technologies in addressing risks that Europe's cultural heritage is facing, encompassing three pillars of action:

- a pan-European initiative for 3D digitisation of cultural heritage artefacts, monuments and sites;
- re-use of digitised cultural resources to foster citizen engagement, innovative use and spill-overs in other sectors;
- enhancing cross-sector and cross-border cooperation and capacity building in the sector of digitised cultural heritage ("EU Member States sign up to cooperate on digitising cultural heritage").

In times of global pandemic crisis caused by COVID-19 outbreak, importance of digital access to cultural heritage is additionally emphasized. On 9 May 2020 on the occasion of Europe Day and 70th anniversary of the Schuman Declaration, the European Heritage Alliance Manifesto „Cultural Heritage: a powerful catalyst for the future of Europe" is launched and supported by many heritage community stakeholders. The Manifesto highlights seven incarnated ways in which cultural heritage can act as a **catalyst for positive change, including digital transformation where „Europe** plays a leading role in digital cultural heritage and has the potential to forge ahead with new technologies such as artificial intelligence and machine learning based on humanistic and ethical principles" (European Heritage Alliance 2020, pp. 2). It also outlines collaboration the use of digital technology and expertise, innovation, narrowing digital gap between cultural institutions, as well as critical engagement in education and knowledge sharing (European Heritage Alliance 2020, pp. 2).

Picture 3: Europe Day Manifesto „Cultural Heritage: a powerful catalyst for the future of Europe" campaign[5]

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5   Picture is taken from Europa Nostra available at https://www.europanostra.org/europe-day-manifesto-cultural-heritage-a-powerful-catalyst-for-the-future-of-europe-just-released/ (accessed on 12.08.2019)

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EU-funded Time Machine Project, an ongoing Europe-wide initiative with the joint goal of digitising the entire European cultural heritage, is designed on these fondations with idea of forming a unique alliance between the best European players in the humanities, sciences and technologies for reaching this goal.

3 TIME MACHINE PROJECT

Time Machine: Big Data of the Past for the Future of Europe is a pan-European FET[6] Flagship project launched in 2017 by an interdisciplinary group of academic and cultural institutions and the IT industry. Flagships are visionary, science-driven, large-scale research initiatives (LRSI) addressing grand scientific and technological challenges, launched in the framework of EU Horizon 2020 Programme for Research and Innovation. Time Machine is built around the vision to develop the big data of the past – a widely distributed digital information system mapping the European social, cultural and geographical evolution across times by designing and implementing advanced new digitisation and artificial intelligence (AI) technologies. This large-scale digitisation and computing infrastructure should result with enabling Europe to turn its long history into a living social and economic resource for co-creating a common future (Time Machine Consortium, 2019b)

The fundamental idea of Time Machine (TM) is based on Europe's unique political, economic and social asset – its cultural heritage, marked by multilingualism and interculturalism, which will became available by using space and time as shared references across domains, disciplines and cultures, to understand and give value to constructions, artefacts, observations and data produced over centuries (Time Machine Consortium 2019a, pp 10).

The Time Machine ecosystem includes academic, research and cultural institutions, as well as large businesses and innovative small and medium-sized enterprises, government bodies and associations of the civil society involved in cultural heritage which make it the largest and most ambitious project ever created at the intersection of culture heritage and information sciences. This collaborative network target specific objectives:
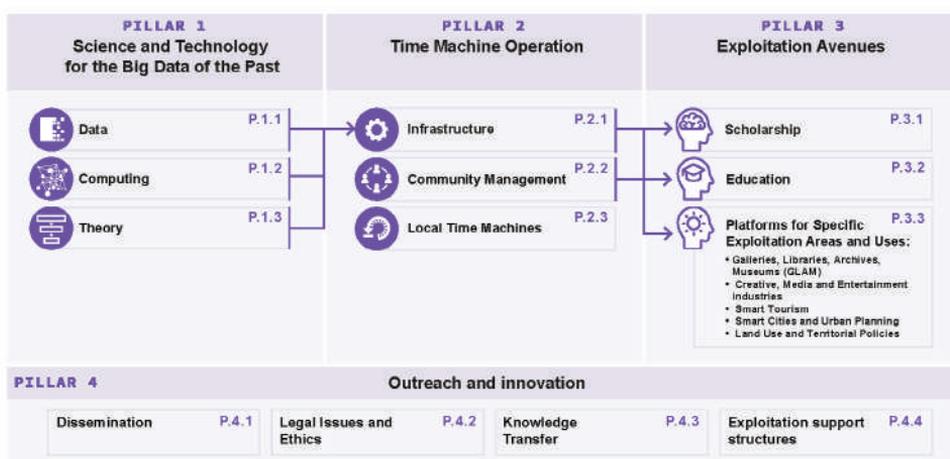
- addressing the scientific and technological challenges in artificial intelligence (AI), robotics and ICT for social interaction in order to develop the big data of the past, while boosting these key-enabling technologies in Europe,

- building the infrastructure for digitisation, processing and simulation that will support a sustainable management and operational model (the "TM franchises" in the form of local Time Machines), as well as create the basis for and engagement with communities (citizens, scientists, innovators) participating in the development and use of Time Machine,

- creating innovation platforms in promising application areas, by bringing together developers and users for the exploitation of scientific and technological achievements, and therefore leveraging the cultural, societal and economic impact of Time Machine,

- fostering favorable framework conditions for the outreach to all critical target groups, and for guiding and facilitating the uptake of research results produced in the course of the Time Machine initiative (Time Machine Consortium 2019a, pp 3).

