Traditional vs. Virtual Archives

– The Evolving Digital Identity of Archives in Germany

by

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Second revised and improved version

Soon available as *wiki* in Polish and English: (planned for 2017).

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MIĘDZY TRADYCYJNYM A WIRTUALNYM ARCHIWUM

NARODZINY CYFROWEJ TOŻSAMOŚCI ARCHIWÓW W NIEMCZECH
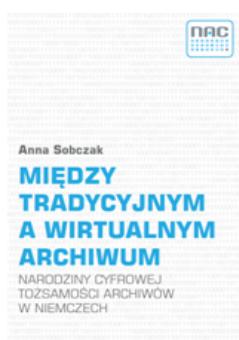
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Introduction

The last two centuries witnessed an enormous change in the quality of archival records management in Europe. In the 19th century, as a result of social, political, administrative and economic changes rooted in the French revolution, archives emerged as separate institutions and archivists became state officials. Historians, though still strictly supervised by archivists, were first granted permission to use archives for research. The two world wars in the first part of the 20th century caused huge loss of material and dispersal of archival records. Then, the beginning of the cold war brought no more favourable circumstances for either reconstruction of decimated archives[1] or information exchange between institutions. Broadening the scope of rights to access and reuse public information in the late 1980s and early 1990s resulted inimportant changes in the common access to archival records for the citizens, with changes in the law to information access and reuse. Electronic processing of archival description and scanned copies became widespread, including in the internet, which further supported the development of information society, a new and more open state, as well as an economy where information became a most precious commodity. The dynamics of these changes can be explained by the following factors listed by C. Gränström:

- technological development, which contributed to the creation of cheap and easy communication tools, including data transfer and data processing carried out by people living far away;
- democratisation, including wider access to education and information, raising awareness of citizens' rights and economic development;
- internalisation, manifesting itself in standardising personal data regulations, copyright and related issues, as well as access to information, transparency of administration and access to state documents;
- change in social structure resulting from technological development and privatisation of public areas previously belonging to the state[2].

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[1] Reconstruction of archival records should be understood as: conservation of damaged archival holdings, recovery of stolen items or relocation in order to protect them from destruction (for instance, during a war), creating joint finding aids for fonds divided by national borders as well as merging dispersed collections such as scanned documents, microfilms or any other form of reproduction.

[2] Ch. Reinicke, *Neue Nutzungsformen von Archivgut im Landesarchiv Nordrhein-Westfalen Personenstandsarchiv Brühl*, in *Zwischen Tradition und Innovation. Strategien für die Lösung archivischer Aufgaben am Beginn des 21. Jahrhunderts*, ed. V. Kinle, Siegburg 2002, p. 87; M. Cook, *Access to archival holdings and unique library materials*, in *World Information. Report 1997/98*, Paris 1997, pp. 328-329, [access: 29.01.2013], http://www.unesco.org/webworld/wirerpt/wirenglish/chap24.pdf.

The transformation of attitude towards online accessibility of information also had a big influence on shaping the place of archives in the information society. Archives wanted to become brokers of information at the same level as libraries and similar institutions. Moreover, implementation of information technologies improved the quality of services provided and allowed the introduction of new ones. Higher social requirements stimulated by the development of business services added an extra factor. Also the European Commission (EC) pressed for building information society and democratising access to information. As the 20th century turned into the 21st the above-mentioned factors came together and seemed to finally manage to break the isolationist trend, which served the exchange of information and cooperation among European archivists well. This was facilitated by the Dutch presidency of the European Union at the end of the 1990s. The first "*Report on archives in the European Union"* was written at that time, covering the situation at the time and areas for possible development. The accession of ten new member states, closely followed by the second report on archives setting out the archival policy for the member states[3], were further steps forward in strengthening cooperation. As a result, some important concepts of cooperation on hybrid[4] archival heritage were created at community and European levels[5]. The most important included DLM-Forum

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[3] *Raport o archiwach w Unii Europejskiej po rozszerzeniu. Pogłębiona współpraca archiwalna w Europie – plan działania*, J. Szymańska trans., Warsaw 2011, [access: 12.08.2012], http://www.archiwa.gov.pl/images/stories/RAPORT%20O%20ARCHIWACH%20W%20UNII%20EUROPEJSKIEJ%20.pdf.

[4] *Hybridakte*, in *Terminologie der Archivwissenschaft* [online], 2012, [access: 13.12.2012], http://www.archivschule.de/uploads/Forschung/ArchivwissenschaftlicheTerminologie/Terminologie.html; M. Janiak, *Biblioteka cyfrowa, biblioteka elektroniczna, biblioteka wirtualna*, in *Biblioteki cyfrowe*, eds. M. Janiak, M. Krakowska, M. Próchnicka, series: Nauka–-Dydaktyka–-Praktyka nr 135, Warsaw 2012, p. 19.

[5] EU cultural initiatives are open to non-EU countries from Europe.

(mainly for electronic records), INSAR (*Information Summary on Archives*) – a periodical published in 1995-2005, and the online portal, Archives Portal Europe (APE)[6].

When it comes to archival holdings and contacting users via online services, the introduction of new technologies turned archives into increasingly virtual organisations. It can be said that a new type of archives – a virtual archives – emerged as an institution with specific roles and tasks because of the need to manage archival holdings of both digital native and digitized content. Currently, however, the nature of archives is mixed, or hybrid, and they include records that are both digitized and born digital. Institutions possess partly integrated electronic systems for records management, into which paper finding aids will eventually be converted. Systems for scanning and electronic records management and accessibility, are are becoming more and more popular. In Germany there is a notable willingness to build a unified electronic environment. Such an environment would be used to store information and digitized copies of original archival records together with those born digital within a particular archives through which national access to all archival holdings would be possible.

Digitization, in its full meaning, is understood as multi-stage process, including all activities from the selection of material, through scanning, to preservation on digital data carriers and access through the Internet. This issue will be explained in detail in the chapter on the origins of digitization.

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[6] *Raport o archiwach w Unii Europejskiej po rozszerzeniu…*, op. cit., pp. 7-216; S. Nawrocki, *Państwowa służba archiwalna w RFN*, in *Historia, archiwistyka, ludzie. Księga pamiątkowa w pięćdziesiątą rocznicę powołania Archiwum Państwowego w Rzeszowie*, eds. J. Basta, G. Zamoyski, Warsaw–Rzeszów 2000, p. 211; H. Hofmann, *Towards Greater Coordination of Archival Activities in the European Union: Achievements and Perspectives*, in *Archives in the Society. ICA Pre-Congress Meeting – Vienna 2004. Papers of the International Conference Elbląg, May 22-24, 2003*, ed. W. Stępniak, Warsaw, 2003, pp. 28-29; *European Archives Group* [online], [access: 12.08.2012], http://ec.europa.eu/transparency/archival_policy/eur_arch_group/basis_en.htm; L. Turek-Kwiatkowska, *Z dziejów służby archiwalnej. Archiwa na Pomorzu Zachodnim w latach 1808-1914*, Warsaw 1968, p. 5; H. Robótka, B. Ryszewski, A. Tomczak, *Archiwistyka*, Warsaw 1989, pp. 311-316; D. Nałęcz, *Archivist – a custodian of cyberspace*, in *Archives among the Memory Institutions. Papers of the International Conference Warsaw, May 28-29, 2004*, eds. A. Biernat, W. Stępniak, Warsaw 2004, p. 40; L. Gidlöf, *Improving the Knowledge of the Common User – Information Neutrality or History Didactics?*, in ibid., pp. 91-109; C. Gränström, *A Society of Information – Protection of an Access to Information,* in *Accessibility of Archival Materials in Compliance with the Law and General Practices of the States of Central and East European Countries. Material of the International Conference Mądralin, October 15-16, 1999*, ed. W. Stępniak, Warsaw 2000, pp. 41-45; C. Gränström, *Archives in the Modern Society*, op. cit., pp. 11-13; M. Glauert, *Archiv 2.0. Vom Aufbruch der Archive zu ihren Nutzern*, in *Archive im digitalen Zeitalter. Referate des 79. Deutschen Archivtages in Regensburg*, ed. H. Schmitt, Siegburg 2010, p. 54; *Wytyczne dobrej praktyki. Aplikacje kulturalne. Instytucje lokalne – pośrednicy w accessie do źródeł elektronicznych. Wskazówki projektu CALIMERA*, [access: 17.03.2012], pp. 181-182, http://consilr.info.uaic.ro/uploads_lt4el/resources/docpolWytyczne%20dobrej%20nauki_%20Calimera%20calosc.doc, pp. 181-182; *Poradniki DGM – Wskazówki sieci doskonalenia PULMAN*, [access: 23.04.2012], http://www.pulmanweb.org/DGMs/DGMs-Polish-Ver-Sep02.doc, p. 3; D. Giersberg, *Archive im Wettbewerb um Dienstleistungsqualität*, Goethe Institut [online], [access: 23.09.2012], http://www.goethe.de/wis/bib/dos/bip/typ/de3072732.htm.

The following research presents the changes in virtualisation[7] and dematerialisation[8] of archival holdings. Some German archives, where digitization trends could be observed from the beginning of the 21st century, are used here as an illustration of this process.

Public archival institutions make use of developments in IT technology either by creating databases of holdings and making them accessible online, or by digitizing their holdings and accumulating electronic content[9] produced by a growing number of authorities, companies and institutions[10]. The opportunity of automating the digitization of archives and the work of archivists opens a new virtual world and eventually makes archives available through the Internet. The process of transformation is a consequence of development and implementation of technologies and provokes reflection on the new ways that memory institutions are becoming digital, which give rise to a new identity[11]. New IT solutions not only pose challenges, but also provide archives with new opportunities to fulfil their main tasks, such as accession, storage and processing of archival records, as well as making them electronically accessible. To process analogue content, specialist software is needed, whereas the digital content is processed almost automatically, because electronic records management systems provide the necessary metadata automatically. These days, due to the domination of the analogue material, digital accession and records management can only be carried out on a limited scale. In the future, however, the processes will be carried out electronically with interoperable ICT systems providing the transfer of data as one of their services. The matter of online accessibility and storing

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[7] The following nouns: digitalisation, virtualisation, electronisation, quantisation and binarisation, are in this thesis all treated as synonyms and they mean: transferring an analogue item into a digital format.
K. Schmidt, *Digitalizacja, cyfryzacja czy dyskretyzacja i jaka?*, in *Cyfrowy świat dokumentu. Wydawnictwa, biblioteki, muzea, archiwa*, ed. H. Hollender, Warsaw 2011, p. 52.

[8] A. Ullmann, P. Rösler, *Archivierung von Netzressourcen des Deutschen Bundestages*, 1st draft, Veröffentlichungen aus dem Parlamentsarchiv des Deutschen Bundestages, [access: 11.10.2012], http://www.bundestag.de/dokumente/parlamentsarchiv/oeffent/arch_netz_gross2.pdf, pp. 10-11.

[9] Electronic content includes: electronic documents, geodata, websites and all kinds of other items in digital form fulfilling the criteria of archival material.

[10] It can be assumed that in the future electronic records will include not only records produced by state offices and their customers, but also electronic legacy collections and other archival materials in binary form.

[11] The adjectives digital, virtual and electronic are treated here as synonymous. Rassalski confirms in his articles published in "Archiwsta Polski" that such practice is common, however, he also notes this may cause some confusion.
B. Rassalski, *W kierunku archiwów dnia jutrzejszego (część I)*, „Archiwista Polski" 2001, 1, pp. 31-32; idem, *W kierunku archiwów dnia jutrzejszego (część II)*, „Archiwista Polski" 2001, 2, pp. 57-58.
Library science has a similar problem when attempting to differentiate libraries by labelling them with different adjectives (see for instance: E. Chmielewska-Gorczyca, *Ku bibliotece wirtualnej*, "Zagadnienia informacji naukowej", 1/1996, pp. 3-13). However, A. Radwański says in his article: *Biblioteka wirtualna - problemy definicyjne* [online], [access: 3.05.2011], (http://ebib.oss.wroc.pl/arc/e008-02.html, that all three terms have been accepted as synonyms by professional literature. One of the examples is: S. Ross, *Przesiadka w WIGAN: digitalne zabezpieczanie i konserwacja zbiorów a przyszłość nauki*, [orginal title: *Changing Trains at Wigan: Digital Preservation and the Future of Scholarship*], E. Mątwicka trans., Toruń 2003. B. Matusiak also sheres this opinion in *Organizacja wirtualna*, op. cit., pp. 475-476 czy M. Janiak, *Biblioteka cyfrowa…*, op. cit., pp. 15-35. The terms have been also accepted as synonyms by professional German literature e.g.: M. Gross, J. Kunz, op. cit., p. 514.

is similar. As far as electronic and digitized holdings are concerned, the process of ordering and direct use is getting more and more automatic. But the issue of traditional and not yet digitized data carriers is rather different, as much of the process concerns managing information about them[12].

The following research questions have been asked in the course of completing this thesis:

- How does the implementation of information technology change the direction of archival records management?

- How does the informatization of archives influence interactions with users and the accessibility of analogue records?

- How does the developing virtualisation of archives influence the new role and tasks of archivists?

- To what extent is the virtualisation of archives possible?

- What are the aims and what is the meaning of digitization?

- What is the role of standards in archival description and the exchange of information?

The book covers all the major networks of national archives operating in the Federal Republic of Germany, including Bundesarchiv (Federal Archives) and state archives (*Landesarchiv* or *Staatsarchiv*)[13].

The contemporary structure of German archives fully corresponds to the administrative division of the country. The Bundesarchiv serves authorities at the governmental level and the state archives operate at the state level. They both function under one label of national archives. Another group is the archives created to take care of the archival materials produced in a particular town, municipality or district. Church, business, personal and gentry's archives, as well as archives of parliament, political parties, associations, high schools, academic institutions and media all add additional flavour to the archival environment in Germany.

This research covered the period from 1970 for the Deutsche Demokratische Republik (DDR) (German Democratic Republic) and from 1972 for the Bundesrepublik Deutschland (BRD) (Federal Republic of Germany), to the 2nd quarter of 2011 in united Germany. 1970 was chosen in DDR's history because the Forschungsgruppe Inforamationsrecherchesystem

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[12] D. Giersberg, op. cit.
[13] National archives include:
federal: Bundesarchiv,
state: Landesarchiv Baden-Württemberg, die Staatliche Archive Bayerns, Landesarchiv Berlin, Brandenburgisches Landeshauptarchiv Potsdam, Staatsarchiv Bremen, Staatsarchiv Hamburg, Staatsarchive in Hessen, Landesamt für Kultur und Denkmalpflege (Landeshauptarchiv Schwerin, Landesarchiv Greifswald), Niedersächsisches Landesarchiv, Landesarchiv Nordrhein-Westfalen, Landesarchivverwaltung Rheinland-Pfalz, Landesarchiv Saarbrücken, Sächsisches Staatsarchiv, Landeshauptarchiv Sachsen-Anhalt, Landesarchiv Schleswig-Holstein, Die Thüringischen Staatsarchive.

der Staatlichen Archivverwaltung (Scientific Group for the System of Information Research in the Administration of the State Archives) was created in that year. In BRD, on the other hand, the EDV-Ausschuss (Commission on Electronic Processing of Data) was established at the Archivreferentenkonferenz (ARK) (Conference of the Directors of the Bundesarchiv and State Archives). The cut-off date for this study of the continuing process of the emerging digital identity of the German archives was determined by the launch of a beta version of the archive content browser in a European portal called Archives Portal Europe[14], co-created by some German archivists. That event is perceived as a watershed, the first time when a single database containing descriptions as well as digitized copies of records was created and made available through the Internet jointly by national archives from twelve European countries. It was a real European phenomenon, because earlier archivists had been focused on integrating the electronic archival aids at the national, administrative or local levels and had not undertaken global IT projects. This event shows the value and meaning of using international standards for description and archival information exchange, without which international cooperation and online access to finding aids and records would be not possible.

The main method employed in this thesis is comparative method, namely that developed by W. Moszczeńska. The broad and general aim is to seek and establish similarities and/or differences between the researched objects which may appear similar or different on the surface. Comparative studies allow conclusions that are impossible to make if each phenomenon is looked at separately. They support broader generalisation about the development of particular object of research inquiry. Studying the analogies between a range of selected institutions at the same or similar stage of development, over the same period and in the same territory, reduces the risk of contradictions and errors. Other, but equally important, tools were the quantitative method and questionnaires with open questions sent by e-mail to the state archives. The quantitative method allowed for data to be obtained which could not be directly noticed due to the lack of a previous classification or processing[15]. The questionnaire was needed to get information not presented in books, journals or elsewhere.

