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DIGITAL AGE: TIME TO TRANSFORM OF PUBLIC ARCHIVES

Abstract

In this paper, the author points out that the challenges of long-term preservation of digital records are giving the public archives the inevitable requirement of revolution in their archival practice. The author believes that digitalization and digital transformation are not something that only companies should be thinking about, so they could be as efficient and competitive as possible, but the author believes that the time has come when public archives also need to rethink their business processes. In the paper is thus briefly presented the evolvement of public archives during the different periods of social and technological changes. It presents that public archives can also be transformed into modern digital archives using existing digital technologies.

Key words: *digitalization, digital transformation, digital technologies, digital archival records, Slovenian Public Archives, e-ARH.si*

1. INTRODUCTION

Public archives are of particular importance in all societies because their key mission is to preserve our memories. The records they collect and preserve are used to understand the past and the present easier, and on that basis to choose the direction into the future. For this the precondition is, of course, that the records are safely preserved, which means that they are accessible and usable all the time. The exponential technological development we have been witnessing in recent years results in a changed way of social life. Not so long ago, the records that were created in all spheres of society and which public archives were accepting for preservation and use, were tangible; those were boxes of paper documents, photographs and maps. Modern digital technologies, as we experience them today, are changing the way of creating records. They are becoming digital, and digital technologies are changing the way of their use and, above all, their quantity, which is growing exponentially. Advanced technologies allow us to store every email and practically any other type of digital record we create, since the storage space is not a major problem anymore. This leads to the accumulation of large quantities of digital records, including their duplication, and thus the non-transparency, the inability to search for them quickly and many other risks. Records originally born in digital form can have multiple copies in multiple versions, stored in several different locations, preferably under different names and in different formats. A similar example is found in institutional collections. There may be more than one author of digital records in one research, they may be stored in different repositories in different versions (for example, working version, published version). Versions may be inconsistently labelled in different digital repositories, and there is a risk that changes of one version will not be transferred to all versions in other digital repositories. This also increases the risk of data loss and undermines the authenticity (credibility) of digital records.

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When talking about digital records, it is not fully clarified, unlike of paper records, what record presents the original (Hajtnik, 2017). In addition, large volumes of records are being digitized[2], especially for easier and faster use. This may also mean that we might have the same record stored both, in physical and digital form. More often, however, we have files where we have some records in physical and others in digital form. In this case, we are talking about combined storage, which again requires different approaches and procedures, from taking such records to storage, the way how to store them, as well as the search and further use. An additional problem is the fact that not all digital records are in a presentation form that is easy to understand for humans. In this case, it is necessary to decide how the records will be processed and prepared for future use, while taking into account the technical capabilities of the end user. The diverse nature of digital records (document formats, email, multimedia, data set, code) and the different technologies, which help users to access and use digital records (from desktops to tablets and smartphones) are creating additional challenges.

On the other hand, regarding on today's level of technological development, users expect that services for accessing and using digital archival records are intuitive, transactions simple and results immediate.

For public archives all of this represent new challenges. These are connected to the making the decision, which digital records to keep and how to keep them safe so that we can find exactly those records that we need at any time.

> The time has come when public archives also need to provide services that keep pace with the growing expectations of users, as well as with changes in the way of accessing and using records. The ability of public archives to preserve and to offer for use authentic records, regardless of their format, will determine what evidences will be available in the future to our descendants, in comparison with today.

Since their constitution, public archives were adapting to social and technological change all the time and were subject of various forms of transformation at different times, either for social requirements or for their own needs. They will not be able to avoid this neither in the digital age that we are currently living in. Inversely, now the time has come when they need to think about how to transform and digitalize their processes using the latest digital technologies such as cloud computing, internet of things, 3D printing, artificial intelligence, robotics, mobile technology, social media and others.

2. PUBLIC ARCHIVES IN TIME OF SOCIAL AND TECHNOLOGICAL CHANGES

About ten thousand years ago, when the first radical change in our lifestyles took place, domestication of animals allowed the transition from working on the field to agriculture, the social changes started. The agricultural revolution brought together the power of humans and animals for the purpose of production, transportation and communication. In the spirit of the people's saying, "the nation holds the evidence," societies have recognized the value of public charters at various times, from the ancient Greeks and Romans with their archeion[3] and tabularium[4] through the middle and new ages until the 18th century, when a series of industrial revolutions followed the agricultural revolution. In the Middle Ages, until the rise of cities in the 12th century and the increase in commerce, there were few documents, but the ancient tradition of archiving did not remained, and many doc-

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2   Conversion and capture of records originally produced in physical or electronic analog form into digital form.
3   *Archeion* is the Greek name for the archive.
4   *Tabularium* was the official archive of ancient Rome, and housed the offices of many city officials

uments were also regularly destroyed. With the exception of the papal archives, where the most important records have been preserved, also some evidences of the rights of individuals and institutions has been preserved. In the 16th century, due to the increased volume of records, they introduced the registry books were solved files were registered in chronological order, while older records, which were no longer relevant to the day-to-day business, were filed in the archives. In the meantime, appeared a new profile of an official - an archivist, who was employed by the government and was exclusively taking care of the old records. At the beginning of the 17th century a new type of archives appeared, so-called a secret archives[5] that was centrally organised and closed for the public.