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6   F(uture and) E(merging) T(echnologies) Flagships

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Time Machine CSA[7] project (1.3.2019 - 28.2.2020), launched by 33 founding institutions under the leadership of Ecole Polytechnique Federale de Lausanne (EPFL), in 2019 brougtht together more than 500 institutions from humanities, sciences, technologies and culture, including 19 nationals archives from Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, Germany, Hungary, Lithuania, Malta, Norway, Poland, Romania, Slovenia, Spain, Slovakia, Sweden and Switzerland (Time Machine Consortium 2019a, pp 5). It is organised through four basic pillars: Science and Technology, Time Machine Operation, Exploitation Avenues and Outreach and Innovation, while project infrastructure is implemented through Time Machine Organization (TMO).

Picture 4: Pillars and thematic areas of TM project[8]

Time Machine is also supported by major initiatives and collaborative platforms related to the digitization of European heritage that will largely benefit from the expected scientific and technological progress. Active involvement of Europeana, Archives Portal Europe (APE), Digital Research Infrastructure for the Arts and Humanities (DARIAH), European Research Infrastructure for Heritage Science (E-RIHS), European Spatial Data Research (EuroSDR), Consortium of European Research Libraries (CERL), International Image Interoperability Framework (IIIF); European Association for Urban History (EAUH), Common Lab Research Infrastructure for the Arts and Humanities (CLARIAH), Joint Programming Initiative Cultural Héritage and Global Change (JPl-CH) and many others provide Time Machine the status of one of the most important stakeholders in future research and professional projects in the field of cultural heritage in Europe.

4 TIME MACHINE OPERATIONS AND TMO ACTIVITIES

During last few years various activities were realized in the framework of Time Machine consortium and a large number of expert communities were involved in the development of guidelines and operational plans for achieving its vision and goals. Various project working groups and experts have developed an extensive ten-year action plan (Time Machine Roadmaps), series of working meetings and workshops

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7   CSI - Coordination & Support Action
8   Picture is taken from Time Machine Manifesto: Big Data of the Past for the Future of Europe, May 2019, pp 13 which is available at https://www.timemachine.eu/wp-content/uploads/2019/06/Time-Machine-Manifesto.pdf

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were organised, organization of annual TM conferences started from 2018, TM News-letter, social networks and communication channels have been launched and numerous TM materials have been published (Factsheet, Newsroom, etc.) for dissemination of project ideas and activities.

The project infrastructure is organized through the Time Machine Organization (TMO), which was formally established in 2019 as a sustainable joint platform for future development and research in technology, science and cultural heritage and their positioning in new Horizon Europe programs for the next decade. By the beginning of 2020, more than 1.000 institutions had joined TMO[9], thus establishing the largest European network of academic, research and cultural institutions and the IT sector. Creating TMO as an institutional framework for sustainable financing and coordination of such a consortium provide cross-sector communication and partnership structure that allows all members to participate in managing the organization, defining research and innovation actions, as well as, in their implementation and development directions.

TMO is oriented on cooperation and ensuring of sustainability and economic independence of the Time Machine project based on strategic objectives such as :
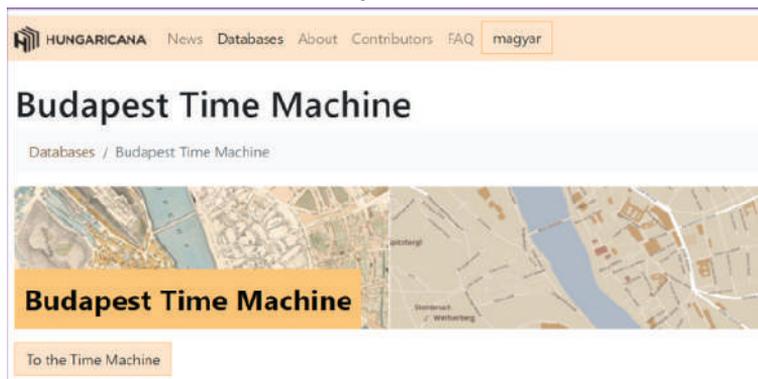
• enabling the technological revolution - development of new "open source" technologies for cultural heritage,

• connecting (community) of cultural institutions, science and industry,

• improving, lobbying and developing new and alternative ways of cooperation and interaction based on a strong inter-institutional and cross-sectoral inclusive approach,

• creating conditions for new technologies related to cultural heritage at national and EU level.

With the completion of the CSA Time Machine project, TMO took over the coordination of Time Machine activities in March 2020. The organization is headquartered in Vienna, with additional offices in Lausanne, Amsterdam and Budapest, engaged in building of network and infrastructure that implements the goals and activities of the Time Machine road maps (servers, databases, platforms, etc.), supporting local TM projects, organizing national TM days, TMO conferences, developing new services and projects, etc.