The topic of digitization of archives and informatization of archives based on the case study of Germany in the form presented below has not been fully researched before. It is, however, the most current issue that archivists from German national and other archives are dealing with. No academic works presenting analysis, comparisons and conclusions on this broad issue

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[14] http://www.archivesportaleurope.eu
[15] J. Topolski, *Metodologia historii*, Warsaw 1984, pp. 342-344, B. Miśkiewicz, *Wstęp do badań historycznych*, Poznań 1976, pp. 229-234; W. Moszczeńska, *Metodologii zarys krytyczny*, Warsaw 1968, pp. 248-259.

or portraying the technological changes in accessing archival information and records have been published so far. In comparison to other texts about IT achievements in particular archives, this work delivers a broad spectrum of issues backed by detailed research followed with summaries. The first research works on informatization and archiving electronic records appeared in the 1970s in Germany, mainly in the professional periodicals such as "Der Archivar"[16]

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[16] A. Menne-Haritz, *Büroautomation und Schriftgutverwaltung. Der Stand der Entwicklung und Überlegungen zu den Konsequenzen für die Archive*, „Der Archivar" 1988, 3, [access: 17.02.2013], http://hdl.handle.net/2027/mdp.39015072446456; idem, *Indizierung oder konventionelle Verzeichnung*, „Der Archivar" 1985, 4, [dostęp: 17.02.2013], http://hdl.handle.net/2027/mdp.39015072446605; idem, *AIDA-SH – eine Großrechnerlösung im Einsatz. Erfahrungsbericht über die EDV-Einführung im Landesarchiv Schleswig-Holstein*, „Der Archivar" 1987, 4, [access: 17.02.2013], http://hdl.handle.net/2027/mdp.39015072446605; A. Ullmann, *Der EDV-Ausschuß der Archivrererentenkonferenz des Bundes und der Länder 1972-1994*, „Der Archivar" 1998, 4, [access: 17.02.2013], http://hdl.handle.net/2027/mdp.39015072446787; B. Kappelhoff, *Die Nutzung der Datenverarbeitung in den niedersächsischen Staatsarchiven, insbesondere für die Verzeichnung und Erschließung moderner Archivalien*, „Der Archivar" 1994, 2, [access: 17.02.2013], http://hdl.handle.net/2027/mdp.39015072446 464; J. Milz, *Zum Einsatz der elektronischen Danteverarbeitung im Archiv*, „Der Archivar" 1971, 3, [access: 17.02.2013], http://hdl.handle.net/2027/mdp.39015072446746; *EDV-Planung im Archiv – Planungs- und Entscheidungsprozesse. Grundlagenpapier des Automatisierungsausschusses des Internationalen Archivrats*, „Der Archivar" 1997, 4, [access: 17.02.2013], http://hdl.handle.net/2027/mdp.39015072446472; H. Höing, *ADV-gestütztes Informations- und Dokumentationssystem für Archive (AIDA). Ein vorläufiger Bericht aus dem Bereich der niedersächsischen Archivverwaltung*, „Der Archivar" 1983, 2, [access: 17.02.2013], http://hdl.handle.net/2027/mdp.39015072446753; H. Romeyk, *Zum Einsatz der EDV im Archiv. Erfahrungen im Hauptstaatsarchiv Düsseldorf bei Erschließung eines Bildbestandes*, „Der Archivar" 1975, 3, [access: 17.02.2013], http://hdl.handle.net/2027/mdp.39015072446449; H. Weber, *Der Computer im Archiv – zeitgemäße Arbeitshilfe oder modische Spielerei*, „Der Archivar" 1987, 4, [access: 17.02.2013], http://hdl.handle.net/2027/mdp.390150724 46605; W. Moritz, *Wofür Datenbanken? Zum Stand der archivischen EDV-Ausstattung und den Perspektiven für die Nachlaßverzeichnung*, „Der Archivar" 1987, 4, [access: 17.02.2013], http://hdl.handle.net/2027/mdp.3901507 2446605; W. Schüler, *Datenverarbeitung im Hessischen Hauptstaatsarchiv. Multifunktionale Gesamtlösung mit vernetzten Arbeitsplatzcomputern und Großrechneranschluß*, „Der Archivar" 1988, 4, [access: 17.02.2013], http://hdl.handle.net/2027/mdp.39015072446456; K. H. Meyer-Uhlenried, U. Meindl, *Voraussetzungen für ein integriertes, automatisiertes Dokumentationssystem*, „Der Archivar" 1970, 2-3, [access: 17.02.2013], http://hdl.handle.net/2027/mdp.39015072446746; M. Wettengel, *Zur Rekonstruktion digitaler Datenbestände aus der DDR nach der Wiedervereinigung. Die Erfahrungen im Bundesarchiv*, „Der Archivar" 1997, 4, [access: 17.02.2013], http://hdl.handle.net/2027/mdp.39015072446472.

and "Archivmitteilungen"[17]. Those texts focused on explaining the details of technology implementation in particular archives or whole networks. Some other articles touched upon the meaning of services that information society was provided with, especially access to archival information[18]. Interest in the issue of digitization[19] began to develop in the second half of the 1990s when it was initially compared with microfilming. In this and the following period the first guidelines were also prepared to explain the need to introduce tested solutions for digitization projects[20], displaying scanned documents in the Internet[21] and constructing websites[22].

[17] B. Brachmann, *Die heuristische Umsetzung von informationstheorethischen Kenntnissen im Archivwesen*, „Archivmitteilungnen" 1970, 3; B. Fröhlich, D. Hebig, *Rechnergestützte Arbeit auf dem Gebiet der Bewertung und Bestandsergänzung. Zur Arbeit mit dem Programmpaket REVEKAS (REchnergestützte Vereinfache KASsation von dienstlichem Schriftgut)*, 1983, 4; E. Müller, H. Welsch, *Zur Programmierung der Erfassung und Übernahme von dienstlichem Schriftgut und Archivgut*, „Archivmitteilungnen" 1980, 4; idem, *Zur Programmierung der inneren Ordnung von Archivbeständen*, „Archivmitteilungnen" 1979, 4; idem, *Zur Programmierung der Verzeichnung von Archivgut*, „Archivmitteilungnen" 1976, 2; idem, *Zur Programmierung des Bewertungsverfahren*, „Archivmitteilungnen" 1974, 1; I. Rösler, *Zur Programmierung der Aktenplanung und Aktenbildung*, „Archivmitteilungnen" 1981, 2; *Archivwesen der Deutschen Demokratischen Republik. Theorie und Praxis*, ed. B. Brachmann, Berlin 1984; J. Hartman, *Zur Erschließung von Archivgut auf der Grundlage von Deskriptoren*, „Archivmitteilungnen" 1974, 1; J. Hartmann, E. Hartstock, H. J. Schreckenbach, *Informationsaufbereitung und Informationswiedergewinnung. Bericht über eine Arbeitsberatung zum Informationsrecherchesystem*, „Archivmitteilungnen" 1975, 3; K. Meyer, *Tendenzen der Entwicklung auf dem Gebiete der Informationsträger und – Speicher für die Zwecke der Archivierung*, „Archivmitteilungnen" 1970, 2; R. Ziesemann, *Einige Probleme der EDV im Archivwesen*, „Archivmitteilungnen" 1976, 5; S. Schlombs, *Zur Vorbereitung des Computereinsatzes im Staatsarchiv Schwerin*, „Archivmitteilungnen" 1988, 2; K. Kleinwächter, *Zur rechnergestützten Verwaltungsarchivarbeit*, „Archivmitteilungnen" 1988, 2; H. Scholta, *Projekt zur Rationalisierung der Verwaltungsarbeit im Archiv der Staatlichen Zentralverwaltung für Statistik*, „Archivmitteilungnen" 1983, 4; B. Fröhlich, D. Hebig, op. cit.; H. Herz, *Verwendung von Kerblochkarten bei der Bestandserschließung. Versuch einer Bilanz*, „Archivmitteilungnen" 1970, 3; H. Weiß, *Einige Aspekte zukünftiger Informationsspeicher*, „Archivmitteilungnen" 1970, 3; B. Brachmann, Die heuristische…, op. cit.; E. Suckow, *Moderne Informationsspeicher*, „Archivmitteilungnen" 1971, 5; I. Hebig, *Die Bewertung von Informationen auf modernen Datenträgern*, „Archivmitteilungnen" 1987, 5.
[18] G. Maier, *Archive als Informationsdienstleister in der digitalen Welt. Bestandsaufnahme und Perspektiven am Beispiel des Landesarchivs Baden-Württemberg*, in *Staatliche Archive als landeskundliche Kompetenzzentren in Geschichte und Gegenwart. Zum 65. Geburtstag von Volker Rödler*, ed. R. Kretzschmar, Stuttgart 2010, series: Werkhefte des Staatlichen Archivverwaltung Baden-Württemberg Serie A/22.
[19] H. Weber, M. Dörr, *Digitisation as a Method of Preservation* [online], [access: 7.11.2012], http://www.clir.org/pubs/reports/digpres/digprep.html, (German version: *Digitalisierung gefährdeten Bibliotheks- oder Archivguts. Digitale Beiträge zu archivischen Fachfragen Nr. 1. Abschlußbericht der Arbeitsgruppe "Digitalisierung" des Unterausschusses Bestandserhaltung der Deutschen Forschungsgemeinschaft*, 1996, [access: 18.07.2012], http://www.landesarchiv-bw.de/sixcms/media.php/120/46628/digitalisierung_gefaehrdeten_archivguts_DFG.pdf).
[20] M. Dörr, *Planung und Durchführung von Digitalisierungsprojekten*, in *Digitale Archive und Bibliotheken. Neue Zugangsmöglichkeiten und Nutzungsqualitäten*, eds. H. Weber, G. Maier, Stuttgart-Berlin-Köln 2000.
[21] K. Uhde, *Archive und Internet* [online], [access: 30.10.2010], http://archivschule.de/publikation/digitale-texte/archive-und-internet.html; *Das Internet-Archiv*, in *Die Rolle von Archiven in Online-Informationssystemen*, eds. F. M. Bischoff, W. Reininghaus, Münster 1999; P. Flamme, U. Herkert, V. Viergutz, *Hinweise zur Darstellung staatlicher Archive und Archivverwaltungen im WorldWideWeb des Internet* [online], [access: 28.10.2010], http://www.archivschule.de/publikation/digitale-texte/hinweise-zur-darstellung-staatlicher-archive-und-archivverwaltungen-im-worldwideweb-des-internet.html?PHPSESSID=3e2952a2c0ff0342c29924b89fa1ec32.

They were prepared by experts and supported by the Deutsche Forschungsgemeinschaft (DFG) (German Research Community)[23]. Retrospective conversion of archival finding aids, using international standards for archival description[24] and preparation of electronic inventories[25] have also become important issues[26]. In 2002–2007, as part of the Minerva project, reports[27] on the state of digitization in Germany were published. Some analysis can also be found in the works by the Fraunhofer-Institut für Intelligente Analyse- und Informationssysteme from

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[22] K. Uhde, *Archive und Internet*, http://archivschule.de/publikation/digitale-texte/archive-und-internet.html, 30.10.2010. This topic was also mentioned in an article entitled: *Das Internet-Archiv*, in *Die Rolle von Archiven in Online-Informationssystemen*, eds. F. M. Bischoff, W. Reininghaus, Münster 1999; P. Flamme, U. Herkert, V. Viergutz, *Hinweise zur Darstellung staatlicher Archive und Archivverwaltungen im WorldWideWeb des Internet*, [access: 28.10.2010], http://www.archivschule.de/publikation/digitale-texte/hinweise-zur-darstellung-staatlicher-archive-und-archivverwaltungen-im-worldwideweb-des-internet.html?PHPSESSID=3e2952a2c0ff0342c29924b89fa1ec32.

[23] H. Weber, M. Dörr, op. cit.

[24] B. Gau, *Das deutsch-amerikanische Projekt „Gemeinsames Fachkonzept Online-Erschließung. Zur Übertragbarkeit der Encoded Archival Description (EAD) auf die archivische Praxis in Deutschland*, in *Online-Findbücher, Suchmaschinen und Portale*, series: Beiträge des 6. Archivwissenschaftlichen Kolloquiums der Archivschule Marburg, ed. A. Menne-Haritz, Marburg 2001; M. Black-Veldtrup, *DFG-Projekt: „Deutsch-amerikanische Arbeitsgruppe Online-Findmittel”*, „Der Archivar” 2000, 4, [access: 15.09.2012], http://www.archive.nrw.de/Archivar/hefte/2000/Archivar_2000-4.pdf; N. Brübach, *Entwicklung von Internationalen Erschließungsstandards*, „Archivar” 2008, 1, [access: 4.08.2012], http://www.archive.nrw.de/Archivar/hefte/2008/ausgabe1/Archivar_2008-1.pdf; E. Kutzner, *Von Papritz zu ISAD(G) und EAD*, „Archivar” 2008, 3, [access: 4.08.2012], http://www.archive.nrw.de/Archivar/hefte/2008/ausgabe3/Archivar-03-2008_Internet.pdf; N. Bickhoff et al, *Schlussbericht an die DFG zum Projekt: Deutsch-Amerikanische Fachkonzeption Online-Erschließung*, 2001, [access: 4.08.2012], http://www.kulturerbe-digital.de/dateien/daagead1215857983.pdf; N. Brübach, *Internationale Erschließungsstandards in der deutschen Erschließungspraxis,* in *Archive im digitalen Zeitalter. Referate des 79. Deutschen Archivtages in Regensburg*, ed. H. Schmitt, Siegburg 2010.

[25] K. Uhde, Kontextbezogene *Online-Präsentationen von Archivgut*, in *Digitale Archive und Bibliotheken. Neue Zugangsmöglichkeiten und Nutzungsqualitäten*, eds. H. Weber, G. Maier, Stuttgart-Berlin-Köln 2000, pp. 233-244; H. Weber, *Digitale Konversionsformen von Archivgut – attraktive Nutzung, problematische Erhaltung*, in *Archive im zusammenwachsenden Europa. Referate des 69. Deutschen Archivtages und seiner Begleitveranstaltungen 1998 in Münster*, Siegburg 2000, pp. 212-215; G. Maier, *Qualität, Bearbeitung und Präsentation digitaler Bilder,* in *Digitale Archive und Bibliotheken. Neue Zugangsmöglichkeiten und Nutzungsqualitäten*, eds. H. Weber, G. Maier, Stuttgart-Berlin-Köln 2000.

[26] *Online-Findbücher*, *Suchmaschinen und Portale*, ed. A. Menne-Haritz, Marburg 2002.

[27] M. Hagedorn-Saupe, G. Maier, *Germany*, in *Coordinating digitisation in Europe. Progress report of the National Representatives Group: coordination mechanisms for digitisation policies and programmes*, 2002, [access: 8.07.2012], http://www.minervaeurope.org/publications/globalreport/globalreppdf02/germania.pdf; A. Ermert et al, *Germany*, in *Coordinating digitisation in Europe. Progress report of the National Representatives Group: coordination mechanisms for digitisation policies and programmes*, 2003, [access: 8.07.2012], http://www.minervaeurope.org/publications/globalreport/globalrepdf03/germany.pdf; A. Ermert et al, *Germany*, in *Coordinating digitisation in Europe. Progress report of the National Representatives Group: coordination mechanisms for digitisation policies and programmes*, 2004, [access: 8.07.2012], http://www.minervaeurope.org/publications/globalreport/globalreport/globalrepdf04/germany.pdf; A. Ermert et al, *Germany*, in *Coordinating digitisation in Europe. Progress report of the National Representatives Group: coordination mechanisms for digitisation policies and programmes*, 2005, [access: 8.07.2012], http://www.minervaeurope.org/publications/globalreport/globalreport/globalrepdf05/germany.pdf; A. Ermert et al, *Germany*, in *Coordinating digitisation in Europe. Progress report of the National Representatives Group: coordination mechanisms for digitisation policies and programmes*, 2006, [access: 8.07.2012], http://www.minervaeurope.org/publications/globalreport/globalrepdf06/Germany.pdf; U. Schwens, Germany, in *Coordinating digitisation in Europe. Progress report of the National Representatives Group: coordination mechanisms for digitisation policies and programmes*, 2007, [access: 8.07.2012], http://www.minervaeurope.org/publications/globalreport/globalrepdf07/Germany.pdf.

2007[28]. Another useful resource for this thesis were the strategies and recommendations on digitization prepared by some archives[29] and developed by the Conference of the Directors of the Bundesarchiv and State Archives[30]. They refer to European Union (EU) policies on shaping the information society and stimulating cultural institutions to engage with it. The recommendations on this issue made by the European Commission have been also introduced, as their influence on the changes in developing digitization in Germany can be observed[31]. As well as these, various handbooks on digitization and building functional and user-friendly websites[32],

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[28] *Bestandsaufnahme zur Digitalisierung von Kulturgut und Handlungsfelder*, [access: 9.09.2012], http://www.deutsche-digitale-bibliothek.de/pdf/bkm_end_01.pdf.

[29] *Strategische Leitsätze für den Einsatz neuer Techniken der Digitalisierung zur Verbesserung der Zugänglichkeit des Archivguts und zu seinem Schutz – Digitalisierungsstrategie für die Jahre 2006-2010*, Stand: März 2006, [access: 30.10.2011], http://www.bundesarchiv.de/imperia/md/content/bundesarchiv_de/fachinformation/digitalisierungsstrategie.pdf; *Digitalisierung im Bundesarchiv. Strategie für den Einsatz neuer Techniken der Digitalisierung zur Verbesserung der Zugänglichkeit des Archivguts und zu seinem Schutz 2011–2016*, 2011, 16 p., [access: 30.10.2011], http://www.bundesarchiv.de/imperia/md/content/bundesarchiv_de/fachinformation/informationstechnologie/digitalisiertesarchivgut/digitalisierungimbarch2011_2016fv.pdf; *Das Landesarchiv Baden-Württemberg in der digitalen Welt. Strategie für die Integration von analogem und digitalen Archivgut, die Digitalisierung von Archivgut und die Erhaltung digitalen Archivguts*, 2007, [access: 30.10.2011], http://www.landesarchiv-bw.de/sixcms/media.php/120/43034/Digistrategie_labw2007web.pdf, also published in „Archivar" 2008, 1, pp. 15-19.

[30] *Digitalisierung von Archivgut im Kontext der Bestandserhaltung. Positionspapier der ARK ausgearbeitet von den Fachausschüssen „Bestandserhaltung" und „Sicherung und Nutzung durch bildgebende Verfahren – Fototechnik"*, 2008, [access: 8.07.2012], http://www.landesarchiv-bw.de/sixcms/media.php/120/42353/digibest.pdf.

[31] *i2010. Biblioteki cyfrowe*, [access: 8.09.2012], http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2005:0465:FIN:PL:PDF; *i2010. Europejskie społeczeństwo informacyjne na rzecz wzrostu i zatrudnienia*, [access: 8.09.2012], http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2005:0229:FIN:PL:PDF; *Raport z Lund – koordynacja w zakresie digitalizacji* [original title: *eEUROPE: creating cooperation for digitalisation – Lund Principles*], ed. M. Śliwińska, M. Marcinek trans., Toruń 2003, 30 p.; *Karta Parmeńska*, [access: 17.03.2012], http://www.icimss.edu.pl/minerva/download/Karta_Parmenska.doc; *Plan działania z Lund* (*Lund Action Plan*), [access: 9.09.2012], ftp://ftp.cordis.europa.eu/pub/ist/docs/digicult/lund_action_plan-en.pdf; *Zalecenie Komisji z dnia 24 sierpnia 2006 r. w sprawie digitalizacji i udostępniania w Internecie dorobku kulturowego oraz w sprawie ochrony zasobów cyfrowych (2006/585/WE)*. Dziennik Urzędowy Unii Europejskiej L236/28, 31.08.2006, [access: 8.07.2012], http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:236:0028:0030:PL:PDF.