2.1 THE FIRST INDUSTRIAL REVOLUTION: the first modern archives and the term of cultural heritage

The *first industrial revolution*, which has been running from 1760 to 1840, was launched by the invention of the steam engine and the beginning of the construction of the first railways. During this time, the first steamships were made, the first factories were build, all this led to machine production, man begins to exploit the power of machines. During the first industrial revolution, from the secret archives the *first historical archives* were developed, which slowly became overcrowded, as they also kept for the state administration irrelevant records. The archive has finally separated from the registry office, from the treasury of rights of the state it was becoming increasingly a treasury of historical resources.

> *During the first industrial revolution, the **first modern archives** was created, integrated into the state administration and accessible to the general public.*

Interest in historical research work has increased, and as a consequence also the required knowledge of archivists increased. This led to the creation of the first schools of diplomatics[6] and other auxiliary historical sciences in the first half of the 19th century, including archival science as a science of arranging and maintaining archival records. In 1831, the first regulation of non-destroying the old records was adopted. According to the law, the Archive began to take over the records of the institutions that were still operating.

> *The term of **cultural heritage**[7] emerged, which also considered the archival records.*

2.2 SECOND INDUSTRIAL REVOLUTION: First archives in Slovenia

The second industrial revolution happened in the late 19th century and continued into the early 20th century. It was based on the discovery of electricity and the invention of the conveyor belt, which result the beginning of serial production. It marked a turning point, as the internal combustion engine took over the role that previously had the steam engine, invented was the first telephone and with this the transmission of speech, the phonograph as a turntable precursor, a light bulb was patented, the world's first car was made and a wireless telegraph system was established. All this lead to rapid industrialization, progress in transport and communication between people.

> *In the late 19th century, i.e. during the Second Industrial Revolution, the **first archives in Slovenia** were created. They represent institutions for the ingest, storage and preparation of archival records for use.*

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5   The oldest *secret archives* were created in Prussia (1610) and the Vatican (1612). Established in 1749 in the Habsburg Monarchy, it employed officials and individuals to take over the material of the abolished offices. (Wikipedia, 2019a).

6   *Diplomatics* is an auxiliary historical science that examines charters. Based on the language, style, font and materials used, it determines the origin, author and authenticity of historical records.

7   *Cultural heritage* is a property inherited from the past, defined by the community as a reflection and expression of its values, identities, religious and other beliefs, knowledge and traditions. (Delak Koželj, 2009).

2.3 THIRD INDUSTRIAL REVOLUTION AND THE TRANSITION TO THE INFORMATION REVOLUTION: The First Slovenian Archival Law

The third industrial revolution began in the 1960s. The breakthrough was caused by the automation of production due to the development of electronics and computer science, the use of mainframes in the 1960s and personal computers in the 1970s and 1980s. Major changes began with the development of mobile telephony and the rise of the Internet. Together, however, in the form of different social networks, the social standards and relationships between people have completely changed. In the late 70's, the information revolution began, triggered by a marked transition from the industrial to the information age. This period is characterized by an exponential increase in new information and communication technologies (hereinafter: ICT) in microelectronics, computer science (hardware and software), telecommunications and optoelectronics. The mode of communication began to change profoundly, processes became faster and more powerful, and paper records started to be replaced by digital records. The company is becoming more and more an information society, its main feature is being e-commerce and computerization of business.

> During the third industrial revolution, in the late 80s and in early 90s of 20th century, **Slovenian public archives realized the first computerization of one part of their business**. For the purpose of describing archival records they began to use specially developed software.

2.3.1 First Archival Law

> At the time of the information revolution, **the first archival law** was introduced in Slovenia - the Law on Archives and Archival records (1997, hereinafter: ZAGA), which **defined current[8] and archival[9] records** as a **cultural monument.**

ZAGA determines that archival public service in Slovenia is performed by The Archive of the Republic of Slovenia, regional archives[10] and archives of local self-governing communities. In addition to regulating the protection of archives, it also lays down the conditions for its use and the jurisdiction and duties of public archives.

2.3.2 Legal basis for e-commerce

When the National Assembly of the Republic of Slovenia adopted the Electronic Commerce and Electronic Signature Act (hereinafter: ZEPEP) in 2000, Slovenia also received legal bases for e-commerce. Under special conditions, the law recognized the e-signature with the same validity as in the paper world. Along with several other regulations[11],, it mainly set out e-commerce procedures, conditions regarding availability and suitability for later use, and only partly the procedures and requirements for the retention of digital records.

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8   *Current records* are files, charters and other separate records, official books, files, charts, plans, posters, pictorial records, film, sound and other undefined records, regardless of the format of information or the form of its media and digital or analog formats of computer processing along with the software. (ZAGA, 4. člen).

9   Archival records are original and reproduced (written, drawn, printed, photographed, filmed, photographed, magnetic, optical or otherwise recorded) current records received or created in the work of legal or natural persons and has a lasting importance for science and culture (ZAGA, 2. člen)

10 The Republic of Slovenia becomes the founder of the Historical Archives in Celje, the Regional Archive in Koper, the Historical Archive in Ljubljana, the Regional Archive in Maribor, the Regional Archive in Nova Gorica and the Historical Archive in Ptuj with the entry into force of ZAGA.