One of the project key activities is the development of local Time Machines based on the example of Venice in 2013, as a pilot project of this initiative. Several such projects have been launched so far: Amsterdam TM (1500 - 2000), Antwerp TM (1500 - 2000), Barcelona TM, Broumov TM (1200 - 2020), Budapest TM (1680 - 1990), Colone TM (1500 - 2000), Dresden TM (1200 - 2000), Dubrovnik (1400 - 1450), Ghent-Bruges TM (800 - 2000), Innsbruck (1500 - 2020), Jeruzalem TM (2000 BC - 2000), Limburg TM (1000 - 2018), Lower Austria TM (800 - 2000), Luxembourg (1800 - 2000), Naples (800 - 2000), Nuremberg TM (1000 - 2000), Paris TM (1000 - 2000), Regensburg TM (1200 BC - 2000), Utrecht TM (0 - 2018), Venice TM (1000 - 2000) and Vienna TM (1200 - 2000)[10].

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9   A complete list of TMO members is available at https://www.timemachine.eu/members/

10   Intearactive map of local Time Machines is available at https://www.timemachine.eu/timemachines/

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Picture 5: Budapest Time Machine[11]

The Time Machine project is operationally focused on short-term, medium-term (2-3 years) and long-term goals (3+ years), but to achieve the Time Machine vision it is important to continuously provide extensive sources of funding and therefore one of TMO's core activities is realization of LSRI projects at the national and EU level. In doing so, it is vital not only to maintain the activity and engagement of the heterogeneous TM community, but also to enhance collaboration and expand the network to strengthen the voice of cultural heritage initiatives. The launch of TM Project Scouting Service in 2020 aims to support TMO members in the process of forming competitive project consortia and networking areas for submitting high quality project proposals with specific regards to EU funding schemes (see Time Machine Consortium, 2019c).

Building TM local franchises, including tools, standards, economic models and processes, are one of the crucial activities for developing and managing a comprehensive common Time Machine infrastructure. Time Machine seeks to create a kind of "History Streetview" and build 4D representations of cities based on the data from the past, for which historical maps are particularly important. One of the goals is the development of character and image recognition technology, which will enable automatic "reading" of historical maps in order to connect them with geo-references and other historic data like cadastre, ownership documents, lists of works of art, etc. (see Time Machine Consortium, 2019c).).

The medium-term goals of the Time Machine project also include the development of a search engine for access to information about people and places from the past through the functionality of searching handwritten historical documents, iconographic materials and viewing historical maps. A prototype of this platform was demonstrated in 2018, and based on the planned mass digitization that will be made possible by digitization centers across Europe; it will be rearranged in compliance with the International Image Interoperability Framework (IIIF) technology and European standards.

5   CONCLUDING REMARKS ON THE WAY TO REALIZATION OF TIME MACHINE IDEA

Global environment shaped with constant changes and fast ICT development requires flexible and adaptable responds to challenges and needs of contemporary society from archival institutions and archival profession. Archives have become information centres, integral part of national and international government; records management, cultural,

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11 Budapest Time Machine is part of Hungaricana portal and it is available at https://hungaricana.hu/en/
    budapest-idogep/

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education and social inclusion policies, as well as active participants of wider network of educational and cultural institutions that seek to educate society and evoke a shared heritage (see Lemić 2017, pp 128-129).

Majority of ongoing programs, activities and initiatives in archival community are focused on fostering cross borders cooperation and connecting archives with various cultural and scientific institutions, presenting archives to the community, making archival records accessible to everybody, exchanging professional knowledge, creating new services and programs and finding ways for their practical implementation. Also, digital technologies put emphasis of common characteristics and similar problems of traditionally different heritage institutions and bring libraries, archives, museums, documentation centres and others to work together in the creation of common cultural landscape and open access to holdings of heritage institutions. Active partnership between the best European players in the humanities, sciences and technologies in the Time Machine framework, with archives inclusion as well, puts them in positon not just to monitor and influence the development and use of new technologies, but also to actively participate and contribute to further advance the digital use and reuse of their holdings.

Time Machine plans to transform kilometres of archival fonds, museum collections and other geo-historical data sets into a distributed digital information system by bringing together academic research teams, heritage institutions and industry, from major GLAM institutions to leading technology companies in the field of digitization and artificial intelligence. Such interdisciplinary operational environment is indispensable for developing the big data of the past that would launch a new era of open access to sources from history and culture field, as well as provide practical collaborative model for science and technology to actively contribute to safeguarding European identity and democratic values.

Planning and implementation of Time Machine as a global initiative provides required resources for mass-scale digitization and shared computing infrastructure Gathering stakeholders from the humanities, culture, science, IT and research sectors around this project opens the possibility of global collaboration on big set data (big data), artificial intelligence, augmented reality, 3D exploitation of European platforms in line with European values, as well as presenting their own achievements and potentials related to research, innovation, technological development and cultural heritage (see Time Machine Consortium, 2019c).

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