[32] *Digitisation. Standards Landscape for European Museums, Archives, Libraries*, ed. ATHENA WP3 Working Group Identifying Standards and Developing Recommendations, Rome 2009, [access: 13.12.2013], www.athenaeurope.org/getFile.php?id=435; *Draft. Digitisation Guidelines for Creating Digital Still Images*, ed. Alexander Turnbull Library National Library of New Zealand Copying and Digital Services, 2003, [access: 7.11.2012], http://www.natlib.govt.nz/downloads/Creating_digital_still_images.pdf; *Handbook for Quality in Cultural Web Sites. Improving Quality for Citizens. Version 1.2 – Draft*, ed. The Minerva Working Group 5 Identification of User Needs, Contents and Quality Criteria for Cultural WEB Applications, 2003, [access: 24.08.2011], http://www.minervaeurope.org/publications/qualitycriteria1_2draft/qualitypdf1103.pdf; *Minerva. Technical Guidelines for Digital Cultural Content Creation Programmes*, version 2, 2008, eds. K. Fernie, G. De Francesco, D. Dawson, [access: 13.12.2012], http://www.minervaeurope.org/publications/MINERVA%20TG%202.0.pdf; *Poradniki DGM…*, op. cit.; *Principles for Cultural Websites: a Handbook*, ed. The Minerva Working Group 5 Identification of User Needs, Contents and Quality Criteria for Cultural WEB Applications, 2005, http://www.minervaeurope.org/publications/qualitycommentary/qualitycommentary050314final.pdf; *Quality Principles for Cultural Websites: a Handbook*, ed. The Minerva Working Group 5 Identification of User Needs, Contents and Quality Criteria for Cultural WEB Applications, 2005, http://www.minervaeurope.org/publications/qualitycommentary/qualitycommentary050314final.pdf; *The Brussels Quality Framework*, [access: 24.08.2011], http://www2.cfwb.be/qualite-bruxelles/anmviewer2.asp?a=77&z=4&isasp=; *The Brussels Quality Framework. Context*, [access: 24.08.2011], http://www2.cfwb.be/qualite-bruxelles/anmviewer2.asp?a=17&z=4&isasp=; *Wytyczne dobrej praktyki. Aplikacje…*, op. cit.; *Wytyczne dobrej praktyki. Streszczenia…*, op. cit.

and official publications on standards for archival descriptions[33], Web 2.0[34] and preservation of electronic records were used[35]. The research for this thesis also included publications by German archivists, such as A. Brenneke, edited by W. Leesch[36] and J. Papritz[37]. Polish literature[38] as well as English literature[39] formed supplementary reading. Due to the interdisciplinary

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[33] *<EAG> Encoded Archival Guide*, [access: 29.07.2012], http://www.agad.archiwa.gov.pl/about/EAG.pdf; *<METS> Metadata Encoding and Transmission Standard: Premier and Reference Manual*, [access: 31.07.2012], http://www.loc.gov/standards/mets/METSPrimerRevised.pdf; *Data Dictionary for Preservation Metadata. PREMIS*, version 2.0, 2008, 217 p., [access: 2.08.2012], http://www.loc.gov/standards/premis/v2/premis-report-2-0.pdf; EAC-CPF [online], [access: 6.08.2012], http://eac.staatsbibliothek-berlin.de/about/ts-eac-cpf.html; *EAD_PL. Międzynarodowy standard zapisu informacji o zasobie archiwalnym*, eds. A. Klubiński, W. Woźniak, [access: 24.07.2012], http://www.nac.gov.pl/files/EAD_PL_www_0.pdf; *eEurope – An information society for all* [online], [access: 7.03.2012], http://europa.eu/legislation_summaries/information_society/strategies/l24221_en.htm; *Encoded Archival Context – Corporate Bodies, Persons, and Families (EAC-CPF) Tag Library* [online], 2010, [access: 7.08.2012], http://www3.iath.virginia.edu/eac/cpf/tagLibrary/cpfTagLibrary.html; *General International Standard Archival Description* [online], [access: 28.07.2012], http://www.agad.archiwa.gov.pl/isad/isadg.html; *ISIAH. International Standard for Institutions with Archival Holdings. Draft. Międzynarodowy standard opisu instytucji z zasobem archiwalnym. Projekt*, ed. Committee on Best Practices and Professional Standards, Madrid 2007, 67 p., [access: 25.07.2012], http://www.agad.archiwa.gov.pl/metodyka/isiah.pdf; ISO 25964-1:2011 *Thesauri and interoperability with other vocabularies -- Part 1: Thesauri for information retrieval* [online], [access: 25.07.2012], http://www.iso.org/iso/home/store/catalogue_ics/catalogue_detail_icp.htm?csnumber=53657; *Międzynarodowy standard opisu archiwalnego. Część ogólna*, version 2, Stockholm, 1999, (ISAD (G): *General International Standard Archival Description*, version 2, Stockholm, 1999), 144 p., [access: 28.07.2012], http://www.agad.archiwa.gov.pl/isad/ISADv2PL.pdf; *Międzynarodowy standard haseł wzorcowych ISAAR (CPF)*, ed. Komisja ad hoc ds. standaryzacji opisów, trans. A. Laszuk, Warsaw 2000; C. Williams, *Managing Archives. Foundation, Principles and Practice*, Oxford, Cambridge, New Delhi 2006; *PREMIS Data Dictionary for Preservation Metadata*, version 2.1, 2011, 226 p., [access: 1.08.2012], http://www.loc.gov/standards/premis/v2/premis-2-1.pdf.

[34] M. Glauert, *Archiv 2.0…*, op. cit.; J. Kemper et al, *Archivische Spätzünder? Sechs Web 2.0-Praxisberichte*, „Archivar" 2012, 2, [access: 5.08.2012], http://www.archive.nrw.de/Archivar/hefte/2012/ausgabe2/Archivar_02-12_internet.pdf; B. Gillner, *Jenseits der Homepage. Zur archivischen Nutzung von Web 2.0-Anwendungen. Transferarbeit im Rahmen der Laufbahnprüfung für den höheren Archivdienst an der Archivschule Marburg*, Marburg 2011; S. Gutsch, *Web 2.0 in Archiven. Hinweise für die Praxis*, series: Veröffentlichungen der Landesfachstelle für Archive und öffentliche Bibliotheken im Brandenburgischen Landeshauptarchiv 8, Potsdam 2010.

[35] A. Brown, *Archiving Websites. A Practical Guide for Information Management Professional*, London 2009; H. Weber, M. Dörr, op. cit.; Ch. Keitel, *Elektronische Archivierung in Deutschland. Eine Bestandsaufnahme*, in *Für die Zukunft sichern! Bestanderhaltung analoger und digitaler Unterlagen. 78. Deutscher Archivtag 2008 in Erfurt*, ed. H. Schmitt, Fulda 2009; *Ochrona dziedzictwa cyfrowego. Zalecenia, National Library of Australia*, Warsaw 2003; K. E. Lupprian, *Rematerialisierung digitaler Unterlagen – ein Weg zur Langzeitarchivierung? Das Projekt HD-Rosetta*, in *Virtuelle Welten im Magazin. Aussonderung, Aufbewahrung, Sicherung und Nutzung. Vorträge der 5. Tagung des Arbeitskreises „Archivierung von Unterlagen aus digitalen Systemen" in München, 5. und 6. März 2001*, series: Sonderveröffentlichungen der Staatlichen Archive Bayerns, v. 2, ed. K. E. Lupprian, Munich 2003; S. Ross, *Przesiadka w WIGAN…*, op. cit.; H. Weber, *Digitale Konversionsformen…*, op. cit.

[36] A. Brenneke, *Archivkunde. Ein Beitrag zur Theorie und Geschichte des Europäischen Archivwesens*, ed. W. Leesch, Leipzig 1953.

[37] J. Papritz, *Archivwissenschaft*, Marburg 1983.

[38] P. Nawrocki, *Archiwum jako ośrodek informacji*, in *Archiwistyka i regionalizm*, Poznań 1995; idem, *Archiwum jako układ cybernetyczny*, in *Powstanie – przepływ – gromadzenie informacji. Materiały I Sympozjum nauk dających poznawać źródła historyczne. Problemy warsztatu historyka. Kazimierz Dolny–Lublin, 23-25 IX 1976*, Toruń 1978; idem, *Kartoteka perforowana ręcznie jako pomoc archiwalna*, „Archeion" 1972, 57; idem, *Komputer w służbie archiwalnej*, Poznań 1985; idem, *Komputeryzacja archiwów polskich*, in *Historia i archiwistyka. Księga pamiątkowa ku czci profesora Andrzeja Tomczaka*, eds. P. Kalembka, M. Wojciechowski, A. Tomczak, Toruń–Warsaw 1992; H. Robótka, *Opracowanie i opis archiwaliów. Podręcznik akademicki*, Toruń 2010; idem, *System informacji archiwalnej czy system zarządzania informacją archiwalną w epoce nowych technologii*, in *Historyk – archiwista – komputer*, Toruń 2004.

[39] A. Brown, op. cit.

nature of the topic of this thesis, contemporary sociological literature on the information socie-ty[40] and IT literature, mainly on website design, were also studied[41].

This thesis is divided into six chapters. The first two form the theoretical and historical introduction of the subject matter. The first chapter, entitled *Informatization of archives*, ex-plains the topic of informatization, including computerisation and the implementation of archiv-al information management system. The second chapter, *The beginnings of digitization*, was prepared likewise, although it also has a thread of analysis of subsequent attempts to coordinate digitization, from the lowest to the highest level. The digitization dealt with in this chapter is understood broadly as a process consisting of many different stages from selecting, through scanning to Internet availability. In the next chapter, entitled *Description,* a range of standards used by archivists to describe archival material is presented, beginning with ISAD(G)[42], provid-ing details on the criteria for archival description and EAD[43], which standardises the electronic exchange of data. Other standards, including EAG[44], ISDIAH[45], EAC[46] and ISAAR[47], as well as METS[48] and PREMIS[49] are also mentioned. This chapter also touches upon the issue of soft-ware used by German archives to describe archive records, such as HADIS, scopeArchiv, BASYS, AUGIAS or Faust, as well as the issue of electronic inventories and related retroconversion. The fourth chapter, *Digitization of records*, covers the process of digitization as it is broadly understood, equipment, digitization laboratories and formats of stored scanned documents, and presents models for digitization projects based on in-house digitization or out-sourcing. The fifth chapter, *Archives on the Internet*, is devoted to the issues related to the de-

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[40] T. Białobłocki et al., *Społeczeństwo informacyjne. Istota, rozwój, wyzwania*, Warsaw 2006; M. Castells, *Społeczeństwo sieci*, Warsaw 2008; *Społeczeństwo informacyjne – problemy rozwoju*, ed. A. Szewczyk, Warsaw 2007; *Społeczeństwo informacyjne*, ed. J. Papińska-Kacperek, Warsaw 2008; M. Casey, *Europejska polityka informacyjna. Wyzwania i perspektywy dla administracji publicznej*, Toruń 2001; D. Barney, *Społeczeństwo sieci*, Warsaw 2008; *Nie tylko Internet. Nowe media, przyroda, i "technologie społeczne" a praktyki kulturowe*, ed. J. Mucha, Kraków 2010.
[41] M. Dutko, *E-biznes. Poradnik praktyka. Biznes usieciowiony*, Gliwice 2010; B. Eisenberg et al, *Google Website Optimizer. Przewodnik*, Gliwice 2010; M. Kasperski, A. Boguska-Torbicz, *Projektowanie stron WWW. Użyteczność w praktyce*, Gliwice 2008; J. Kalbach, *Projektowanie nawigacji strony WWW*, Gliwice 2008; R. Hoekman, *Magia interfejsu. Praktyczne metody projektowania aplikacji internetowych*, Gliwice 2010; T. Karwatka, *Usability w e-biznesie. Co kieruje twoim klientem*, Gliwice 2009; E. Watrall, J. Siarto, *Head First. Web Design*, Gliwice 2010; P. Frankowski, *Firmowa strona www. Idee, strategia, realizacja*, Gliwice 2010; B. Dankowski, M. Makaruk, *Pozycjonowanie i optymalizacja stron www. Jak to się robi*, 2nd edition popr. i uzup., Gliwice 2009, 431 p.; P. Krug, *Nie każ mi myśleć. O życiowym podejściu do funkcjonalności stron internetowych*, 2nd edition, Gliwice 2006.
[42] *International Standard Archival Description (General).*
[43] *Encoded Archival Description.*
[44] *Encoded Archival Guide.*
[45] *International Standard for Describing Institutions with Archival Holdings.*
[46] *Encoded Archival Context – Corporate Bodies, Person, Families (EAC-CPF).*
[47] *International Standard Archival Authority Record for Corporate Bodies, Persons and Families.*
[48] *Metadata Encoded and Transmission Standard.*
[49] *Preservation Metadata: Implementation Strategies*.

velopment of internet archives services, namely their websites and portals. The last chapter, *Future Archives,* deals with the developing and unavoidable trend in the formation of new electronic archives that collect electronically developed archive materials, which include electronic documents, databases, websites and digitized objects. As in the first two chapters, there is a theoretical introduction, which guides the reader into the issue and makes an attempt to estimate the advance in creating that sort of archives. The final part of this thesis summarises the development of the digital identity of the German archives in the last decades.

The factor proving the importance and validity of these research problems is UNESCO's adoption in 2003 of a *Charter on the Preservation of Digital Heritage.* Information resources and human creative expressions in different digital formats were included in this charter and divided into native binary and analogue records. The preservation of these is important for the development of human beings, which meant that the problem is international. Alongside the need to preserve cultural heritage, UNESCO also pointed to the importance of making it accessible, with all required exceptions, and protecting it from loss, as well as promoting international efforts to develop the best possible methods to achieve these ends[50].

Some of the footnotes may appear a bit imprecise (sometimes the author, year or place of publishing or page numbers are missing), but they are presented here the same way as in the original. Unfortunately, a disadvantage of Internet is that it lacks standards and therefore often provides inadequate descriptions and structure of its content.

This edition is an improved and revised version of the Polish edition published 2014.

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[50] T. Klüttig, *Zur Bewertung elektronischer Unterlagen*, in *Handlungsstrategien für Kommunalarchive im digitalen Zeitalter. Beiträge zu einem Workshop im Rathaus Oberhausen 14.12.2005*, Münster 2006, pp. 40-42.

"... it [a computer] is the dominant metaphor of our age; it defines our age by suggesting a new relationship to information, to work, to power, and to nature itself "

– N. Postman, *Technopoly: the Surrender of Culture to Technology*, New York: Vintage Books, 1993, p. 111.

1. Informatization of archives

1.1 Overview

An archives is itself a dynamic and very complex system with internal and external circulation of information. External circulation establishes contact with society, represented by records creators, users, officials and others. The information flow incorporates sending and receiving messages, as well as giving feedback. For that purpose a specific instruction (algorithm or process) defining each individual stage should be provided. Writing out all the activities undertaken inside archives would not only increase transparency but also facilitate the work of archivists and all cooperating subjects. Additionally, it would allow for flexible modeling and software design to support everyday archival work. Archivists, especially those from East Germany, researched these issues many times, but for various reasons it appeared impossible to provide a precise definition of all the algorithms. Let us take weeding as an example. When an archivist has to make an individual decision using such tools as selection and appraisal, the decision about what to shred must be made on the basis of a methodological interpretation supported by retention schedules, for example, and often on subjective reflection relying on professional experience[51].

An important element of external circulation is the communication between records creator and archives during a transfer of records. Another example of an external circulation relationship would be the communication between archives and its users after records have been made accessible. In internal circulation a significant role is played by announcements of decisions concerning human resources management or holdings management and their execution. To act efficiently the system needs to balance all its elements. Lack of balance leads to destabilisation and may eventually cause functional breakdown. The main processes inside archives include: acquisition, processing, management, weeding, making records accessible, conservation, digitization and microfilming. Record creators, users and archivists all participate in these processes[52].

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[51] B. Brachmann, *Die heuristische…*, op. cit., pp. 85-89; K. H. Meyer-Uhlenried, U. Meindl, op. cit., pp. 189-190; P. Nawrocki, *Archiwum jako układ cybernetyczny*, op. cit., pp. 18-25; idem, *Możliwości zastosowania cybernetyki i jej pojęć w archiwistyce*, in *Archiwistyka i regionalizm*, Poznań 1995, pp. 107-122 (also published: „Archeion" 1974, 60, pp. 7-21); idem, *Archiwum jako ośrodek informacji*, op. cit., pp. 128-131, B. Fröhlich, D. Hebig, op. cit.; E. Müller, H. Welsch, *Zur Programmierung der Erfassung…*, op. cit.; idem, *Zur Programmierung der inneren Ordnung…*, op. cit.; idem, *Zur Programmierung der Verzeichnung…*, op. cit.; idem, *Zur Programmierung des Bewertungsverfahren*, op. cit., 1974, 1; I. Rösler, op. cit.

[52] B. B. Brachmann, *Die heuristische…*, op. cit., pp. 85-89; P. Nawrocki, *Archiwum jako układ cybernetyczny*, op. cit., pp. 18-25; idem, *Możliwości zastosowania…*, op. cit., pp. 107-122; idem, *Archiwum jako ośrodek informacji*, op. cit., pp. 128-131.

When dealing with information management, it should be remembered that, even with optimal configuration, no system is able to produce more information than the data input at any point in time. This means simply that archives cannot provide more information than the data it has processed. Therefore, it often happens that if a query on the same subject is renewed it brings back more results, because more records have been described or accessioned[53].

Computers and the Internet facilitate communication in archives and become channels through which information is transferred to the interested parties and obtained from outside. This communication runs in both directions correctly if, as has already been indicated, there is a transreceiver system encoding and decoding the communiques transmitted by one or other of the parties.

German archivist literature mentions the issue of electronic data processing (*elektronische Datenverarbeitung*, EDV) which falls into the scope of the more appropriate and specialised term – informatization. This term is understood as the introduction of IT solutions, i.e. software and equipment, allowing information stored as data to be managed. In line with the International Council on Archives guidelines of 1995, informatization includes:

- a long-term strategy setting out the main tasks stemming from analysis of needs of those users for whom a particular solution is envisaged;
- functional planning and solution management which will be implemented;
- structure and usage planning of the implemented solution;
- an IT strategy and tactics setting goals and implementation methods of approved principles on how to use the new solutions;
- a concept of IT architecture (data structure, technical solutions, standards) needed for the implementation of the solution and its realisation in accordance with the strategy;
- selection criteria for equipment, software and communication methods for the implemented solution;
- acquisition or development of software needed to use the solution[54].

On the other hand, H. Romeyk divided the introduction of computers and software into archives as follows:

- defining the needs of an institution and its ability to apply computers;
- establishing costs on the basis of equipment application analysis;

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[53] Ibidem.
[54] *EDV-Planung im Archiv…*, op. cit., pp. 747-768.

- defining the principles, including the analysis of problems, as well as goals, people involved in the project, equipment and access to it[55];

- introducing the protection of personal data;

- defining and automating computer-aided processes[56];

Elsewhere in the literature on how modern IT technology is being introduced into archives, archivists seem to include the following issues:

- project management;

- looking for software and introducing it,

- defining the indexing and retrieval language, both descriptive and classificatory, and responsibility for accurate archival description;

- introducing archival description standards;

- creating IT infastructure (hardware);

- adjusting archival terminology to the new phenomena;

- updating archival methodology in the context of its application in computerised systems;

- introducing holdings management standards;

- applying organisational management through process;

- constructing IT system;

- applying computer and software skills;

- considering possibilities for available IT technology[57].

One can observe that these explanations show an understanding of informatization concentrated on the main factors, which are software and hardware. This is a very technical view of this problem, typical of the hard sciences, which makes no mention of the third main factor, which is human – that is, people working with the IT system, using it or programming it.

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[55] The need to buy equipment for archives or for potentially renting or sharing with other institutions was considered in terms of its high cost.

[56] *EDV und Archive*, ed. H. Romeyk, 2nd edition, Siegburg 1981, pp. 56-58.