11 E.g. General Administrative Procedure Act, Administrative Procedure Regulation, Judicial Order.

The technological possibilities and legal underpinnings for e-commerce have led to an increasing amount of digital records, and consequently many issues and challenges. Technology was evolving at an unprecedented rate, hardware and software were rapidly becoming obsolete, and so the question what will happen with digital records after ten, twenty or several hundred years arose. An important fact brought into the Slovenian legal order by ZEPEP was that digital records have evidential value and legal validity. The condition is, however, that they must be kept in a way to be always accessible for the future use, in their original form or the form, which represent them as authentic, and the time of their origin can always be ascertained, and that the technology does not allow changes or deletion of the data. However, the provisions of ZEPEP were not sufficient to comprehensively regulate the preservation of all types of records, as they apply only to those records that were created and also stored in digital form and were not subject to any specific preservation conditions. In doing so, ZEPEP provided a legal basis for the evidential value of a small amount of the records that various organizations encountered in their operations. Authorities and courts were thus, e.g. in most cases, requiring from clients to provide the original record in physical, non-digital form.

2.4 FOURTH INDUSTRIAL REVOLUTION: New Archival Regulations and the New Role of Slovenian Public Archives in Society

By the transition to the new, 21st century, there is the fourth industrial revolution, which is building on the foundations of the information revolution. It is characterized by artificial intelligence[12], robotics, the Internet of Things, autonomous vehicles, 3D printing, virtual reality, nanotechnology, biotechnology and quantum sciences. This began to fundamentally change our lives and transform society, the economy started to be global. The exponential growth of computing capacity and the availability of large amounts of records have begun to foster the impressive advances in artificial intelligence. The fourth industrial revolution is often referred to as Industry 4.0. The term signifies the transition from the already established automation and robotization to a completely new era, characterized by the complete digital integration of business and production processes throughout the supply and sales chain. It integrates mostly known technologies from complex business analytics and artificial intelligence to the connection of physical systems and machines through the Internet of Things. These technologies indicate the development of brand new production and organizational concepts.

2.4.1 New archival regulations

*With the beginning of the Fourth Industrial Revolution coincided in 2006 the **adoption of a new archive law**, the Law on the Protection of Documentary and Archival Material and Archives (hereinafter: PDAAIA). It extends the definition of **archival records**[13] from the cultural heritage only to also the **means of ensuring the legal protection of individuals**.*

PDAAIA extended the protection of records in physical form to the protection of digital records as it regulates the manner, organization, infrastructure and performance of the capture and storage of such records, including the legal effects of such storage. In addition, it arranged:

- the legal system for digital records[14],

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12 Kaplan and Haenlein (2019) define artificial intelligence more precisely as "the ability of a system to interpret external data correctly, to learn from such data, and to use this new knowledge to flexibly adapt and achieve specific goals and tasks."

13 PDAAIA, Article 2.

14 PDAAIA, Article 31.

- information systems for the long-term preservation of digital records,
- destruction of originals after conversion to digital form[15],
- transfers of digital records to new, standardized media and conversions[16] to new formats that are generally suitable for long-term storage, and
- accessibility and conditions of use of digital records.

Since digital records can not be preserved in their original form in the long term[17], as is the case with paper records, PDAAIA also allows the preservation of digital records to preserve equivalent and authentic reproductions of records instead of the previous exclusive preservation of original material.

2.4.2   The new role of Slovenian public archives

> *During the fourth industrial revolution, **Slovenian public archives are given a new, important role** as a regulator in the field of long-term preservation of digital records in Slovenia.*

In order to preserve digital archival records, PDAAIA requires from their creators to adopt internal rules[18] in the form of an internal act for managing these records at all stages of their life-cycle, from creation to storage. It entrusted the Archives of the Republic of Slovenia with the important task of reviewing these internal rules and confirming their compliance with the regulations. The validity of digital records can already be recognized by law on the basis of such approved internal rules and their demonstrable implementation. In addition to regulating the legal validity[19] of preserved digital records, PDAAIA also establishes a legal framework[20] to provide an efficient information infrastructure that can support the capture and storage of all types of digital records. It also introduces legal control of the market for information and communications technology providers and associated services for the purpose of capturing and storing digital records. The supervision was entrusted to The Archive of the Republic of Slovenia, and in the field of qualification of persons who work with current and archival records also to other Slovenian public archives.

At the time of the fourth industrial revolution, in which organizations were accelerating the use of digital technologies to digitalization[21] their business processes and, as a result, creating more and more digital records, another important task was assigned to the Slovenian public archives by PDAAIA. This is the preparation and adoption of uniform

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15 PDAAIA, Articles 13-16.

16 PDAAIA, Articles 28-30.

17 PDAAIA long-term preservation of digital records as preservation over five years (Article 11).

18 PDAAIA, Article 18. More about internal rules and other instruments for ensuring the long-term preservation of digital records in this guide: Hajtnik, T., Škofljanec, J., Zupančič, M., Mrdavšič, A., Vodopivec, J., Dobernik, M. (2018). *Nova arhivska zakonodaja in praksa : arhiviranje, hramba in upravljanje dokumentov za podjetja in ustanove.* [Spletna izd.]. Maribor: Forum Media, 2018 - .

19 PDAAIA, Article 31.

20 Supervision includes mandatory *registration of providers* PDAAIA, Articles 83 and 84) of equipment and services and the possibility of *additional certification of registered equipment and services* (PDAAIA, Articles 85 - 87).

21 The term *"digitization"* encompasses the creation of a digital record (e.g. in electronic form as it exists on a computer) from a physical record e.g. from a digitization paper. Regulation on Current and Archival records in Article 13 defines digitization as "Any form of digitization is considered to be the conversion and capture of current and archival records, originally created in physical or electronic analog form. The term *"digitalization"* refers to the automation enabled by digital technologies. Efficiency can be increased if digital technologies allow previously separate processes to be connected and integrated, thereby reducing production costs and creating opportunities for new customer experiences (for example, allowing customers to access an online catalog). Generally, these services typically enhance or accelerate an existing business without changing its fundamentals.

technological requirements[22] (hereinafter: UTR) in the field of providing long-term storage of digital records. Their purpose is to prescribe in greater detail the scope and implementation of the stages of preparation or organization of the capture and storage of digital records. Following these requirements is binding on all public sector organizations and for businesses seeking legal recognition of their digital records.

3. DIGITAL SOCIETY: NEW CHALLENGES FOR PUBLIC ARCHIVES

Going back to the Fourth Industrial Revolution. According to Schwab (2016), the speed of its development, in contrast to the industrial revolutions, has been developing at an exponential rate and not just at a linear speed in the past. He attributes this to the complex and strongly interconnected world we live in, and to the fact that the emergence of new technology contributes to the development of newer and more powerful technology. Related to the Third Industrial Revolution, digital technologies based on computer hardware and software and networks are becoming more sophisticated and integrated and, as a result, they are transforming society in all spheres of its operations. In the fourth industrial revolution, new technologies and widely used innovations are getting introduced much faster and more extensively than in previous ones, which have not yet been fully completed in certain parts of the world. Today, instead of talking about the digital society, computerization has been replaced by digitalization, and the need for organizations to digitally transform[23] business comes to the fore.

Here, we will not highlight all the benefits, opportunities and challenges that a digital society brings. In the following, we will start from the fact that the way of work and communications is changing due to the rapid technological development, working with digital records and databases is replacing the traditional office business, e-mail replaces classic paper mails, paper forms and applications replacing electronic applications. As a result, we are producing increasing amounts of records exclusively in digital form.

> *Based on a survey conducted, International Data Corporation has predicted that the global data sphere will grow to 163 zettabytes by 2025 (Reinsel, Gatz & Rydning, 2017).*

This is ten times more than the 16.1 zettabyte of data created in 2016. However, the amount of digital records is not even the biggest problem, since today, the storage of digital records does not require so much expenses as did years ago. The bigger problem is that these records are being lost on a daily basis, both by their creators and by public archives (examples: Holehouse, 2019; Ahiers, M.M & Quijano, E., 2009; Sierman, 2019). Gemalto[24] (2019) states that 14,717,618,286 records were lost or stolen since 2013 (Fig-

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22 The Archive of the Republic of Slovenia adopted and published the first uniform technological requirements in 2006 on its website, now version 2.1 applies. (available at http://www.arhiv.gov.si/en/laws_ and_documents/) (July 20, 2019). The 2014 edition of PDAAIA upgraded the document with uniform technological requirements into a regulation adopted by the Ministry of Culture.

23 *Digital transformation* represents a complete change of the organization and its business activities, processes, models, strategies and organizational culture with optimized utilization of digital technologies, their changes, opportunities and impacts, taking into account the current state and looking into the future. It does not focus on Information and communications technologies (hereinafter: ICT) and digital technologies, but rather on optimizing business needs through the efficient use of technology. Important levers are raising awareness and promoting digital transformation, innovating digital business models, digital process optimization, developing digital competences and education, internationalizing digital solutions and services, supporting the deployment and integration of business and ICT standards, adapting digitalization to national and EU environments, and promoting entrepreneurship supporting the introduction of new business models.

24 *Gemalto* is a leading provider of digital security solutions in the world, particularly in the area of authentication, verification and data protection solutions.

ure 1), of which 3,353,172,708 records in the first half of 2018 alone, with an average of 72 records per second, respectively 6,189,074 records each day (Figure 2). That number represents a 72% increase over the first quarter of 2017.

Figure 1: Statistics on records lost or stolen since 2013

Source: Gemalto, 2019.

Figure 2: Frequency of loss or theft of records

Source: Gemalto, 2019.

Most of these losses or places are related to social media[25] records (56.18%) and only a small part to public sector records e.g. governmental records were lost or stolen around 0.41%. Man plays a major role in the destruction or loss of digital records, as evidenced by the recent case of deliberately destroying media from the Austrian Chancellery (Dnevnik, 2019).

Using research data from the Society of American Archivists (2017), at least 3-5% of records lost or stolen are considered to have archival value. So there is a huge gap between the amount of records created today that require security and the amount of records that are actually secured, and that gap will widen - this is the reality of our data-driven world. The IDC predicts that by 2025, nearly 90% of all data generated in the global data sphere will require some level of security, but less than half will be secured (Reinsel, Gatz & Rydning, 2017).

Considering that social media posts can also refer to governmental changes and records, individual creativity, the legal order of individual countries, institutions' websites, etc., it can be said they have a profound impact on society as a whole. This can, be however, an important primary source for future researchers. However, in order for them to understand and explore the past, we must also keep these records. However, in the multitude of records published by individuals, organizations and government institutions, it is extremely difficult to predict which of them will be relevant for the future (Hajtnik,

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25 *Social media* are applications, web services, platforms or websites that build social relationships between people based on modern technological solutions (Wikipedia, 2014).

Živkovič & Uglešić, 2015). Either, because of the need for evidence in legal proceedings or for the preservation of cultural heritage. Public archives should therefore ask themselves as soon as possible if and what is the value of the records posted on social media by government institutions, companies, celebrities e.g. policy, public relations specialist. Or, are advertisements, forums or online stores an important source of information about the culture and society of a nation at a given time? They will need to think carefully about what records they should keep and for how long (due to the later need for reuse, as evidence or as written cultural heritage).