[57] H. Weber, *Der Computer…*, op. cit., pp. 485-504; H. Romeyk, *Zum Einsatz…*, op. cit., pp. 311-320; J. Milz, op. cit., pp. 261-262; I. Koberdowa, *VI Międzynarodowy Kongres Archiwów w Madrycie (3–7 września 1968)*, „Archeion" 1969, 51, pp. 237-239; H. Robótka, *Opracowanie…*, op. cit., pp. 177-183; B. Ryszewski, *Aktualny stan badań problemów komputeryzacji archiwów w ośrodku toruńskim*, in *Komputeryzacja archiwów. Problemy komputeryzacji archiwów. Zagadnienia ogólne, opracowanie dokumentacji kartograficznej i technicznej w skomputeryzowanych systemach informacyjnych. Materiały sympozjum Toruń 15 i 16 grudnia 1994 r.*, ed. B. Ryszewski, Toruń 1994, p. 7; W. Chorążyczewski, *Omówienie dyskusji III Sympozjum nt. „Problemy komputeryzacji archiwów", 15 i 16 grudnia 1994*, in ibid., pp. 51; idem, *Problemy swobodnego indeksowania i założenia kartoteki haseł wzorcowych dla opisów archiwalnych*, in *Komputeryzacja archiwów. Problemy opisu archiwaliów w systemach informacyjnych. Materiały sympozjum Toruń 5 i 6 grudnia 1997 r.*, ed. H. Robótka, Toruń 1998, pp. 59-61; P. Nawrocki, *Komputeryzacja…*, op. cit., p. 260; H. Barczak, P. Nawrocki, C. Włodarska, *Zagadnienie informacji naukowej w archiwach państwowych*, „Archeion" 1971, 56, p. 49; W. Woźniak, *Informatyzacja w działalności archiwów*, in *Archiwa polskie wczoraj i dziś*, eds. W. Stępniak, K. Kozłowski, Warsaw 2012, p. 37.

The attitude to the issues of implementation of IT solutions, in which people are considered, is quite new. It says that, without a proper attitude to people at particular stages of any undertaking, it can be not realized even it is well prepared. Another issue is IT literacy, without which the potential of hardware and software will be never fully used[58].

Ideas related to scientific and technical information gathering, which began to emerge en masse in the 1950s, had a major influence on informatization globally. At that time it was noticed that access to such information might play a major role in a country's economy. Gradually scientific information in all disciplines of knowledge advanced. Quick and efficient routes for acquiring knowledge became most important, because the state and the development of a business or public entity might depend on it. Willingness to create a network allowing data from various academic centres to be collected was another factor. In the 1970s, two of biggest such networks were created in the USA and Europe. They became the cornerstones of Internet. Also in the 1970s, public administration started to use computers to compile different kinds of population statistics and mortgage registers. A significant acceleration of informatization could be observed at the beginning of the 1980s. At that time databases on mainframe computers[59] began to be widely applied in the mass processing of data. However, it was not until the 1990s that the Internet became commercialized and the virtual connection of the whole world could begin, not only in the area of science, but also in social, political and economic fields, not to forget the military, which actually created it. Computers found their place in archives because of their usefulness in supporting repeated manual actions, such as compiling figures and registers, planning, conducting appraisal, preparing archival descriptions and inventories, making records accessible, computing, querying, and managing in broad terms. As explained by A. Menne-Haritz, H. Weber, J. Milz and A. Ullmann, it was the possibility of using computers to prepare archival descriptions, especially modern ones, that was the main reason archivists became interested in them[60].

All in all, archives, thanks to the tools of informatization and the new breeze they blew into digital information management, have opened and started to make their stored data more and more accessible than ever before. They became increasingly engaged in the process

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[58] K. Smith, *Planning and Implementing Electronic Records Management. A practical guide*, London 2007, pp. 7-8, 153, 190, 195-196.

[59] Central computers processing data.

[60] I. Hebig, *Die Bewertung…*, op. cit., p. 167; M. Wettengel, *Zur Rekonstruktion…*, op. cit., pp. 735-736; A. Ullmann, *Der EDV-Ausschuß…*, op. cit., pp. 593-608; M. Casey, op. cit., pp. 7-11; W. Woźniak, *Informatyzacja…*, op. cit., p. 37; *EDV…*, op. cit., pp. 52-82; H. Weber, *Der Computer…*, op. cit., pp. 485-504; A. Menne-Haritz, *Büroautomation und Schriftgutverwaltung. Der…*, op. cit., p. 383-384; J. Milz, op. cit., pp. 261-262, 264.

of hybridisation of holdings. Selected records are now digitized and accessible through the Internet or in reading rooms equipped with necessary apparatus. Thanks to the application of new technological solutions, they are more visible online. This changes the perception and image of archives in society; they are evolving into increasingly user-friendly and open institutions. Apart from regular visitors, such as active records creators, academics and civil servants, new users began to show up who generally had no previous contact with such institution. Their interest is triggered by the fact that archives appeared in search results when they browse the Internet. They are new users without any knowledge of the rules for using archival holdings and little ability in evaluating sources. Therefore, archives need to adopt a different approach to serving and educating these users. Finding aids and electronic services, that users with less or even no experience can easily use are required. It must be said, alas, that, so far, little consideration has been paid to this issue and that it has been assumed that users are competent in using archives. In the case of German archives this trend is slowly changing, with, for example, the Bundesarchiv organizing repeated workshops on the use of their electronic finding aids. But can it really be said that there is any improvement, when one has to teach and explain how to use the tools?[61]

1.2 Development of informatization

It can be assumed that in Germany computerization and informatization took several different forms. Some archives considering the need of computerization were waiting to see the results experienced by others before they took action. There were also those that thought twice and then applied what seemed useful and available at a particular moment. A few experimented with and implemented new solutions immediately after. The biggest group were those archives that initially took no action at all.

With the beginning of the PC era, computers started to spread, but at first just a few institutions bought an insignificant number of them. Only in the 1990s, when prices were lowered and their operation became easier, computers settled into archives for good. Over time they began to be used on more widely in processing archival records. The first computerized archives in Germany include Bundesarchiv in Koblenz and state archives in Dusseldorf, Wiesbaden

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[61] A. Menne-Haritz, *Digitaler Lesesaal, virtuelle Magazine und Online-Findbücher. Auswirkungen der Digitalisierung auf die archivischen Fachaufgaben*, pp. 8, [access: 8.07.2012], http://staff-www.uni-marburg.de/~mennehar/webtexte/pdf/digilesesaal.pdf.

and Stuttgart. Schools for archivists also contributed to the development of informatization by beginning to offer, IT courses for archivists in their programes[62].

In DDR of the 1970s, consistent with the concept of the centralized state, the focus was on standardization of archival methodology and optimization of the work process of archivists to make it more efficient. Steps were taken to set up a joint information research system for all state archives (Informationsrecherchesystem, IRS). It was to include archival description, data collecting, and queries for different types of audience. A special IRS State Archives research group was established to conduct research into these issues and prepare archival description guidelines, procedures and descriptors. Detailed descriptions of procedures, called programs, were produced, based on the IT methodology of algorithm construction, but existing only on paper. Electronic data processing solutions were first introduced in mid-70s to relieve archivists of their most time-consuming activities, such as comparing, ordering and querying. Facilitating work with large archival fonds was of special interest, because for smaller fonds the use of punched cards was enough. Archives processed newly accessioned archival records and improved the old ones in accordance with the above-mentioned guidelines until the late 1980s. At that time archival descriptions were first written on special cards and then entered into computers using special software called Sachorientiertes Programmsystem automatisiertes Informations- und Dokumentationssystem (Subject-Oriented Automated Information and Documentation System)[63] at a data centre. This solution, however, appeared very unreliable. Once the high error rate in the data entry process (sometimes up to one-third) became apparent, some archives sought to obtain computers and MIDOS software[64] for their own use, which proved a better solution[65].

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[62] W. Moritz, op. cit., p. 517; A. Ullmann, *Der EDV-Ausschuß…*, op. cit., pp. 593-608; I. Koberdowa, op. cit., pp. 237-239; H. Robótka, *Opracowanie…*, op. cit., p. 177-183; B. Ryszewski, *Aktualny stan badań…*, op. cit., p. 7; W. Chorążyczewski, *Omówienie…*, op. cit., p. 51; idem, *Problemy…*, op. cit., pp. 59-61; P. Nawrocki, *Komputeryzacja…*, op. cit., p. 260; H. Barczak, P. Nawrocki, C. Włodarska, op. cit., p. 49; *EDV an der Archivschule Marburg*, „Der Archivar" 1970, 4, [access: 17.02.2013], http://hdl.handle.net/2027/mdp.39015072446746, p. 405.

[63] SOPS AIDOS was software used by computing centres to gather data for queries. It was not designed for archives.
Ausstellung zum 3. Symposium zur Informatik in der DDR [online], [access: 20.02.2013], http://robotron.foerderverein-tsd.de/iddr_ec1055.html.

[64] MIDOS is software for managing document descriptions data, for use on personal computers. The data, once it had been entered, then had to be delivered to the computing centre.

[65] K. Meyer, op. cit., pp. 71, 75; R. Ziesemann, op. cit., p. 169-173; J. Hartmann, E. Hartstock, H. J. Schreckenbach, op. cit., pp. 91-96; E. Müller, H. Welsch, *Zur Programmierung…*, op. cit., pp. 6-10; idem, *Zur Programmierung…*, op. cit., pp. 56-61; idem, *Zur Programmierung…*, op. cit., pp. 147-150; idem, *Zur Programmierung…*, op. cit., pp. 147-150; J. Hartman, op. cit., pp. 10-14; I. Rösler, op. cit., pp. 55-63; *Archivwesen der Deutschen…*, op. cit., pp. 344-353; I. Hebig, *Die Vorbereitung des Einsatzes eines Bürocomputers im Staatsarchiv Potsdam*, „Archivmitteilungnen" 1988, 2, p. 63.
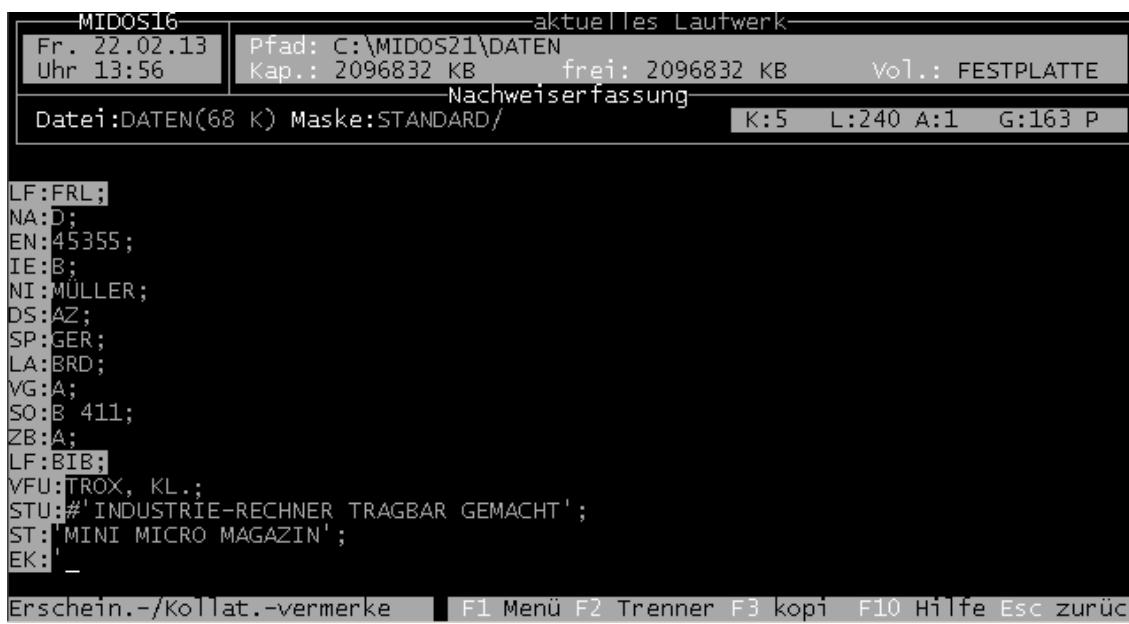
Screenshot 1 MIDOS2.1 (1990) – Input screen for record description, released by P. Kunkel from ROGRIS Projektgruppe Informationssysteme Dietmar Strauch, 25.02.2013.

The centralized character of the archival network in DDR enabled the development of joint guidelines on archival holdings management and software to facilitate archivists' work and standardize archival IT education. Not only were guidelines for archival description popular, but also guidelines relating to records management and records creation. In 1980 a project called Informations- und Dokumentationsregister (Information and Documentation Register) was launched, together with the Bürocomputer Staatliche Archivverwaltung (Working Group on Computerization); six years later another group was created to deal with appraisal of information through the modern data storage carrier – Bewertung von Informationen auf modernen Datenträgern. It should be noted that, even then, archivists were aware of the need for permanent preservation of electronic archives and were conducting research on what kinds of new materials could be stored electronically in the future[66]. At the end of the 1980s and beginning of the 1990s, software supporting the work of departmental archivists and the creation of documents in public administration was developed. The computer-aided cassation of regulatory records, called REVEKAS (REchnergestützte VEreinfachte KASsation von dienstlichem Schriftgut), included two modules: computer aided appraisal of regulatory files, called REBEDIS (REchnergestützte BEwertung von DIenstlichem Schriftgut), and computer-aided records centres (in Germany called Zwischenarchiv [67]), called REVA (REchnergestützte

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[66] Statistical data on marital status and mortgage registers and citizens were taken into account.
[67] An arepository where records are stored before they are transferred to the archives.

VerwaltungsarchivArbeit)[68.] These two modules together enabled record registration in a unit, transfer to the records centres and historical archives, external loans, storage, appraisal, and production of different act registers[69].

Archives in West Germany started to show some interest in computers in the 1960s. However, before they actually started using information technology, considerable attention had been given to such issues as automation of as many of the activities as possible related to processing of very large volumes of incoming documents, making them accessible and conducting queries. Similar to East Germany, experiments with descriptors were conducted. In 1972, asa response to the International Council of Archives setting up the Committee on Information Technology[70], the EDV-Ausschuss was established by the ARK. Its aim was to create a platform for discussion and consideration of joint initiatives on informatization of archives and electronic records preservation. It was followed by some proposals to establish an electronic data processing system for archivists and joint coordination of that enterprise. But, the archival sector undertook no particular actions other than meet annually and participate in the sessions of the International Council on Archives. Some attention was, however, paid to training archivists in the field of IT. The greatest hope was placed in the Bavarian school for archivists and in Archivschule Marburg, which began to offer IT courses on programming as early as 1970. The ARK published its first guidelines on archival education in mid-1970s, but they were not implemented in full. Only in 1990s did archival schools begin to offer IT courses at a level that met the needs and expectations of archives[71].

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[68] REVA was created by representatives from the State Archives Administration (Staatliche Archivverwaltung), the State Central Statistics Office (Staatliche Zentralverwaltung für Statistik) and the Institute of Administrative Organisation and Office Technologies (Institut für Verwaltungsorganisation und Bürotechnik) responsible for improving public administration.

[69] D. Hebig, K. Kleinwächter, *Softwareinformationen*, „Archivmitteilungnen" 1990, 1, pp. 39-40; B. Fröhlich, D. Hebig, op. cit., pp. 59-61; P. Schlombs, op. cit., p. 64; K. Kleinwächter, op. cit., pp. 61-63; H. Scholta, op. cit., pp. 134; B. Lißner, *Perspektivische Überlegungen zur Erschließung mit Deskriptoren und Anwendung der EDV*, „Archivmitteilungnen" 1987, 5, pp. 172-173; *Archivwesen der Deutschen…*, op. cit., pp. 81, 102, 105, 108, 110-111, 113, 115, 126, 167, 182, 286, 351; B. Brachmann, *Ergebnisse und Aufgaben in der archivarischen Hochschulausbildung der DDR*, „Archivmitteilungnen" 1989, 4, p. 148.

[70] R. Gautier presented the first report on informatization of archives in the world during the 13th session of the International Conference of the Round Table on Archives, which took place in 1971 in Bad Godesberg, near Bonn. This report encouraged archivists to take a deeper look into the problem.

[71] W. Schüler, op. cit., pp. 527-528, 540-547; A. Menne-Haritz, *Büroautomation und Schriftgutverwaltung. Der…*, op. cit., pp. 383-384; W. Moritz, op. cit., pp. 515-518; A. Menne-Haritz; *AIDA-SH…*, op. cit., pp. 503-506; H. Weber, *Der Computer…*, op. cit., pp. 485-504; H. Höing, op. cit., pp. 149-156; A. Menne-Haritz, *Indizierung…*, op. cit., pp. 407-414; A. Ullmann, *Der EDV-Ausschuß…*, op. cit., pp. 593-608; *EDV an der Archivschule…*, op. cit., pp. 405; H. Romeyk, *Zum Einsatz…*, op. cit., pp. 311-320; *Archivwesen der Deutschen…*, op. cit., p. 398; J. Milz, op. cit., pp. 261-262, 264; R. Jacobs, B. Martin-Weber, *BASYS 2 – Das Archivverwaltungssystem des Bundesarchivs der zweiten Generation*, „Mitteilungen aus dem Bundesarchiv" 2007, 1, [access: 13.09.2012], http://www.bundesarchiv.de/imperia/md/content/bundesarchiv_de/oeffentlichkeitsarbeit/fach-publikationen/mitteilungenausdembundesarchiv/heft_1-2007__15._jahrgang.pdf; EDV…, op. cit., pp. 45-46.

In 1989 it was planned to bring closer all the actions to set up a German land register and to inform the ARK of all IT projects carried out in the archives, but during German unification that issue was set aside. After the 1990s the focus was on promoting those archives with a high level of computerization and application of electronic data processing systems, while those who were less engaged were encouraged to get involved in the process of implementating IT solutions. Special emphasis was put on smoothing away the differences between the "new" states and those that so far had not been so active in applying information technologies[72].

From the 1970s archives in West Germany, on their own or in collaboration with private IT companies, had been trying to create specialized software to support archivists in describing records. At the end of the 1970s the following were created: AKABDA (Aktenabgabedatei), a program supporting records management and description in the Bundesarchiv; AIDA (Automatisiertes Informations- Dokumentationssystem für Archive = Automated System of Information and Documentation for Archives), which was developed by state archives from Lower Saxony; MIDOSA (Microcomputer gestütztes Informations- und Dokumentationssystem für Archive = Information and Documentation Microcomputer Aided System), created by the Landesarchivdirektion Baden-Württemberg (State Directorate of Baden-Württemberg Archives) [73]; and HADIS (Hessisches Archiv-Dokumentations- und Informationssystem = Documentation and Information System of Hessen Archives) by the Hessisches Landesarchiv. Those archives that did not want to use such professional products used simple database programs (dBase[74]) or wordprocessing software (MS Word). In 1993–1994 some guidelines on software for use in archives[75] and a thematic bibliography[76] were prepared by the ARK. At about that time archives took up the challenge of integrating information management systems to allow for an advanced archival holdings management and publishing electronic inventories in the Internet. One of the examples is Bundesarchiv's IT

[72] A. Ullmann, *Der EDV-Ausschuß...*, op. cit., pp. 593-608; *EDV an der Archivschule...*, op. cit., p. 405; H. Romeyk, *Zum Einsatz...*, op. cit., pp. 311-320; *Archivwesen der Deutschen...*, op. cit., p. 398; J. Milz, op. cit., pp. 261-262, 264; R. Jacobs, B. Martin-Weber, *BASYS 2...*, op. cit.