3.1 Development strategy and the first beginnings of the Slovenian electronic archives

Years ago, the Slovenian public archives became aware of all of the aforementioned and came to the realization that the situation they were facing requires an immediate approach to finding solutions. They were aware that, despite their different technological options, they did not have an established or basic environment in which they would be able to retrieve digital records from creators and securely preserve them. The first concrete and successful step in this direction was that they managed to establish in 2006 the important basis for the establishment of the Slovenian electronic archive in the PDAAIA. Article 59 stipulates that The Archive of the Republic of Slovenia, together with the ministry, which is responsible for computerization of the administration, provide information and communication infrastructure for record keeping, storage, use of digital archival records, integration of archives into a single information system and connection to similar systems in the protection of cultural heritage.

As one of the main goals in the field of archival activity, i.e. *the establishment of modern internationally an internationally comparable system of professional and legal protection of archival records*, was also set by the Resolution on the National Program for Culture 2008-2011 (Official Gazette of the Republic of Slovenia, 2008). That is very important for the legal security of the country, its institutions and citizens and their rights. Similarly, the establishment of the Slovenian public e-archive as an environment for e-archiving is one of the goals of the eGovernment Action Plan until 2010 (Ministry of Public Administration, 2007). For the realization of this goal was responsible The Ministry of Culture, which means The Archive of the Republic of Slovenia as a body within this Ministry.

Based on the aforementioned regulations and strategic documents, The Archive of Republic of Slovenia, together with foreign experts, in 2008 prepared a feasibility study[26] on the long-term preservation of digital records and the establishment of a Slovenian e-archive.

> Based on a feasibility study, the **Slovenian public archives**, on the threshold of the fourth industrial revolution, have adopted, and the **Government of the Republic of Slovenia has also approved, the first development strategy of the Slovenian e-archive** (named e-ARH.si) for the period 2010 - 2015 (Ministry of Culture, 2010).

The Slovenian public archives have strategically decided to establish a joint e-archive on their own information infrastructure and in its direct management. The decision was based on the assessment that such a solution is more economically justified than if each archive set up an e-archive for itself, and is the only feasible way regarding the given resources of individual archives, especially financial and human.

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26 Original title: Feasibility Study LTDP – ARS: Feasibility Study for the Implementation of a Long-term Digital Preservation (LTDP) System for the Republic of Slovenia; based on Article 59 of PDAAIA.

However, the state did not provide the necessary financial nor human resources for this purpose. The Archive of the Republic of Slovenia managed to obtain only one tenth of the planned funds for the development of e-ARH.si from the European Cohesion Fund, to which, in accordance with Article 59 of the PDAAIA, it also attracted other regional archives. The e-archiving process was defined in accordance with ISO 14721 standard. The OAIS reference model. This standard deals with e-archiving from the point of view of three important areas (Figure 3). The first relates to the environment where digital records are created, that is, the environment in creators. The second is an environment that is in the domain of public archives, and which preserves digital records taken over from creators. The third area represents solutions that enable users to find, access and use digital records. In each of these environments, a series of processes are taking place that archives wanted to support methodologically and technologically. Given the experience and expertise of working with digital records at the time, and, last but not least, financial and human resources, they were only able to realize the plans of the first strategy partially. The implementation[27] mainly refers to the creation of a software tool for creators to prepare and submit to archives certain types of digital archival records, namely unstructured files and databases. For the long-term preservation of digital archival records, an electronic repository (repository for digital archival records) has been established, represented by an open source software solution and infrastructure at three geographically distanced locations.

Figure 3: E-archiving process according to OAIS reference model
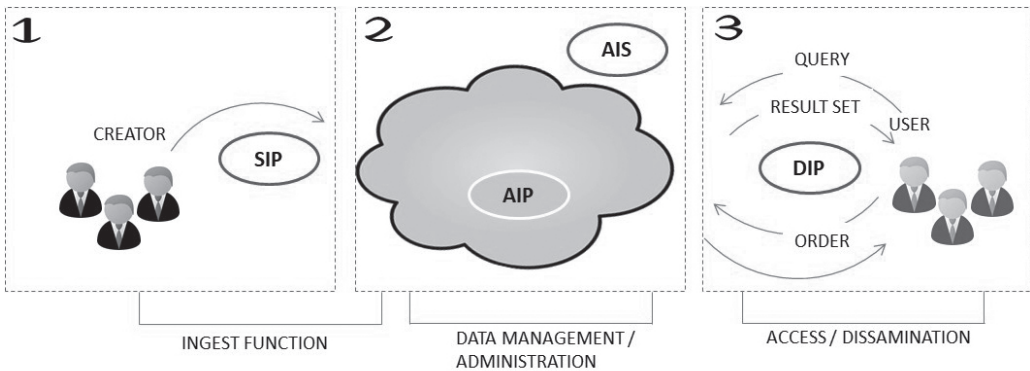
SIP – Submission Information Package
AIP - Archival Information Package
AIS - Archival Information System
DIP - Dissemination Information Package

Source: Author's

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27   More about the realization of the first development strategy of the Slovenian public e-archive in the article Hajtnik, T. (2015). Na poti do slovenskega elektronskega arhiva. V: Volčjak, J. (ur.). *Arhivi na razpotju : zbornik referatov : 27. zborovanje*. Ljubljana: Arhivsko društvo Slovenije, str. 143-152.

3.2 Further development of the Slovenian public e-archive

At the end of 2015, the Slovenian public archives completed the period of the first development strategy for the Slovenian public e-archive. In the meantime, the problem of preserving digital records in Slovenia has also become also the governmental strategic issue in Slovenia. In addition to the benefits and opportunities of digital society, the threats and dangers of digital society have been identified. In the field of cultural heritage, as the opportunity for the digital society was recognized the development of creative content and the creation of new and/or enriched offering of digitized cultural heritage, digitization on the field of education and research, culture and media, and increased production of digital media content. On the other hand, the loss of digital cultural heritage was recognized as a threat to the digital society in the public sector, thus reducing legal certainty and the difficulty of reusing data due to an inadequate system for archiving and preserving digital records.

In response to the perceived threats and dangers of the digital society, Slovenia adopted the Strategy for the Development of the Information Society until 2020, shortly called Digital Slovenia 2020, prepared by the Ministry of Public Administration (2016). It identified key strategic development orientations and integrated strategies into a single strategic development framework. It also included the further development of e-ARH.si, including the establishment of a digital archive for film and other audio/video archival records and of a center for the digitization of archival records.

> All these strategic documents formed the basis for the new Strategy for the Further Development of e-ARH.si for the period 2016 - 2020 (Ministry of Culture, 2016), prepared by the Slovenian public archives, and approved by the Government of the Republic of Slovenia in March 2016.

Particular attention was paid to the access and continued use of digital archival records to all interested users, regardless of their capabilities. The ultimate goals of the development and establishment of e-ARH.si include:

• contributing to the optimization of the basic functions of eGovernment and improving the internal efficiency of eGovernment operations,

• providing and developing a quality management service for Slovenian cultural heritage and, consequently, legal certainty for the country, its institutions and individuals,

• increasing the interoperability of linking public sector basic data sources, thereby increasing access to archives in terms of cultural heritage and legal certainty.

In accordance with the dynamics of the reorganization of informatics in the state administration, the e-ARH.si strategy envisages the placement of certain solutions of the e-ARH.si system in the Government Cloud Computing[28], setting up by the Ministry of Public Administration.

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28 Government Cloud Computing (GCC) is a computing infrastructure for direct budget users, providing them with storage, development, business and other capabilities in the form of services and the ability to achieve quickly their business goals using the concept of cloud computing. The infrastructure is owned and operated by the government and provides services that use sensitive, personal and other data and information that the government does not want to store outside its environment. (NIO, 2019).

Among the anticipated products of the implementation[29] of the implementation plan of the second strategy for the period 2016 - 2020, the Slovenian public archives included, among other things, the digitalization of key phases in the e-archiving process (Figure 4), which replaced the "manual" procedures with automated ones, namely:

Figure 4: Digitalization of individual phases in the e-archiving process
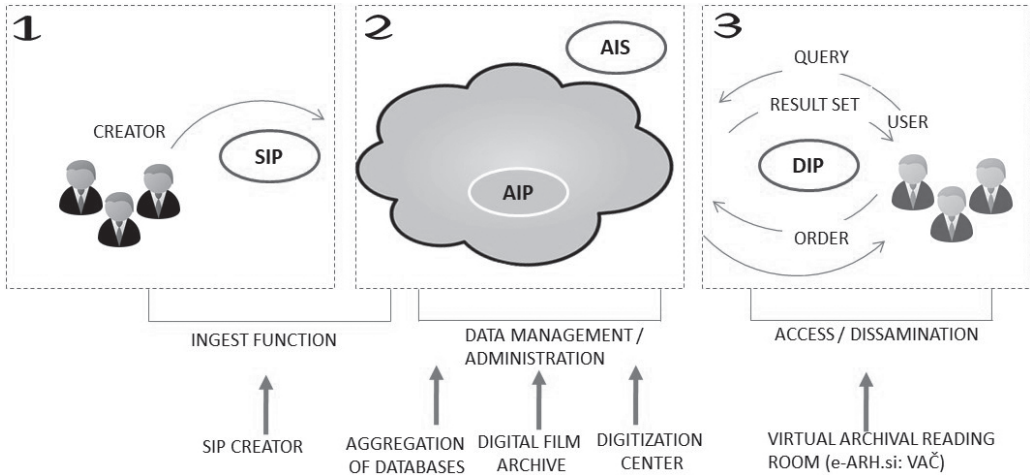
Source: Author's

The process of preparing and delivering digital records from creators to archives (Ingest function)

The Acquisition Process provides the services and functions of receiving submission information packages (SIPs) from creators, preparing records for storage and managing in the archive. Takeover features include e.g. preparation and acceptance of SIPs, implementation of quality control of SIPs, generation of archival information packages. This process, especially the preparation of digital archival records for delivery to archives, has proven to be a challenging task in the past, both for the creators of those records and for archives. It required a great deal of negotiation, coordination and verification. In order to simplify and standardize this process, Slovenian public archives have developed a special software tool SIP Creator, thereby at least partially digitalized the process of delivering digital archival records. The tool enables the creator to organize and list digital archival records for delivery in the form of a pre-defined structure of the SIP and to verify and validate it before being transferred to the archive.