[73] The Directoreate supervised archives in Baden-Württemberg until January 2005, when the Landesarchiv Baden-Württemberg was established.

[74] dBase was a database system for microcomputers that was widely used in its heyday.

[75] P. Bohl, C. Müller-Boysen, *Klassifikation der EDV-Anwendungen in der Verwaltung*, „Der Archivar" 1997, 2, [access: 17.02.2013], http://hdl.handle.net/2027/mdp.39015072446472, pp. 333-340.

[76] *Fachbibliographie EDV in Bürokommunikation und Archiv*, ed. EDV-Ausschuß der Archivreferentenkonferenz des Bundes und der Länder, as for 15.11.1999, [access: 14.02.2013], http://www.archivschule.de/content/330.html #12.

system, so called BASYS (BundesArchiv IT-SYStem). In the last few years of the 20th century international standards of archival description – ISAD (G) and EAD – began to spread[77].

Two decades ago archives began to receive electronic recordes. For example, electronic archival records created by East German institutions between 1970 and 1990 have been accessioned by Bundesarchiv since 1990s. This meant that archives took a much deeper interest in creating and acquiring tools needed to handle the records[78].

Nowadays, all state and federal archives are equipped with some basic computer amenities, office software, and programmes supporting archival description. Many archives have also acquired more sophisticated software facilitating the management of hybrid records, repository, reading rooms and many other areas; for example, MIDOSA 21 in Landesarchiv Baden-Württemberg and BASYS in Bundesarchiv. Some joint platforms have been created to manage both analogue and electronic holdings. Widely dispersed metadata, including computer databases, paper inventories, card catalogues and other finding aids, are now being gathered, which enabled greater work efficiency, improves the quality of service for citizens and increases the availability of records, at any time of day or night. Developments in computer applications facilitated and accelerated data flow and the conversion of analogue information into digital form. There has also been a growing interest in the market for new working tools. All present-day state archives have their own websites, where they publish information about themselves and their holdings. Majority of state archives have founded or cofounded internet portals where all archival institutions can publish their finding aids. Cooperation between archives and public administration in the area of electronic records preservation is also strengthening[79].

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[77] W. Schüler, op. cit., *Datenverarbeitung…*, pp. 527-546; B. Kappelhoff, op. cit., *Die Nutzung der Datenverarbeitung in den niedersächsischen Staatsarchiven, insbesondere für die Verzeichnung und Erschließung moderner Archivalien*, „Der Archivar" 1994, 2, pp. 35-38, http://hdl.handle.net/2027/mdp.39015072446613; W. Moritz, op. cit., *Wofür Datenbanken…*, pp. 515-518; E. Büttner, *Internet-Präsentation von Online-Findmitteln. Voraussetzungen und Bestrebungen des Bundesarchivs*, „Der Archivar" 2001, 3, http://www.archive.nrw.de/Archivar/hefte/2001/Archivar_2001-3.pdf; H. Weber, *Der Computer…*, op. cit., pp. 488-491, http://hdl.handle.net/2027/mdp.39015072446605; H. Höing, op. cit., *ADV-gestütztes…*, pp. 149-158, [access: 14.07.2012], http://hdl.handle.net/2027/mdp.39015072446753; A. Ullmann, *Der EDV-Ausschuß…*, op. cit., pp. 593-608; *EDV an der Archivschule…*, op. cit., p. 405; H. Romeyk, *Zum Einsatz der EDV…*, op. cit., pp. 311-320, http://hdl.handle.net/2027/mdp.39015072446449; *Archivwesen der Deutschen…*, op. cit., p. 398; J. Milz, op. cit., *Zum Einsatz…*, „Der Archivar" 1971, 3, pp. 261-262, 264, [access: 17.02.2013], http://hdl.handle.net/2027/mdp.39015072446746; R. . Jacobs, B. . Martin-Weber, *BASYS 2…*, op. cit.
[78] A. Ullmann, *Der EDV-Ausschuß…*, p. 598; M. Wettengel, *Archivierung digitaler Datenbestände aus der DDR nach der Wiedervereinigung,* in *Archivierung von Unterlagen aus digitalen Systemen. 2. Tagung, 9.-10. März 1998*, Ludwigsburg, pp. 223-224, [access: 08.07.2012], http://www.staatsarchiv.sg.ch/home/auds/02/_jcr_content/ /Par/downloadlist_6/DownloadListPar/download_1.ocFile/Text%20Wettengel.pdf.
[79] A. . Menne-Haritz, *Büroautomation und Schriftgutverwaltung. Der…*, op. cit., pp. 383-384; E. Büttner, *Internet-Präsentation…*, op. cit.; *Wytyczne dobrej praktyki. Aplikacje…*, op. cit., pp. 268-276; *Digitalisierung im Bundesarchiv…*, op. cit., pp. 16.

The creation of European internet portals (e.g. Archives Portal Europe), national internet portals (e.g. BAM-Portal zu Bibliotheken, Archive Museen), state internet portals (e.g. Archive in NRW), and topical internet portals (e.g. Landeskunde entdecken online), as well the establishment of cooperation with digital libraries (e.g. Europeana), seem to be optimistic signs of informatization[80].

German archives have reached an intermediate level in their application of modern IT solutions, having not yet adopted the more advanced approaches of archives in Australia and Sweden. Initially it was hoped that computers would support and accelerate work and reduce costs. The installation of computer systems was meant to facilitate querying and gathering data on archival holdings, in ways that exceeded the expectations of computers in the 1970s. The development of the Internet significantly contributed to online accessibility of archival records[81].

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[80] Europeana www.europeana.eu, Archives Portal Europe http://www.archivesportaleurope.eu/Portal/, BAM Portal zu Bibliotheken, Museen, Archive http://www.bam-portal.de/, Landeskunde entdecken online http://www.leo-bw.de/.
[81] *EDV...*, pp. 11-12.

"Digitization activity … is part of a wider context related to the information society and the effective use of the digital content by cultural institutions"

— *Summary of Progress*, in *Coordinating digitization in Europe. Progress report of the National Representatives Group*, Brussels: European Commission Information Society Directorate-General, 2003, p. XXIII, [access: 11.9.2016], http://www.minervaeurope.org/publications/globalreport/globalreppdf02/sumprog.pdf.

2. The beginnings of digitization

2.1 The basics

The process of digitization involves the processing of a signal, sound, image or data into digital form using an analogue-to-digital converter (ADC). General dictionaries of the Polish and English languages provide rather terse definitions. Fuller definitions can be found in technical dictionaries. The broadest definitions, however, can be found in German dictionaries, as they do not focus solely on its meaning in the fields of IT, telecommunications, medicine, and natural sciences but also include physics and media studies. English, German and Polish entries in Wikipedia, link digitization mainly to libraries and further detail its goals and tasks[82].

Here are some examples of dictionary entries:

- *Duży Słownik Informatyczny angielsko-polski*, J. Szeniawski, Warsaw 1997, p. 103: *digitize* (Polish *dyskretyzować*): to convert into digital form*;*
- *Słownik Naukowo-Techniczny angielsko-polski*, eds. S. Czerni, M. Skrzyńska, Warsaw 1986, p. 221: *digitize* (Polish: dyskretyzować, cyfryzować): to transform (analogue value of physical quantity) into its numerical form;
- *Wielki Słownik PWN-Oxford*, 2006[83]: *digitize* (Polish: z|dyskretyzować); *digitization*: a process of analogue data transformation into their digital form (the entry does not provide Polish equivalent, just the definition);
- *Terminologie der Archivwissenschaft*, 2012, *Digitalisieren* (Polish: digitalizowanie): a transformation of analogue records, including images and their content, into their digital form[84].

The scope of all the above definitions is limited to conversion, or processing, which may be dismissed as a narrow view. A broader description is provided by A. Trembowiecki and M. Glauert, who treat digitization as a process embracing many more activities. In archives dealing with digitization on a professional basis, it is properly organised and every stage constitutes a separate phase in which a particular activity is conducted. Depending on the character of the archives, the way the process is organized may vary, but the general model, includes:

- project preparation,
- archival material selection,

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[82] M. Kowalska, *Dygitalizacja zbiorów bibliotek polskich*, Nauka, Dydaktyka, Praktyka No 86, Warsaw 2007, pp. 24-26 (footnotes 9-21).

[83] K. Schmidt in his paper *Digitalizacja…*, op. cit., p. 51, did not mention the dictionary he cited.

[84] Quated from: K. Schmidt, *Digitalizacja…*, op. cit., pp. 51-53; R. Rohrkamp, *Digitalisieren*, in *Terminologie…*, op. cit.

- scanning standards selection,

- choosing the contractor,

- conservation,

- primary conversion to the master copy,

- scanning quality control,

- long-term preservation of the master copy,

- secondary conversion to the users' copy available as a e-service,

- making users' copies available[85],

In summary, the term digitization encompasses the transformation of items readable without electronic assistance, including analogue video and audio items, using special equipment and conversion software, into an electronic reproduction of them that is captured on a carrier of some sort. They can be divided into masters and use copies (non-invasive). The production of the master involves the direct scanning of archives; the production of copies relates to digitization from other carriers, mostly microfilms[86].

The product of digitization is an electronically created reproduction of the original with similar features. The lack of perfect precision is caused by reproduction techniques that are not yet perfect. The more precise a copy is required, the more time is needed to convert the source into a digital signal and, of course, the more advanced equipment is needed. Therefore, the best name for that process now is reproduction. On the other hand, however, the biggest advantage of digitization is the ability to maintain quality and produce identical copies[87].

From a European perspective, digitization constitutes an important element of building the information society and an innovative economy within the European Union. Digitization strengthens the position of the Old World in competition with newer nations such as the United States and in dynamically developing Asia. Digitization plays a key role in the preservation and accessibility of archives. It aims to enhance cooperation between cultural institutions and promote public-private partnership through various projects. Functions such as facilitating

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[85] *Narodowe Archiwum Cyfrowe. Wizja, projekt, ludzie*, eds. P. Dudek, A. Kowalska, Warsaw 2010, pp. 59-64 [access: 14.07.2012], http://nac.gov.pl/files/NAC_wizja_projekt_ludzie_WWW.pdf; A. Trembowiecki, *Digitalizacja zbiorów bibliotecznych. Teoria i praktyka*, Warsaw 2006, pp. 15-20; M. Glauert, *Dimensionen der Digitalisierung. Kosten, Kapazitäten und Konsequenzen*, (conference paper: Rheinischer Archivtag w Ratingen, 21.06.2012 [typescript]), p. 1.

[86] K. Schmidt, *Digitalizacja…*, op. cit., p. 52; *Digitalisierung von Archivgut im Kontext…*, op. cit., p. 2; *Digitalisierung von Archivgut in den Staatlichen Archiven Bayerns: Technische Rahmenbedingungen, Workflows, Praxisregeln*, 2011-2012 [typescript], p. 19; K. Ober, *Proces digitalizacji*, [access: 8.11.2012], http://dl.psnc.pl/biblioteka/Content/105/Proces+digitalizacji.pdf, p. 15 (PowerPoint).

[87] K. Schmidt, *Digitalizacja…*, op. cit., p. 55-56; M. Kowalska, op. cit., p. 25.

searching and reaching information gathered by cultural sector over the ages are also attributed to digitization[88].

All the above-mentioned factors lead us to conclude that the aims of digitization are:

- preserving:
  - keeping from destruction: repeated use of materials may impair them, some damage may also be caused by obsolescence or disasters;
  - reducing the risk of stealing, as only copies, never the originals, can be accessed by users;
- making copies accessible:
  - popularizing heritage through facilitating access via either the Internet or local networks if public access to documents is restricted;
  - possibility of access by many users simultaneously, in-house or remotely;
  - improving the legibility of archival records, by exploring the parameters of digital reproductions, such as adjusting brightness or enlarging them;
  - facilitating and speeding the searching process and, hence, research and analysis;
  - maintaining the same quality for all reproductions, every copy of a copy is identical and its quality remains unchanged;
  - lowering the costs of equipping readers' facilities: it is cheaper to buy computer equipment than a microfilm reader. If in the future users' own mobile devices are allowed in archives, the costs of providing computer equipment would further decrease;
  - enriching a description with appropriate reproduction of a record;
- social advantages:
  - prestige gained by applying modern technologies;
  - enhancing cooperation: an opportunity for joint institutional action in making materials accessible or exchanging experiences;
  - gaining experience;
  - reacting to trends;
  - promoting interest in institutional collections;
  - showing openness to users' needs and expectations;
- economic advantages:
  - innovation through applying new technologies;

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[88] *Wytyczne dobrej praktyki. Aplikacje…*, op. cit., pp. 196-197.

o developing a digitization industry;

o providing electronic services directly to archives, their partners and users, for example the remote ordering of reproductions for publication;

o possibility of accessing additional funding for statutory activities or additional services;

o cooperation with business partners to bring new types of services[89].

Digitization also, of course, has its disadvantages, the first of which is the high cost of producing digital reproductions, stemming from expensive and limited software and equipment. The storage of electronic objects is also serious problem due to constant change in carriers and file formats, which results from heavy competition among various companies trying to produce increasingly effective solutions instead of working on standardizing and improving already existing products. Other disadvantages of digitization are the ease of manipulating materials and the difficulty of controlling the change of bitstreams, which is difficult to detect without appropriate solutions to guarantee data integrity and authenticity. A further disadvantage arises from copyright and related issues in need of solutions. Disputes over copyright raise the overall project costs and slow their realization, sometimes even blocking a project's completion[90].

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[89] H. Weber, *Moderne Speichertechniken und digitale Dokumentenverwaltung – Wege ins Informationsparadies oder in die Sackgasse?*, „Der Archivar" 1993, 1, [access: 17.02.2013], http://hdl.handle.net/2027/mdp.39015072446613, p. 63; A. Smith, *Dlaczego przekształcać na postać cyfrową?*, in *Archiwa w postaci cyfrowej. Materiały międzynarodowych warsztatów DELOS CEE. Standaryzacja. Od Międzynarodowego Standardu Opisu Archiwalnego ISAD (G) do formatu Kodowanego Opisu Archiwalnego EAD. Wdrożenia i najlepsze praktyki. Warsaw 25-26 kwietnia 2003 r.*, ed. E. Rosowska, Warsaw 2003, pp. 108, 112; *The Explanatory Memorandum enclosed to the Recommendation No. R(2003) 15 of the Committee of Ministers to Member States on Archiving of Electronic Documents in the Legal Sector*; K. Schmidt, *Material Created and Recorded in Digital Technology*, in *Archives and Non-Traditional Carriers of Information. Papers of the International Conference Warsaw, May 19, 2005, Toruń, May 20-21, 2005*, A. Biernat, ed. W. Stępniak, Warsaw 2006, p. 273; *Digitalizacja piśmiennictwa*, ed. D. Paradowski, Warsaw 2010, p. 27; *Digitalisierung im Bundesarchiv...*, op. cit., pp. 7-8; *Digitalisierung von Archivgut im Kontext...*, op. cit., pp. 2-3; *Digitalisierung von Archivgut...*, op. cit., pp. 4-6; Email from the Landesarchiv Saarbrücken Head M. Sander dated: 11.12.2012 and 18.12.2012.

[90] O. Porubović-Vidović, *Selection of Archival Holdings for Digitalization. Possibility of Applying Multiple Criteria Decision Methods*, in *Archives in the Information Society. Papers of the International Conference Popowo, May 31 – June, 2002*, ed. W. Stępniak, Warsaw 2002, p. 116; K. Schmidt, *Digitalizacja...*, op. cit., pp. 54-56; A. Witowiak, *Zalety intranetu i zastosowanie architektury informacji w udostępnianiu cyfrowych zasobów archiwów*, in *Pamiętnik IX Ogólnopolskiego Zjazdu Studentów Archiwistyki. Archiwistyka wczoraj, dziś i jutro*, eds. M. Jabłońska, P. Ławniczak, Toruń 2010, pp. 213-214; *Summary of Progress*, op. cit., p. XV; M. Kowalska, op. cit., p. 43; W. Kasperkiewicz, *Archiwa wirtualne. Rewolucja czy ewolucja?*, in *Pamiętnik IX Ogólnopolskiego Zjazdu Studentów Archiwistyki. Archiwistyka wczoraj, dziś i jutro*, eds. M. Jabłońska, P. Ławniczak, Toruń 2010, p. 225; *Digitalisierung von Archivgut im Kontext...*, op. cit., p. 2; A. Trembowiecki, *Digitalizacja...*, op. cit., pp. 21-23; A. Smith Rumsey, *But Storage is Cheap. Digital Preservation in the Age of Abundance* [online], series: Preservation Lecture Series Yale University, lecture dated: 17.03.2011, [access: 3.06.2012], http://youtu.be/Yk9ccNP9xTk; B. Post, *Digitalisierungsstrategie der Thüringischen Staatsarchive* [typescript], lecture dated: 29.10.2008, p. 5; A. Menne-Haritz, *Digitalisierung und Onlinestellung von Archivgut im Bundesarchiv und im Archivportal D: Verfahren und Werkzeuge*, [access: 9.11.2012], http://www.bundesarchiv.de/imperia/md/content/archivportald/digitalisierung_menne-haritz.pdf; *Digitalisierung von Archivgut...*, op. cit., p. 4.

One of the reasons why digitization is so popular is that it allows repeated multiple use of scanned copies. The benefits are as follows:

- high quality of copies allowing creation of lossless copies due to reproducing content and graphics,

- possibility to zoom in on objects to handle them better,

- compactness of data carriers storing scanned copies,

- completeness (text and graphics) in reproducing the original; users can access it as a substitute for the original;

- multi- and hypermedia, allowing for storage of text, graphics, sound, or all of these;

- constant accessibility: online content can be made available to all Internet users 24/7,

- ease and speed in producing copies and editing materials,

- enhanced searching,

- allowing online research based on remote access to materials[91].

Future further development of digitization is hampered by financial and other issues. It has also been noted that the biggest projects are contracted to commercial companies who are motivated by profits only and have little interest in quality of service. However, results of observations of the German market contradict these assumptions. Archives and other institutions do not accept scanned copies if the requirements defined in contracts have not been met. Furthermore, professional companies realise that further contracts depend on quality of their projects and pay great attention to their work. There are also some psychological barriers, such as fear of fragility and technology obsolescence, and the constant obligation to learn how to use new tools. As mentioned above, unregulated legal issues on the usage of cultural properties also place a serious constraint on many interesting projects. There are indeed some regulations at the European and national levels, but so far it has not been enough. ARROW (Accessible Registries of Rights Information and Orphan Works towards Europeans)[92] is one such project that was set up to conduct research aimed at resolving copyright issues for works to be digitized. It is today possible to identify information about specific books published in Germany. Because of the public nature of archival records, archives nowadays do not generally have problems with publishing information (excluding photographs, which may need some attention

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[91] M. Kowalska, op. cit., pp. 42-43; O. Porubović-Vidović, op. cit., p. 114.
[92] http://www.arrow-net.eu/

to the copyright), but this may change in the future as the variety of archival holdings expands[93].