Data Management and Administration process in the archival repository

Aggregation of archival databases: After ingesting digital archival records from creators to archives, those are stored in the archival repository, where their metadata is stored together with the records themselves. In Slovenian public archives, there are two databases of fonds and collections of archival records, which function as their archival information system. The first is the database of The Archive of the Republic of Slovenia, and the second is common to the other six regional archives. The existing solution, from a user standpoint, does not allow simultaneous inquiry in both databases, which is why the Slovenian public archives have identified this deficiency as the absence of a "national content aggregator" for the field of archival activity. One of the strategic goals of the

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29 More about the realization of the first development strategy of the Slovenian public e-archive in the article Hajtnik, T. (2016). Nadaljnji razvoj slovenskega javnega arhiva do leta 2020. V: Hartman, M. (ur.), et al. Doksis 2016 by Media.doc : zbornik. Ljubljana: Media.doc, str. 55-65.

e-ARH.si strategy for the period 2016 - 2020 is also merging the two databases into one database and one web user interface for searching through the single (common) database. In this way, Slovenian public archives establish new organizational, business, information and archival professional solutions.

Digital Film Archive: The Archive of the Republic of Slovenia also receive and preserve film (on film or digital form) and other A/V records. One of the strategic goals of the development of e-ARH.si is the establishment of its own digital film archive as an integral part of the e-ARH.si system. One of its key tasks is taking over film and other A/V records and digitizing those records that are still in analogue form. The entire workflow is supported by special software that enables the preparation, import, review and validation, conversion, labeling, basic manipulation and accessibility of archival film and A/V records and their preservation (short and long term).

Digitization Center: Regardless of the fact that the original form of the paper archival record proves its legal value, it should be borne in mind that over time this form may become unusable. That is why Slovenian public archives have established a digitalization center and equipped it with modern scanners for converting records from physical to digital form. The whole process of digitization is supported by special software. It represents professional technological-organizational procedures for converting contents and visual form of records from their physical to electronic form in order to provide material protection of archival records (protection against damage) and to ensure fast and wide access to archival (cultural) content.

The process of accessing and retrieving archival records (Access / Dissemination Function)

Archives should allow all interested users to access the records they preserve. This process is carried out within the framework of the user service in the archives reading room, which the Slovenian public archives wanted to digitalize. For this purpose, they have designed the concept of a virtual archives reading room e-ARH.si: VAČ. This provides all the key functionalities in support of basic reading processes, such as e.g. user registration, search, ordering, delivering, use of records, control of use and recording and making statistics of use. By allowing digital archives to be remotely accessed, the virtual archival reading room will provide support to different types of users and their needs; from complete archival laymen to advanced archival professionals and technical administrators, including users from vulnerable groups (blind, partially sighted, deaf). Its concept envisages effective ways of automating reading processes and interactive virtual communication and providing archival professional help (Koncilija & Hajtnik, 2018). Technically, the concept of e-ARH.si: VAČ is designed as a modular and technologically sophisticated, constantly evolving, scalable and secure information system.[30]

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30 More on Digitalization of the Reading Process and the Concept of the Virtual Archive Reading Room e-ARH.si: VAČ in Two Papers:

  - Koncilija, Ž., & Hajtnik, T. (2018). Koncept virtualne arhivske čitalnice : e-ARH.si: VAČ = Concept of a virtual archival reading room : e-ARH.si: VARR. V: Škoro Babić, A. (ur.). Arhivi v službi človeka - človek v službi arhivov : simpozij : zbornik znanstvenih prispevkov z recenzijo = Archives in the service of people - people in the service of archives : symposium : proceeding book with peer review. Maribor: Alma Mater Europea – ECM, str. 154-162.

  - Koncilija, Ž., Hajtnik T., Jenuš, G., Paulič, A., & Pfajfar, V. (2018). Virtualizacija čitalniških postopkov : od ideje do koncepta. Moderna arhivistika : časopis arhivske teorije in prakse, ISSN 2591-0884. [Spletna izd.], letn. 1, št. 1, str. 95-114, ilustr.

We have mentioned only a few archival procedures, which are being updated by Slovenian public archives with the implementation of the e-ARH.si strategy for the further development of e-ARH.si in the period 2016 - 2020, and are now being transferred from the archival practice to the digital world.

4. MODERN DIGITAL TECHNOLOGIES: NEW OPPORTUNITIES FOR SLOVENIAN PUBLIC ARCHIVES

The implementation of the e-ARH.si Further Development Strategy implementation plan has begun several years ago. Digital technologies have improved over the years, and archives have gained a great deal of knowledge and experience in managing digital archives. This is a good basis for their future work, and they will need to adapt their digital work to the development of digital technologies and to use the new technologies properly. Given the characteristic of the digital society, on the one hand, the exponential growth in the number of digital records and, on the other, the expectation and demand of end users to access these records as quickly as possible, the time has come when traditional archives have to be transformed from static repositories of paper and digital records to dynamic service centers that will serve both, end users and professionals within the archives. In doing so, they can benefit from the use of new digital technologies to help them improve the quality of their services and improve their business efficiency. Since public archives have been facing financial and staffing problems since their formation, the overwhelming reason for studying new digital technologies and implementing them is the great potential for savings in business and record management.

By using modern digital technologies, Slovenian public archives will be able to further improve and simplify their work processes and thus provide better services. As soon as possible, they will need to think carefully about what records they should keep and how long, according to their large exponentially growing volumes and their increasing complexity, intertwining, rapid variability and multiplication, e.g. records on websites and social networks. Therefore, the contents of websites and social networks should become the subject of archival professional research and discussion as soon as possible, both from the point of view of their appraisal and the search for a way of long-term preservation, and last but not least, their future use (Hajtnik, 2017).