The preceding paragraphs lead us to the conclusion that digitization mainly serves the purpose of facilitating the use of archives, especially the presentation of posters, photographs and medieval records, because of their attractive form, can be enhanced when making archives available online. There is no agreement, however, that digitization can replace current methods of preservation, although it can certainly support them. Digitization does not provide 100 per cent assurance that digital information will survive in scanned reproductions, given the current state of information technology. However, for archives whose carriers are at risk of progressive deterioration – for example those on acid paper – it provides the possibility of creating much better and more functional copies than microfilming which has been the process widely used for this purpose until the development of digitizing.[94].

It is not yet possible to estimate the value added by digitization to information society. Based on analysis of what has been done so far, it can be said that digitization has had a positive effect on access to cultural heritage. There are now some online portals presenting descriptions and reproductions of cultural property; some actions to protect digital heritage, both native and digitized, have also been undertaken[95].

2.2 Coordinating digitization

In Germany a gradually developing process of coordinating actions related to digitization can be observed, not only in archives, but also in the field of cultural heritage generally. To understand current phenomena and tendencies, it is necessary to track back through the development of EU policy on digitization and artefacts of human activity collected in the Old World.

Alongside encouraging and supporting digitization and, therefore, building a knowledge society, the EU does not forget about preserving digital materials. The European Commission recognised digitization as an important process influencing the building of the information society and, therefore, became its promoter and coordinator within the EU. The first meeting on digitization of the then 15 EU members took place in Luxembourg in 2000. First, reports

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[93] A. Nowak, *Nośniki pamięci i ich rola w digitalizacji*, in *Biblioteki cyfrowe. Projekty, realizacje, technologie*, Warsaw 2007, p. 187; M. Mocydlarz, *Udostępnianie informacji naukowej na nośnikach elektronicznych* [online], [access: 8.07.2012], http://galileo.pfsl.poznan.pl/horyzonty/nosniki/1rozdzial.html#3.
[94] *Digitalisierung von Archivgut im Kontext…*, op. cit., pp. 1-2.
[95] *Summary of Progress…*, op. cit., p. XXII.

about the state of digitization were requested by the EC. They concluded that digitization was neither promoted nor controlled well enough and that its legal and financial aspects were not supported at all (open copyright issues and lack of financial strategy), which made it impossible for the digitization process to continue smoothly. Some other problems also were identified, such as the lack of cooperation between related cultural sectors (that is, among archives, libraries, museums, and other institutions gathering cultural property) and the lack of standardization of descriptions, which blocked the creation of joint online portals. It also appeared that no competence centres had yet been created and, therefore, that no consultations or agreements on digitization strategy, preserving digital holdings and benchmarking had been conducted. Issues of service quality and research and development influencing the formation of the information society were also noted, as well as the issue of multilingualism in the EU, which online services would need to deal with.

The Lund Principles of April 2001[96] formed the basis for the coordination of digitization in the EU. They set out the directions and principles of further activity, including building competence centres, interoperability of services, cooperation, good practice, supporting digitization with a special emphasis on cultural variety of European countries, establishing a coordinating body to manage digitization in the EU, and developing research techniques in IT. Many projects that followed in Germany and other countries referred to these principles. Also crucial was the change in attitude towards digitization – at the beginning of the 21st century it began to be considered an investment that would bring value for society, rather than just a cost. In the subsequent Lund Action Plan[97], two approaches were taken by the signatories to the Lund Principles. Some decided on the central implementation of the strategy, while others decided to implement it sector by sector. The private sector was also engaged to support digitization financially. Developing cooperation between more cultural sectors, rather than just within one sector, became the goal. The National Representatives Group, the members of which were chosen by the cultural ministers of countries belonging to the Minerva project[98], was created in 2001 to coordinate and implement the Lund Principles. One of the results of their work is the Charter

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[96] *Raport z Lund…*, op. cit.

[97] *Lund Action Plan*, ftp://ftp.cordip.europa.eu/pub/ist/docs/digicult/lund_action_plan-en.pdf, [access: 09.09.2012].

[98] Minerva EC (MInisterial NEtwoRk for Valorising Activities in Digitization, eContentplus – Supporting the European Digital Library) was a cooperative network in the field of culture, scientific information and academic content, with representatives from Belgium, Estonia, Israel, Malta, Poland, Portugal, Russia and Hungary. Set up under the coordination of the Italian Ministry of Culture, it was funded by the EC and participating countries. Its aim was to realise the goals of the Lund Principles. After EU membership had been cxtended to new countries, Minerva+ was created as a framework for cooperation among new member states and previous Minerva EC participants. See: *About Minerva eC* [access: 24.08.2011], http://www.minervaeurope.org/about/minervaec.htm; *Summary of Progress…*, op. cit., p. XVI; M. Kowalska, op. cit., p. 81; *Karta Parmeńska*, op. cit.

of Parma (2003)[99] – a commitment to fulfil the objective of building an information system in the EU and the objectives of the Lund Principles, as well to popularize the good practice guidelines proposed by Minerva[100]. Following that, the eEurope 2002 Action Plan: an Information Society for All drove the development and coordination of electronic services in cultural institutions[101]. In reference to the Lisbon Strategy, it assumed intensive work on developing an innovative economy based on universal transfer of information and online accessibility of cultural heritage. At the same time a European Council resolution was also adopted, highlighting the role of archiving digital heritage and creating infrastructure, to facilitate cooperation among member states and to develop action plans in this area[102].

Next, eContent, later known as eContentplus, was an important factor supporting digitization of European culture property. It co-financed projects aimed at illustrating the variety of EU countries by promoting their culture through the Internet. The projects were also required to promote understanding and cooperation in building the digital single market, including public institutions and private sector. The general goal was to facilitate economic and social development and to strengthen European competitiveness in the global market[103].

In 2006 the EC prepared recommendations on digitization for EU member states. The need to coordinate the work of institutions in digitization was emphasized in its very first lines. To avoid overlaps, the necessity to gather information on ongoing and planned projects was also highlighted. Slightly in contradiction to what was actually written in the recommendations, this passage really referred to redundant holdings – that is, their many volumes of published material, such as books, periodicals, and newspapers accessed mainly through libraries. Archives, as is generally known, collect mainly unique items, which means the likelihood of duplication is very low, so there is no real sense in exchanging information on planned digitization with other institutions, because there is very little risk that something will be scannend twice and paid for twice by taxpayers. On the other hand, when it comes to making decisions about technical standards, it is very useful to create joint internet services. It would be also use-

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[99] *Karta Parmeńska…*, op. cit.

[100] *Summary of Progress…*, op. cit., pp. XIV-XXIII; *Digitalisation Coordination Initiative*, in *Coordinating digitisation in Europe. Progress Report of the National Representatives Group Coordination Mechanisms for Digitisation Policies and Programmes 2002*, 2003, pp. X-XIII; M. Kowalska, op. cit., pp. 79-83; *Raport z Lund…*, op. cit., pp. 7-21; *Karta Parmeńska…*, op. cit.

[101] *eEurope – An information society…*, op. cit.

[102] *Council Resolution of 25 June 2002 on preserving tomorrow's memory – preserving digital content for future generations*, "Official Journal", C, 162, 06/07/2002, P. 0004 – 0005 [online], [access: 18.11.2012], http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32002G0706%2802%29:EN:HTML; *Summary of Progress…*, op. cit., p. XXII; *Digitalisation…*, op. cit., pp. X-XIII; M. Kowalska, op. cit., pp. 76-77; *Poradniki DGM…*, op. cit., p. 150; G. Maier, *Die Digitalisierung des kulturellen Erbes im Rahmen des eEurope-Aktionsplans und der Initiative i2010*, "Archivar" 2006, 3, pp. 276-278.

[103] M. Kowalska, op. cit., pp. 78-79.

ful for various institutions to exchange their digitization plans for anniversaries or jubilees and simultaneously share related materials. The next proposal discussed in the recommendations is the determination of the amount of material to share in a planned European digital library and ways to finance such an undertaking. The third recommendation focused on the need to support cooperation between cultural institutions and the private sector in sourcing funds to pay for digitizing cultural heritage. The fourth recommendation was important for coordinating digitization. It called for creating and maintaining big digitization centres to function as centtres of competence and good practice for smaller institutions. It was further recommended to establish a multilingual European online platform – a European library based on already existing solutions. It could become an access point for cultural material dispersed around Europe, and not in the EU exclusively. The sixth point recommended constant work on improving digitization processes and accessibility, including changing legal regulations on orphan and out-of-print works, and the identification and elimination of legal obstacles hampering the processes of bringing cultural heritage online. The Commission also pointed out the need to develop national strategies on online access to cultural material with respect to local laws and long-term preservation of digital holdings. The last recommendation encouraged member states to report to the Commission on progress in implementing the above-mentioned recommendations. Such reports were to cover:

- lists of digitized objects, to avoid duplication of their digitization within the EU,
- amount of objects to be digitized and ways to count them,
- lists of digitization centres,
- collaboration with private sector,
- creation of a European platform,
- collaboration with publishers to permit browsers to access their metadata,
- standardizing copyright laws[104].

Statistics play an important part in all coordination projects because they provide a general picture of the state and make coordination easier to manage. Furthermore, they positively influence the standard of work done and facilitate the process of obtaining funds. The rules on strategy benchmarking and digitization programmes were developed within Minerva, which produced a digitization assessment framework based mainly on quality assessment and, to some extent, also on quantity assessment. Seven areas were identified for research by experts from the EC Directorate General for Communications Networks, Content and Technology:

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[104] *Zalecenie Komisji z dnia 24 sierpnia 2006 r. w sprawie digitalizacji...*, op. cit..

management, human resources, funds, productivity, impact, priorities and technical aspects[105]. The aim of introducing an assessment system was to support comparative analysis of digitization in the EU, taking into account political, cultural and legal factors. EC analysts pointed out some areas in which progress in other countries could be used as models. They also highlighted others requiring improvement and the implementation of solutions already tested elsewhere, but adapted for local application[106].

In recent years the EU has continuously tried to build and strengthen an innovative and competitive economy and society. That is reflected in the i2010 - A European Information Society for growth and employmen[107], Europe 2020 - A European strategy for smart, sustainable and inclusive growth[108] strategies, and i2010: Digital Libraries Initative[109]. The i2010 strategy has contributed to the development of Europeana and, therefore, cooperation between archives and libraries and creation of the European online gateway to cultural heritage in line with the above-mentioned EC recommendations[110].

Taking into consideration the above-mentioned documents and the reports on digitization presented by the National Representatives Group as a part of Minerva project and EC progress report from 2006[111], it can be said that some digitization initiatives were being undertaken in Germany, where some attempts had been made to coordinate digitization at the national, state, regional and culture sector level. They were, however, not binding because of Germany's federal system. Only some recommendations were made, mainly as effects of conferences, projects, and working groups' activities. In the mid-1990s the DFG prepared recommendations on IT infrastructure building and support for research and science[112], in which libraries and the academy were predicted to play the most important part. The main goal was to centralize access to knowledge. A year later, the DFG published recommendations on digitizing en-

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[105] A detailed list of assessed areas can be found in Appendix 1 to: M. Kowalska, op. cit., pp. 280-282.
[106] *Summary of Progress…*, op. cit., pp. XIV-XXIII; *Digitalisation…*, op. cit., pp. X-XIII; M. Kowalska, op. cit., pp. 83-85; *Raport z Lund…*, op. cit., pp. 22-30; *Poradniki DGM…*, op. cit., pp. 91-102.
[107] *i2010. Europejskie społeczeństwo…*, op. cit.
[108] *Strategia na rzecz inteligentnego i zrównoważonego rozwoju sprzyjającego włączeniu społecznemu*, [access: 8.09.2012], http://ec.europa.eu/eu2020/pdf/1_PL_ACT_part1_v1.pdf.
[109] *i2010. Biblioteki…*, op. cit.
[110] M. Kowalska, op. cit., pp. 85-87. For more on archives cooperation within Europeana, see A. Sobczak, *Archiwa i Europeana a standaryzacja metadanych*, in *Toruńskie Konfrontacje Archiwalne. Archiwistyka między różnorodnością a standaryzacją*, v. 3, eds. W. Chorążyczewski, A. Rosa, Toruń 2013, pp. 43-53.
[111] *Second progress report on the digitisation and online accessibility of cultural material and on digital preservation in the European Union. Working document*, 2010, [access: 8.12.2012], http://ec.europa.eu/information_society /activities/digital_libraries/doc/recommendation/reports_2010/2010%20Digitisation%20report%20overall.pdf, pp. 4, 16, 20.
[112] *Neue Informations-Infrastrukturen für Forschung und Lehre. Empfehlungen des Bibliotheksausschusses und der Kommission fuer Rechenanlagen*, 1995, [access: 17.02.2013], http://www.dfg.de/download/pdf/dfg_im_profil/ reden_stellungnahmen/download/infra.pdf.

dangered archival and library material[113], which focused on digitizing microfilms. In 2002 a new strategy was developed, entitled *Informationen vernetzen – Wissen aktivieren. Strategisches Positionspapier des Bundesministeriums für Bildung und Forschung zur Zukunft der wissenschaftlichen Information Deutschland* (Networking Information to Activate Knowledge: A Strategic Paper on the Future of Scientific Information in Germany by the Ministry of Education and Research)[114]. It showed a change in the scientific information use and management paradigm based on the main assumption that information was to be available to everybody under the same conditions. To make that happen a strengthening of institutional cooperation (archives were not directly mentioned), as well as additional financial support, were envisaged to create a universally available scientific information system giving access to electronic publications (books, papers, periodicals). The Representative of Federal Government for Culture and Media commissioned the Fraunhofer-Institut für Intelligente Analyse- und Informationssysteme (Fraunhofer IAIS) (Fraunhofer Institute for Intelligent Analysis and Information Systems) to prepare *Bestandsaufnahme zur Digitalisierung von Kulturgut und Handlungsfelder* (A View on the Situation of Digitalising Cultural Heritage Including an Operational Manual), published in 2007[115] with financial support by the Ministry of Education and Research. The document was to form the foundation for digitization strategies and plans in cultural institutions, and archives were specifically included. It proposed that the new medium – the Internet – should be used to popularize cultural materials more widely. Experts from the Fraunhofer IAIS analysed the situation and provided guidelines on dealing effectively with digitization and using scanned copies in various ways. It was also an important general assessment of digitization in cultural institutions in Germany at the beginning of the 21st century. An important role in drawing up the strategy and coordinating digitization was planned for an interdepartmental group, EUBAM: Portal zu europäischen Angelegenheiten für Bibliotheken, Archive, Museen und Denkmalpflege (European Affairs Portal for Libraries, Archives, Museums and Historic Artefacts), established in 2001 with the main aim to manage

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[113] H. Weber, M. Dörr, op. cit.

[114] *Informationen vernetzen – Wissen aktivieren*, [access: 9.12.2012], http://www.bibliotheksportal.de/fileadmin/user_upload/content/bibliotheken/strategie/dateien/BMBF_Information_ vernetzen.pdf.

[115] *Bestandsaufnahme…*, op. cit.

international projects at the EU level[116]. Together with Minerva, this working group developed a knowledge portal on digitization called *kulturerbe-digital.de*[117]. Its aim was to create a multilingual Internet website containing all necessary information on digitization. The DFG, sponsor of many digitization projects and author of materials on good practice, acts as a quasi-coordinator. From 2005 to 2009 the DFG also prepared recommendations on digitizing prints and unique documents demonstrated first of all why it is worth digitizing materials of historical value and creating central solutions to make these materials easily accessible. The recommendations also showed the need to coordinate cooperation among cultural institutions and to introduce pre-digitization checks to avoid duplication of expenditure. Some detailed information on running the digitization process was also included, with an emphasis on quality. Certain archives, such as Bundesarchiv and Landesarchiv Baden-Württemberg, can take pride in the fact that they developed their own digitization strategies. Direct coordination functions for archives are also partly fulfilled by Archival School in Marburg and ARK. The former is mainly concerned with organising training for archivists and conducting appropriate research. The latter hosts meetings twice a year, where joint positions and recommendations on range of issues, including digitization, are set out. There is a special permanent commission dealing with digitization. The role of national competence centres is undertaken by: Bundesarchiv, Landesarchiv Baden-Württemberg and Landesarchiv Nordrhein-Westfalen. It is also worth noting the initiative from Brandenburg, which attempted to set a special competence centre to coordinate digitization in all institutions with cultural heritage collections. Furthermore, there is also a tendency to create big digitization institutions, together with cooperation among national projects that gather various cultural institutions, for example Deutsche Digitale Bibliothek[118], or the planed specialised Archivportal-D, or indeed the international Archives Portal Europe[119].

Since the 1990s, increasingly effective programmes have been used in archives to support processing and creating inventories, including electronic ones, and complex archival hold-

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[116] EUBAM is a German interdepartamental working group, comprising representatives of cultural institutions, ministries of culture at national and state level, as well as Deutsche Forschungsgemeinschaft. Set up in 2001, it deals with digitization issues (financing, EU projects participation, collectioning information about programmes and achievements) for libraries, archives, museums and other institutions in protecting cultural heritage.
Wir über uns [online], [access: 14.07.2012], http://www.dl-forum.pt-dlr.de/deutsch/foren/25_2011_DEU_HTML.htm.
[117] www.kulturerbe-digital.de
[118] http://www.deutsche-digitale-bibliothek.de/
[119] A. Ullmann, *Der EDV-Ausschuß...*, op. cit., pp. 590-591; *Strategiepapier zur Digitalisierung von Kulturgut im Land Brandenburg*, 2009, 50 p., [access: 5.12.2012], http://www.mwfk.brandenburg.de/media/lbm1.a.1491.de/strategiepapier.pdf; *Konzept zur Beteiligung von Kultureinrichtungen des Landes Brandenburg an der „Deutschen Digitalen Bibliothek" (DDB)*, 2012, 48 p., [access: 5.12.2012], http://opus4.kobv.de/opus4-fhpotsdam/files/233/Konzept_zur_Beteiligung_von_Kultureinrichtungen_des_Landes_Brandenburg_an_der_DDB.pdf.

ings management. Online services, mainly the presentation of finding aids and the maintenance of quality of scanned copies, have been gradually developing. There is also an idea to partly centralise archival information access through a national online portal. The aim of promoting the above-mentioned reports on digitization[120] by the National Representatives Group among many cultural institutions was to promote the idea and turn their attention to this problem. A planned Deutsche Digitale Bibliothek (German Digital Library)[121] is to serve as a coordinator and become an online gateway for the world to information about and reproductions of German cultural heritage. A competence network, which is a part of it, comprises representatives of different cultural and academic institutions[122]. A tendency towards consolidation can be noticed, as well as a trend to network connection, planning long-term preservation of electronic materials, and constructing services for gathering information centrally[123].

The following part of this work focuses only on the actions undertaken by archives. Details of other cultural sectors can be found in the above-mentioned reports and other documents. German archives do not gather and exchange information on digitization plans since, as already mentioned, their records are unique and this would be unnecessary. Only the state archive from Baden-Württemberg shares a small part of its digitized archival holdings in the European digital library, Europeana. Others have not participated so far, but for reasons other than slowness alone. The main problem concerns models for presenting metadata. Europeana Semantic Elements are based on the Dublin Core model, promoted by libraries, which does not enable the reproduction of hierarchical structure of a fonds. As far as obtaining funding is concerned, archives cover costs from their own budgets or apply for support from the DFG, which often supports such undertakings. Two projects were also initiated in 2003 to create a model and software for the long-term preservation of electronically created materials. These are: Nes-

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[120] *Coordinating digitisation in Europe: Progress report…*, reports available from 2002 to 2007.
[121] http://www.deutsche-digitale-bibliothek.de/
[122] Full membership list: Bayerische Staatsbibliothek, Bibliotheksservicezentrum Baden-Württemberg, Brandenburgisches Landesamt für Denkmalpflege und Archäologisches Landesmuseum, Bundesarchiv, Deutsches Filminstitut, Deutsche Nationalbibliothek, Landesarchiv Baden-Württemberg, Max-Planck-Institut für Wissenschaftsgeschichte, Niedersächsische Staats- and Universitätsbibliothek Göttingen (Göttinger Digitalisierungszentrum), Sächsische Landesbibliothek - Staats- and Universitätsbibliothek Dresden, Stiftung Historische Museen Hamburg (digiCult-Verbund eG), Stiftung Preußischer Kulturbesitz, Digitales Kunst- und Kulturarchiv Düsseldorf (d:kult), [access: 14.07.2012], http://www.deutsche-digitale-bibliothek.de/kompetenznetzwerk.htm.
[123] *Strategische Leitsätze…*, op. cit.; *Digitalisierung im Bundesarchiv…*, op. cit.; *Das Landesarchiv Baden-Württemberg in der digitalen Welt…*, op. cit.; Archivreferentenkonferenz (ARK) [online], [access: 14.07.2012], http://www.bundesarchiv.de/fachinformationen/ark/index.html.de; Reports about Germany were published in *Coordinating digitisation in Europe. Progress report…*; M. Hagedorn-Saupe, G. Maier, *Germany*, op. cit., pp. 74-87; A. Ermert et al, *Germany*, 2003, op. cit., pp. 46-55; A. Ermert et al, *Germany*, 2004, op. cit., pp. 63-72; A. Ermert et al, *Germany*, 2005, op. cit., pp. 53-61; A. Ermert et al, *Germany*, 2006, op. cit., pp. 57-62; U. Schwens, *Germany*, 2007, op. cit., pp. 73-76.

tor[124] – a competence network for libraries, archives and museums – and kopal (Kooperativer Aufbau eines Langzeitarchivs digitaler Informationen; Co-operative Development of a Long-Term Digital Information Archives), which are mainly developed by librarians[125]. There is also a centre of digital heritage preservation in Ludwigsburg. A project on burning colour reproductions with an ARCHE laser (Ausbelichtung von Farbdigitalisaten mit dem ARCHE-Laserbelichter. Erprobung des Echtbetriebs) has been undertaken as a part of the Landesarchiv Baden-Württemberg, Institut für Erhaltung von Archiv- und Bibliotheksgut in Ludwigsburg (Institute for Archives and Library Materials Preservation at the State Archives of Baden-Württemberg) since 2003. A globally unique method for preserving scans on colour microfilms and their digitization, if such a need appears, was developed there[126]. This method is also being considered forthe possibility of lowering the costs of masters in the electronic environment in the future. Storing microfilms is not enormously costly in comparison to maintaining equipment for storing scans in electronic form. In addition to these activities, access to electronic cultural heritage and cooperation with schools are promoted. German archives participated in many European projects aimed at autopromotion and exchanging good practice. Minerva eEurope and MICHAEL Plus – Multilingual Inventory of Cultural Heritage in Europe[127] are good examples. Cooperation with the private sector is not a priority now and has so far been limited to outsourcing selected services that can be done more cheaply than in-house, such as digitization of records, retroconversion of inventories and inventory cards and software creation. The Archival School in Marburg and its Retroconversion Coordination Office area also playing a role in helping archives to standardize and digitize their finding aids, introduced in greater detail later in this thesis, while the ARK and many other bodies play a role in trying to coordinate cooperation among archives[128].

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[124] *Vernetzung* [online], [access: 16.12.2012], http://www.langzeitarchivierung.de/Subsites/nestor/DE/Vernetzung/vernetzung.html?nn=11214.

[125] *Software* [online], [access: 16.12.2012], http://kopal.langzeitarchivierung.de/index_software.php.de. R. Altenhöner, *kopal – ein kooperatives Archivsystem für die Langzeitarchivierung digitaler Objekte*, „Der Archivar" 2007, 4, pp. 307-313.

[126] *Barbarastollen – Deutsches Kulturgut im Bergwerk. SWR Magazin „Odysso" Reportage mit Lena Ganschow. Barbarastollen – Deutsches Kulturgut im Bergwerk* [online], [access: 27.06.2012], http://www.swr.de/odysso/-/id=1046894/nid=1046894/did=9079658/1ev58gc/; *Archiv im Stollen ARD Magazin „W wie Wissen"* [online], [access: 27.06.2012], http://mediathek.daserste.de/sendungen_a-z/427262_w-wie-wissen/9446698_archiv-im-stollen.

[127] Project carried out by fourteen EU member states from 2006 to 2008 with EC support aiming at creating a central list of digitized objects (http://www.michael-culture.org/). MICHAEL Plus - Multilingual Inventory of Cultural Heritage in Europe. Projekt mit Förderung im eTen-Programm der Europäischen Kommission, [online], [access: 14.07.2012], http://www.landesarchiv-bw.de/web/44244.

[128] For an example of a public-private project, see P. Gabrielsson, *Das Projekt "Link To Your Roots".Die digitale Erschließung der Auswandererlisten im Staatsarchiv Hamburg*, „Der Archivar", 2000, 4, [access: 15.09.2012], http://www.archive.nrw.de/Archivar/hefte/2000/Archivar_2000-4.pdf; R. Rohrkamp, *Digitalisieren*, op. cit.

As can be seen, the development of digitization in Germany follows the general trends noted in the EU, although it maintains an individual character in that it focuses more on creating and presenting archival information and in preserving digitized copies than on mass digitization. One gets the impression that Germans are initially more interested in building the necessary capacity by, on the one hand, building good practice by following the various recommendations and strategies, and, building an infrastructure of hardware and specialized software that will become important for accelerating the process of conversion of cultural heritage to digital form. One can assume that this will be achieved in the coming years.

"What you do in the privacy of your own repository is your business. But when you go out into the world, dress up in a standard!"

– D. Pitti, Intention and Impact of Encoded Archival Context. An Emerging International Standard, Berlin, April 2007, [access: 4.08.2012], http://www.bundesarchiv.de/imperia/md/content/instada/pitti.pdf.

3. Description

3.1 International Standards

When IT solutions were first introduced to information management, archivists were working with tools and methods that had not been designed to manage the masses of documentation that were now being produced. Faced with an exponential increase in the amount of archival records at the same time that computerized information management techniques were improving, archives had access to new opportunities that were expected to benefit the availability of archival records for users. It was soon apparent that new methods of preparing archival descriptions would be needed to facilitate the use of electronic tools for data processing[129].

The introduction of inventory cards for preparing archival descriptions was intended to simplify processing. Each archival unit was allocated one card, on which a note similar to what would be written in an inventory was written. The strict rules for ordering a fonds were no longer applied and it was easy to sort the cards. Although it was a new method, it did not mean that old ways were abandoned. It was assumed that archives that had copying machines would be able to produce multiple copies of cards and classify them according to various criteria. The purpose was to present the different aspects of the holdings that were processed, according to the classification tags chosen for the cards. As this method developed the automation of the manual searching process was attempted. Efforts were also undertaken to replace normal cards with punched cards on which the archival descriptions were coded. The introduction of such these was accompanied by the standardisation of descriptions. Computerisation brought a further solution. In specially programmed databases, different descriptors could be assigned to each archival unit so that they could be sorted chronologically, geographically, topically, or according to any other factor that an archivist could think of and the system could deliver. As a result of this, physical arrangement of holdings became less significant, because computers readily allowed for different combinations. Theoretically, this method allowed for archival descriptions to be prepared as documents were received at an archives. The management of a unit could start as soon as the computer program assigned a reference code. After an archival record had been described, different structures could be achieved according to required criteria. This accelerated processing because physical handling of incoming records was reduced. These changes meant that an archival information system could be independent

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[129] M. Black-Veldtrup, *Erschließung im Umbruch*, „Der Archivar" 1998, 4, [access: 17.02.2013], http://hdl.handle.net/2027/mdp.39015072446787, p. 607.

of the physical ordering of records, which was in itself revolutionary, and allowed for new multifacited treatment in the creation of records. Thus, over the last 60 years there has been a change of focus from the physical arrangement of records to the management of the information within records[130].

Meanwhile, questions arose about how detailed the description of archival records should be. Should the description be at the level of a unit or go deeper to the level of particular items? If records in the databases were more detailed, new solutions would be needed to facilitate the description process and keep it short. The creation of thesauruses[131] for indexing and for compiling requests was also proposed. However, such a time-consuming undertaking would only be possible if the time spent on it brought a beneficial dividend. This solution seemed reasonable only for records with similar content, such the large volumes produced by courts, and in other cases that could really support such processing. Another solution was to start generating a description at the moment a record begins its life. The implementation of his solution on a wider scale commenced once electronic document management systems allowing non-standard file metadata had been developed[132].

As the first databases were created, it was acknowledged that there was a need to standardise archival description. However, work on standards was not accelerated until databases became popular and archives began to cooperate with each other. In the 1980s archivists in different countries began to test the solutions that librarians had applied earlier. Meanwhile, consultation between archivists in DDR and BRD led to the development of guidelines for standardisation[133].

To ensure that it, or its description can be found, each born-digital or digitized object, as does each analogue object, needs identifying information, called metadata, which allows

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[130] Cz. Biernat, *Wieloaspektowy system informacyjny w archiwach*, „Archeion" 1989, 86, pp. 7-17.

[131] A thesaurus is composed of descriptors within a hierarchical structure that shows the logical links between terms, and gives the terms' meanings, equivalency, and usage preferences. It is used to simplify indexing by providing terms that can be added to descriptions to indicate a unit's content. There is an ISO standard for creating thesauruses, which was first, published in the mid-1970s and replaced by *ISO 25964-1:2011. Thesauri and interoperability…*, op. cit.).

[132] W. Schöntag, *Quantifizierende Auswertung von Archivalien mit Hilfe der Elektronischen Datenverarbeitung. Referat (Kurzfassung) des 50. Deutschen Archivtages*, „Der Archivar" 1976, 2, pp. 165-168, [access: 17.02.2013], http://hdl.handle.net/2027/mdp.39015072446449; H. Barczak, P. Nawrocki, C. Włodarska, op. cit., p. 47; K. Kleinwächter, op. cit., pp. 61-63.

[133] E. Müller, H. Welsch, *Zur Programmierung des Bewertungsverfahren*, op. cit., pp. 6-10; idem, *Zur Programmierung der Verzeichnung…*, op. cit., pp. 56-61; idem, *Zur Programmierung der inneren Ordnung…*, op. cit., pp. 147-150; idem, *Zur Programmierung der Erfassung…*, op. cit., pp. 147-150; H. Robótka, *Opracowanie…*, op. cit., pp. 177-183; B. Ryszewski, *Aktualny stan badań…*, op. cit., p. 7; W. Chorążyczewski, *Omówienie…*, op. cit., p. 91; idem, *Problemy…*, op. cit., pp. 59-61; P. Nawrocki, *Komputeryzacja…*, op. cit., p. 260.

the management of those objects and their linkage to other representations of them in a database[134].

Archives contain analogue and digital archival records that have to be described. For the description of the former, their physical qualities are used (dimensions, number of cards), as well as their origin (records creator, language and date range) and content (abstract, classification). For digital records metadata that systematically arranges and concisely defines objects is created. It is intended to enhance the usefulness of data it describes, by presenting their context to make interpretation easier, reconstructing their original environment and proving their authenticity. It may be of significant value in cases where data must be recovered using digital archaeology methods[135], such as when data ceases to be readable in new generations of software. Metadata must contain the following information about the objects it describes:

- origins,
- form and date of creation,
- aim and planned function when records were in use,
- guidelines on how to read and save it,
- conditions of access,
- history of modifications,
- history of migrations conducted to secure them,
- applicable software.

Therefore, in accordance with their functions, archival description of digital objects could be grouped as the following types of metadata:

- descriptive (bibliographic, searching): describing objects' content, identified using traditional description of the content, source and physical appearance,

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[134] The term, metadata, originated at the end of the 1960s and was adopted in the professional literature in the 1970s. Metadata can be embedded in a file (usually the metadata elements are determined by the creator of file format) or stored separately (within a database with linkages to the file the metadata describes). Metadata of a .docx text file (MSWord), for example, can include title, type, application, path, size, created, modified, last opened, attributes. Metadata for an archival record in a database can include fonds reference, unit title and date range (P. J. Miller, *Metadata for Digital Collections. A How-To-Do-It-Manual, London-New York*, 2011, pp. 1-3). One important terminology issue needs further explaination; the word "description" is mostly used when talking about analogue archival records, whereas the word "metadata" is used when talking about digital records. Here, however, both terms will be used synonymously, as, although they are used to mean different things, here they have the same definition. The two words are used interchangeably by librarians, who describe both analogue and digital library materials in the same catalogues and have treated them as synonyms. (*Digitalizacja piśmiennictwa*, op. cit., p. 43; M. Glauert, *Dimensionen der Digitalisierung...*, op. cit., pp. 10-11).
[135] Digital archaeology allows the recovery of electronic data that has been damaged, stored in out-of-date file formats or on outdated carriers. It has also been used for research into the history of IT technology or of society in the digital world. Sometimes this term is also understood as a branch of archaeology dealing with the application of IT to archaeological excavations. Here, the first meaning of the term is the one that is relevant. (K. M. Baheyeldin, *Introduction to Digital Archeology* [online], [access: 4.09.2012], http://baheyeldin.com/technology/digital-archeology.html.

- structural: information on internal structure of the object and its links to other objects (significant, especially when reconstructing the hierarchy of archival fonds)
- administrative: allowing the object to be administered, including:
    - technical (maintenance): technical details of objects,
    - legal: information on copyright and users' rights of access,
    - storage: information on storing the objects,
    - provenance: information on the creation of objects and subsequent revisions[136].

As Seamus Ross noted, it was unfortunately widespread practice not to include metadata, especially technical metadata which might help restore and manage data in the future. This was rather surprising as including some metadata requires little effort. Well managed software can collect technical metadata, such as file format, system environment and software, within which data operate. It can be generated directly from the data or from other data linked to them[137].

Some types of metadata are only relevant for digitized or born digital objects, whereas physical description, such as dimensions, is more important for traditional analogue material. However, while the archival holdings were becoming increasingly hybridised, systems for the joint management for all types of archival description and their representations and reproductions were built. A parchment document, or indeed any other document, can be represented in its original, or as a microfilm, scanned or paper copy. An electronic document can be represented in different file formats, such as ODT[138] or PDF[139]. Different file formats have different features and different applications[140].

The readiness to develop and improve the quality of services and facilitate conducting search queries by providing online access to information about archival holdings raised great interest in the introduction of international standards in Europe and in Germany. It was also emphasised by the 2008 ARK strategy. Moreover, it appeared that information, once it had been put into a database could be processed in many ways without additional cost. The wish to invent an open inventory encoding standard that computers could read and process was also

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[136] M. Werla, *Do czego jest potrzebna informatyka w digitalizacji*, in *Cyfrowy świat dokumentu. Wydawnictwa, biblioteki, muzea, archiwa*, ed. H. Hollender, Warsaw 2011, pp. 39-40; S. Ross, *Przesiadka w WIGAN…*, op. cit., pp. 31-32; *Wytyczne dobrej praktyki. Aplikacje…*, op. cit., pp. 18, 235-238, 240, 250-251; *Digitalizacja…*, op. cit., p. 43; M. Nahotko, *Struktury danych*, in *Biblioteki cyfrowe*, eds. M. Janiak, M. Krakowska, M. Próchnicka, Nauka–Dydaktyka–Praktyka nr 135, Warsaw 2012, pp. 362-363.
[137] S. Ross, *Przesiadka w WIGAN…*, op. cit., pp. 32-33; M. Kowalska, op. cit., pp. 51-52; M. Werla, op. cit., p. 41.
[138] OpenDocument Text, a file format used in LibreOffice or OpenOffice .
[139] PDF (Portable Document Format), a file format that accommodates text and static graphics commonly used for document exchange.
[140] *Digitalizacja…*, op. cit., pp. 43-44.

an important stimulus. Libraries were, of course, the pioneers in standardisation, but archives began to follow them and also make use of some of their experiences[141]. Commonly used archival standards include ISAD(G)[142], specifying criteria for archival description, and EAD[143], normalising electronic exchange of data between archives (used, for example, with APE). Other standards include EAG[144] and ISDIAH[145], enumerating elements of description and coding information about archives, EAC[146] and ISAAR[147], with similar functions, but about archival records, and METS and Preservation Metadata: Implementation Strategies (PREMIS)[148], allowing metadata coding for digitized objects[149].