Digital records can be contextualized, so Slovenian public archives will need to find new opportunities to describe the context in connection with other digital record collections using digital technologies. It will take a transition from a period of silos, fragmented information held by different institutions, to distributed data.

At this point, we must ask ourselves what archival processes could be digitalized using existing digital technologies.

4.1 Digitalization of the process of searching and accessing archival records in physical form in archival repositories[31]

Slovenian public archives currently store well over 70 km of archival records, mostly written records on paper, as well as parchment, microfilm, film and other recording media. These records are preserved in geographically distant repositories. The process of finding the right record in these repositories is complex and, above all, time consuming. In addition, there is a high risk that once the record is taken out of the repository and it is not returned to the same location. On the other hand, it might happen that the files of

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31 *Archival repositories* are properly arranged and secured spaces where documentary and archival materials are stored.

records are not returned completely. All processes of searching and giving the records in physical form to users are manual. The process of searching for records in physical form in an archival repository can be significantly simplified by using different technologies, one of them being, for example. RFID[32] technology (Radio Frequency IDentification) or radio frequency identification. With this technology, it is possible to keep a much more consistent record of archival records, which would reduce the number of "misplaced" records. The point of RFID is actually a sticker paced to each box with archival records. By using RFID technology, it is also possible to inventory records much faster on shelves, as we only "walk" with the reader between shelves. Such a solution can also result in significant savings in staff costs, improving the service of giving archival records for use, preventing the theft and easy checking of inventories, managing the archival depository, while providing archival records for use in expected time. Using RFID technology, it is also possible to analyze large volumes of records and make them available to internal and external users, or systems.

4.2 Machine appraisal and record selection using artificial intelligence tools

As long as the records were only on physical media, usually paper, archivists were completely sovereign in managing them, which begins with appraisal and selection at the creator and continues with acquisition and long-term preservation and further use. Dealing with digital records, however, this is unlikely to be the case (Hajtnik & Škoro Babić, 2018). We estimate that the "manual" appraisal and selection methods used for records on physical media, regarding the complexity and exponentially increasing volume of digital records, will not be easily transferred to the digital environment. Artificial intelligence tools provide archivists with almost limitless possibilities. Machine learning technologies provide archives with radically new abilities and capabilities. The challenges of appraisal, selecting and reviewing the sensitivity of born digital records might only be solved by using artificial intelligence tools.

4.3 Proving the integrity and authenticity of archival digital records using a combination of artificial intelligence and blockchain technology

Due to our priceless value, archival records hold the status of the cultural monument. They are part of current records, which, in addition to their lasting importance for history, other sciences and culture, also have a permanent significance for the legal interest of legal and natural persons. Therefore, one of the key tasks of public archives is to assume the responsibility of ensuring the continued integrity and authenticity of these records from the moment the digital archival records are taken over from the creators. Today, this is done primarily by calculating a hash value for each archival unit of digital records taken over to archives, and it is stored and preserved with the record in the e-repository. The combination of blockchain technologies and artificial intelligence can more effectively identify potential changes or tampering with digital records, thus protecting the integrity and authenticity of archival digital records. Some archives around the globe have already approached these solutions. E.g. The National Archives (TNA) is researching and introducing this technology through the Arcangel project, which is expected to provide the right answers and solutions within two years (University of Surrey, 2019).

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32 RFID is a technology for transferring data between the reader and the electronic tag for identification purposes. The tag consists of an integrated circuit (chip) that stores and processes data and performs modulation and demodulation of signals. The other part of the transmitter is an antenna that receives and transmits radio signals. The RFID signals from the transmitters are received by the RFID reader, which allows identification of the objects to which the transmitter is attached.

5. CONCLUSION

A short walk through history shows that public archives, like many other organizations, had to adapt to social and technological changes since their formation. This also applies to Slovenian public archives, which were actually unrecognizable in the society until the adoption of PDAAIA and its subordinate regulations in 2006. The adoption of new archival regulations, in addition to a number of new professional tasks those regulations gave to Slovenian public archives, also caused them to start adapting themselves to the challenges of the digital age.

Social media, open data, big data and record management issues such as freedom of information, privacy, open government and security all point to new trends that shape new views on records, their value, their role, and management. The impact of digital technology not only changes the nature of records, but also the way people and organizations in society behave, communicate and conduct their business. Considering the direction in which the development of digital technologies and thus the society is going, Slovenian public archives will have to make many radical changes to their business. Only in this way will they be able to fulfill the increasing expectations of the users of their services. The e-archive, which is being developing for almost ten years, will be the first generation of the e-archive. It will mostly simulate current archival practices, which are based on paper record management. Today is the time when Slovenian public archives have to think about a new vision for the second generation of e-archive and come up with a new "digital" strategy together with its implementation plan. However, in order to be able to achieve this, they will have to upgrade their current knowledge of digital records management and understand all the risks involved. Employees of archives need to start paying more attention to the learning about and understanding the opportunities offered by modern digital technologies and use that knowledge in the archival practice. The strategic goal of Slovenian public archives in the next five years after the completion of the development of the first generation of e-archive should be to provide services in completely new ways and to form and provide completely new services using new digital technologies. For the next five years, a comprehensive digital transformation is awaiting Slovenian public archives.

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