ISAD(G) was developed by a working group of the International Council on Archives at the end of the 1980s and early 1990s and is based on standards from Canada, USA, the UK and other countries. Developing the model was difficult. To begin with agreement on archival terminology among participating archival schools was needed, each of which brought different approaches to the model. ISAD(G) specifies multilevel arrangement of elements of archival records descriptions and their content. The most important information about holdings includes reference code, title (name), creator, data, description level[150], size and carrier of the described object. That information allows for managing archival records and sharing them with users. A full archival description includes 26 elements in 7 blocks:

- Identity statement area (Reference code(s), Title, Date(s), Level of description, Extent and medium of the unit of description: quantity, bulk, or size);

- Context area (Name of creator(s), Administrative/Biographical history, Archival history, Immediate source of acquisition or transfer);

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[141] H. Romeyk, *Zum Einsatz...* op. cit., p. 320, [access: 17.02.2013], http://hdl.handle.net/2027/mdp.390150724464 49; H. Wajs, *Polska droga do standaryzacji opisu archiwalnego*, in *Archiwa w postaci cyfrowej. Materiały międzynarodowych warsztatów DELOS CEE. Standaryzacja. Od Międzynarodowego Standardu Opisu Archiwalnego ISAD (G) do formatu Kodowanego Opisu Archiwalnego EAD. Wdrożenia i najlepsze praktyki. Warsaw 25-26 kwietnia 2003r.*, ed. E. Rosowska, Warsaw 2003, p. 9; P. Gawrysiak, *Cyfrowa rewolucja*, Warsaw 2008, p. 334; C. Williams, op. cit., p. 89; A. Menne-Haritz, *The standards for structuring descriptive information on archival holdings*, in *The WWW as a Challenge and as a Chance for Parliamentary and Party Archives. Beiträge der Tagung: SPP/ICA: Annual Meeting 2.-4.11.2006 in Bonn. Beiträge aus dem Archiv der sozialen Demokratie*, no. 5, Bonn 2008, pp. 31-33. 36-38, 45-46, [access: 07.10.2012]. http://library.fep.de/pdf-files/adsd/05657.pdf; *Digitalisierung von Archivgut im Kontext*, op. cit., pp. 3-4.
[142] *International Standard Archival Description (General)*
[143] *Encoded Archival Description*
[144] *Encoded Archival Guide*
[145] *International Standard for Describing Institutions with Archival Holdings*
[146] *Encoded Archival Context – Corporate Bodies, Person, Families (EAC-CPF)*
[147] *International Standard Archival Authority Record for Corporate Bodies, Persons and Families*
[148] *Metadata Encoding and Transmission Standard*
[149] N. Brübach, *Entwicklung…*, op. cit., p. 8; *Wissenschaftliche Literaturversorgungs-…*, op. cit., pp. 17-18.
[150] It should be noted whether it is a fonds, sub-fonds, series, sub-series, unit, or document.

- Content and structure area (Scope and content; Appraisal, destruction and scheduling information; Accruals; System of arrangement);

- Conditions of access and use area (Conditions governing access, Conditions governing reproduction, Language/scripts of material, Physical characteristics and technical requirements, Finding aids);

- Allied materials area (Existence and location of originals, Existence and location of copies, Related units of description, Publication note);

- Notes area (Note);

- Description control area (Archivist's Note, Rules or Conventions, Date(s) of descriptions)[151].

This standard is fully in line with J. Papritz's methodology which had been used in Germany so far, which made its adoption in Germany easier[152]. The main difference was that Papritz suggested a top-down structure, starting a description at the unit level and finishing it at the fonds level. ISAD(G) proposed a bottom-to-top approach instead. Moreover, it uses different international rules, defined in:

- ISO norms:
  - country code: ISO 3166 *Codes for the Representation of Names of Countries,*
  - date: ISO 8601:1988 *Data Elements and Information Interchange – Representation of Dates and Times,*
  - language: ISO 639-1; ISO 639-2 *International Standards for Language Codes,*
  - size of described object: ISO 216 *International Standard Paper Sizes,*
  - *Information and Documentation. International Standard Identifier for Libraries and Related Organizations* ISO 15511:2011*,*
- International Council of Archives standards:
  - ISAAR (CPF) [153].

In 1999 a group of German archivists went to the US to work on a project about finding aids in the Internet and implementing EAD. As a result a special group comprising German and American archivists was established to exchange experiences in these areas in 2000-

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[151] *ISAD(G): General International Standard Archival Description*, 2nd version, Stockholm, 1999, [access: 4.09.2012], http://www.icacdp.org.uk/eng/ISAD%28G%29.pdf.

[152] E. Kutzner, op. cit., pp. 271-272, gives a detailed comparison of ISAD(G) with inventory cards, work protocol, and an introduction to the inventory as conceived by J. Papritz.

[153] A. Baniecki, *ISAD(G) – światowy system wielopoziomowego opisu materiałów archiwalnych. Wprowadzenie do zagadnienia*, 31 p., [access: 28.07.2012], http://adacta.archiwa.net/file/baniecki_isad.pdf; *Międzynarodowy standard opisu archiwalnego…*, op. cit.; *General International Standard…*, op. cit.; E. Kutzner, op. cit., pp. 273-274; C. Williams, op. cit., pp. 91-104; A. Menne-Haritz, *The standards for…*, op. cit., pp. 44-45.

2001[154]. In a short period of time the EAD standard had become popular in US cultural institutions, so it was thought that their experiences would be useful for Germany. In the final reports, however, it was stated that a direct implementation of the standard was impossible in Germany, but that the issue would need further observation[155]. Interest in this topic was renewed when the working group from Archival Information Management DFG recommended that ISAD(G) and EAD be used. The Bundesarchiv responded by joining the <daofind> project to support the introduction of standards in Germany. The experiences of an English project Access to Archives[156], which provides access to archival information from a couple of hundred different types of archives, were also used in the years that followed[157].

Encoded Archival Description[158] originated in 1993 in the work of a team headed by D. Pitti from University of California, Berkeley collaborating with Network Development and MARC Standards Office of the Library of Congress[159]. It allows for complex documents to be described according to 146 elements[160] and marked up using SGML (Standardized General Markup Language)[161]. It contains an archival description developed in line with ISAD(G), mentioned earlier. Elements for describing and formatting information are required, obligatory, obligatory (if applicable), recommended or optional.

EAD is a tool that allows for the coding of information and for its presentation in a range of formats as needed. EAD is an XML (Extensible Markup Language) standard[162], which facilitates exchange of data between different systems. Encoded Archival Description

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[154] Project: Deutsch-amerikanische Fachkonzeption Online-Erschließung (German–American concept for presenting descriptions online).

[155] There was to be a German representative on the EAD working group of the Society of American Archivists.

[156] http://www.nationalarchives.gov.uk/a2a/

[157] B. Gau, op. cit., pp. 51-53; M. Black-Veldtrup, *DFG-Projekt…*, op. cit.; U. Fischer, W. Reininghaus, *Großbritannien. „Keeping it simple". Das englische Retrokonversions-programm A2A tritt in seine 4. Projektphase*, „Der Archivar" 2006, 2, [access: 4.08.2012], http://www.archive.nrw.de/Archivar/hefte/2006/Archivar_2006-2.pdf, pp. 198-200; N. Brübach, *Entwicklung…*, op. cit., p. 8; E. Kutzner, op. cit., pp. 271-272; N. Bickhoff et al, op. cit., pp. 2, 12, 20; *Digitalizacja…*, op. cit., pp. 48-51; N. Brübach, *Internationale…*, op. cit., pp. 127-133.

[158] Websites on EAD: P. Tafiłowski, *Strony WWW poświęcone EAD*, in *Archiwa w postaci cyfrowej. Materiały międzynarodowych warsztatów DELOS CEE. Standaryzacja. Od Międzynarodowego Standardu Opisu Archiwalnego ISAD (G) do formatu Kodowanego Opisu Archiwalnego EAD. Wdrożenia i najlepsze praktyki. Warsaw 25-26 kwietnia 2003r.*, ed. E. Rosowska, Warsaw 2003, pp. 101-103.

[159] *MARC (MAchine-Readable Cataloging)* – a format for encoding bibliographic records so that they can be read and exchanged by computer programs.

[160] Element contain particular values of an archival description and are placed within the hierarchy of a collections of tags. An element can be further qualified by attributes, i.e. characteristics that distinguish them from others and give further detail.

[161] M. J. Fox, *Das EAD-Kochbuch (ohne Abschnitte 4 und 5). Übersetzung des EAD Cook Book*, version 1, A. Menne-Haritz trans., 2003, [access: 30.07.2012], http://www.staff.uni-marburg.de/~mennehar/mellonprojekt/uebersetzungen/eadkochbuch.pdf.

[162] XML is a markup language for encoding documents in such a way that they are readable by computers. It is independent of any system platform and programming language in which it might have been created. *Wytyczne dobrej praktyki. Aplikacje…*, op. cit., p. 182.

<ead></ead> is the first element of the standard. It wraps around the whole finding aid and is made up of three parts: EAD Header <eadheader> describing the finding (country, archives, title, publication date, creator, version); Front Matter <frontmatter>, which can be used to encode the structure of a title page and other preliminaries of a finding aid; and Archival Description <archdesc>, which includes a hierarchical description of a body of archives composed of arkups: Component <c>, Descriptive Identification <did>, <dsc>, <dao>, <daodesc>, and indexes. The first (<archdesc>) includes a general description of the fonds. The second (<c>) could be the same as series, subseries, unit or object, meaning <c01>, <c02>, <c03>, <c04> respectively. Attributing numbers to particular markups Component is not permanent and, depending on a finding aid's complexity, each Component can have a different value, for example:

Fonds A	Fonds B
<c01> series	<c01> unit
<c02> subseries	<c02> object
<c03> unit	no level

Table 1 Examples of Component markup in EAD

The third, Descriptive Identification <did> closes and opens the description of a unit or object, whereas Digital Archival Object <dao>, electronic form of archival materials, and its description Digital Archival Object Description <daodesc> are the elements used to locate and describe native electronic or digitized representation of documents within the structure of the standard. Here is an example of an information entry about electronic form attached to archival materials <dao>[163].

Markup	Explanation
<dao>	Electronic representation of archival materials
<c02 level="file">	Level of unit's description
<did>	Beginning of elements of unit's description
<unittitle>Photographs</unittitle>	Unit title
<unitdate type="inclusive" normal="1895/1928">1895-1928</unitdate>	Unit date
</did>	End of elements of unit's description
<c03 level="item">	Level of document's/object's description
<did>	Beginning of elements of document's/object's description
<unittitle>John Smith graduation portrait</unittitle>	Document/object title
<unitdate type="single" normal="18950528">May 28,	Document/object date

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[163] *EAD_PL…*, op. cit., pp. 92-93.

1895</unitdate>	
<dao linktype="simple" href="http://imgs.ud. edu/archives/image/f12001_1. jpg" actuate="onrequest" show="new"/>	Link to document's/object's reproduction
</did>	End of elements of document's/object's de-scription
</c03>	End of the level of unit's description
</c02>	End of the level of document's/object's de-scription

Table 2 Example of an EAD standard description

At each level EAD can also be enriched with authority records for organisations, people, families, geographical names and topics[164].

As already mentioned, EAD and ISAD(G) are compatible and their correlation is presented in the following table[165]:

ISAD(G)	EAD
3.1.1 Reference code(s)	<eadid> with attributes (country code and archive number) <unitid> with attributes (country code and archive number)
3.1.2 Title	<unittitle>
3.1.3 Date(s)	<unitdate>
3.1.4 Level of description	<archdesc> and <c>
3.1.5 Extent and medium of the unit of description (quantity, bulk, or size)	<physdesc> and subelements <extent>, <dimen-sions>, <genreform>, <physfacet>
3.2.1 Name of creator(s)	<origination>
3.2.2 Administrative / Biographical history	<bioghist>
3.2.3 Archival history	<custodhist>
3.2.4 Immediate source of acquisition or transfer	<acqinfo>
3.3.1 Scope and content	<scopecontent>
3.3.2 Appraisal, destruction and scheduling	<appraisal>
3.3.3 Accruals	<accruals>
3.3.4 System of arrangement	<arrangement>
3.4.1 Conditions governing access	<accessrestrict>
3.4.2 Conditions governing reproduction	<userestrict>
3.4.3 Language/scripts of material	<langmaterial>
3.4.4 Physical and technical conditions	<phystech>
3.4.5 Physical characteristics and technical requirements	<otherfindaid>
3.5.1 Existence and location of originals	<originalsloc>
3.5.2 Existence and location of copies	<altformavail>

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[164] W. Stockting, *Zastosowanie EAD w brytyjskim projekcie Access to Archives*, in *Archiwa w postaci cyfrowej. Materiały międzynarodowych warsztatów DELOS CEE. Standaryzacja. Od Międzynarodowego Standardu Opisu Archiwalnego ISAD (G) do formatu Kodowanego Opisu Archiwalnego EAD. Wdrożenia i najlepsze praktyki. Warsaw 25-26 kwietnia 2003 r.*, ed. E. Rosowska, Warsaw 2003, pp. 51-54; H. Wajs, *Polska droga…*, pp. 9-11; *EAD_PL…*, op. cit., pp. 1-233; A. Menne-Haritz, <ead> Encoded Archival Description, [access: 30.07.2012], http://www.staff.uni-marburg.de/~mennehar/webtexte/pdf/ead.pdf (PowerPoint presentation from the lecture at Archival School in Marburg dated: 03.08.2005); Digitalizacja…, op. cit., pp. 51-52; C. Williams, op. cit., pp. 104-107; U. Fischer et al, *Ein EAD-Profil für Deutschland. EAD(DDB) als Vorschlag für ein gemeinsames Austauschformat deutscher Archive*, „Archivar" 2012, 2, [access: 5.08.2012], http://www.archive.nrw.de/Archivar/hefte/2012/ausgabe2/Archivar_02-12_internet.pdf, pp. 160-161; N. Brübach, *Internationale…*, op. cit., pp. 127-133; A. Menne-Haritz, *The standards for…*, op. cit., pp. 48-51.

[165] *EAD_PL…*, op. cit., pp. 225-226.

3.5.3 Related units of description	<relatedmaterial> <separatedmaterial>
3.5.4 Publication note	
3.6.1 Note	<odd><note>
3.7.1 Archivist's note	<processinfo>
3.7.2 Rules or conventions	<descrules>
3.7.3 Date(s) of description	<processinfo><p> <date>

Table 3 Comparison of ISAD(G) and EAD

The EAD profile developed by the Bundesarchiv[166] and used in international projects is adopted as a model. It was compiled following broad consultation between German archivists and English-speaking experts. It is now the most widespread standard in BRD[167].

Two standards, the ISDIAH (International Standard for Describing Institutions with Archival Holdings), developed by the Committee on Best Practices and Standards of the International Council on Archives, and EAG (Encoded Archival Guide), by the National Archives in Spain, define the structure of the description of an institution with archival holdings. The first, similarly to ISAD(G), contains a list of fields to describe the institution. It is divided into six units with a total of 32 elements:

- identity area: identifier, authorised form(s) of name, parallel form(s) of name, other form(s) of name, type of institution with archival holdings,

- contact area: location and address(es), telephone, fax, email; contact persons,

- description area: history of the institution with archival holdings, geographical and cultural context, mandates/Sources of authority, administrative structure, records management and collecting policies, building(s), archival and other holdings, finding aids, guides and publications,

- access area: opening times, conditions and requirements for access and use, accessibility, services area: research services, reproduction services, public areas,

- control area: description identifier, institution identifier, rules and/or conventions used, status, level of detail, dates of creation, revision or deletion, language(s) and script(s), sources, maintenance notes.

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[166] For example, APE documentation includes the standards adopted for this portal. In adopting the standards, its developers defined which values were to be collected and presented and no new fields were added to the standards. For examples of standards adoped for APE see: International archival standards [online], [access: 30.07.2012], http://www.apenet.eu/index.php?option=com_content&view=article&id=50&Itemid=65&lang=fi.
For more about software converting EAD for APE's requirements and different versions used in archives in different countries, see Das Archivportal Europa [online], [access: 30.07.2012], http://www.bundesarchiv.de/archivgut_online/laufende_projekte/APEnet/.

[167] *Strategische Leitlinien für die nationale und supranationale Integration der Erschließungsinformationen des Bundesarchivs unter Verwendung des EAD-Standards für die Jahre 2003-2010*, 2008, [access: 4.08.2012], http://www.bundesarchiv.de/imperia/md/content/bundesarchiv_de/fachinformation/ead-strategie.pdf; N. Brübach, *Internationale…*, op. cit., pp. 132-133.

EAG is its companion encoding format, having the same number of elements with attributes, which allow information about an archives repository to be created in a format that a computer can read, namely XML[168].

In the 1990s attention was directed to an issue previously unnoticed, namely, the need to create a standard for describing the creators of archival materials. This is where the idea of preparing International Standard Archival Authority Record for Corporate Bodies, Persons and Families (ISAAR(CPF)) originated. The task was carried out by the International Council of Archives working group on standards and the final outcome comprises four units:

- identity area: type of entity, authorized form(s) of name, parallel forms of name, standardized forms of name according to other rules, other forms of name, identifiers for corporate bodies
- description area: dates of existence, history, places, legal status, functions, occupations and activities, mandates/sources of authority, internal structures/genealogy, general context
- relationships area: names/identifiers of related corporate bodies, persons or families, category of relationship, description of relationship, dates of the relationship
- control area: authority record identifier, institution identifiers, rules and/or conventions status, level of detail, dates of creation, revision or deletion, languages and scripts, sources, maintenance notes[169].

The relevant XML schema for encoding ISAAR(CPF) records is Encoded Archival Context for Corporate Bodies, Persons, and Families (EAC-CPF) standard. It includes two elements: <control> and <cpfDescription> or <multipleIdentities> (for use when the record concerns more than one identity). The <control> element includes administrative metadata for the record (individual number, creator/institution, status, for example new, history, publication status, language, source of information, convention declaration, ID of other related records, local control, local type declaration). The last two elements include data on the structure, description and references directly concerning the person, family or corporate body (identity, local description, relations, alternative set (or other provider)). Those elements also include more

[168] *ISDIAH. International Standard…*, op. cit.; *<EAG> Encoded Archival Guide*, op. cit.
[169] *ISAAR (CPF) International Standard Archival Authority Record For Corporate Bodies, Persons and Families*, second edition, Canberra 2004, [access 11.06.2016], http://www.icacds.org.uk/eng/ISAAR%28CPF%292ed.pdf

detailed elements and attributes enabling the capture of detailed characteristics of a described item[170].

It is also worth drawing attention to two other standards dedicated to digital objects: METS (Metadata Encoding and Transmission Standard)[171], for encoding the descriptive, administrative, and structural metadata of digital objects, and PREMIS (Preservation Metadata: Implementation Strategies)[172], for encoding the administrative and technical data required for digital preservation of holdings. Both were drafted by the US Library of Congress. METS includes the following blocks of infomration: METS header with information about the document itself; descriptive and administrative metadata; file section (file list including their location) (obligatory); structural map (obligatory, many different structural sets possible); structural data for interfile links executive (can include fragments of code that can be executed on objects in METS model); and behaviour section. The standard was constructed in such a way that, if obligatory parts are filled in, it is enough to make it available for browsers, scans, or electronic objects. The second standard is a different concept. It includes collections of semantic categories, with values defining: objects (digital units of information, such as: file, sequence of identical data, representation); rights, agents (person, organisation, software working with the object through events); and events (events related to the object, for example, creating one more representation). Each has its defined categories, and based on components that can be further elaborated. All the standards described above use the category of an element. PREMIS, on the other hand, introduces a category called intellectual entity, meaning an entity or archival object that can have one or more representations, for example, a scanned working copy for online publication and for other purposes. For example, a website contains a number ofweb pages, images and other files, each of which can contain more than one object. The standard has not got a category of unit description (unit name, title, etc.); it was excluded from semantic categories as it is treated as descriptive metadata obtainable from other standards. Regarding the introduction of the newly redefined structure based on elements and attributes, for which the XML schema was developed, it is to noticeable that PREMIS is different from other standards. It must also be noted that this type of metadata stands at the border between archival de-

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[170] A. Baniecki, op. cit., p. 8; *Międzynarodowy standard haseł wzorcowych ISAAR (CPF)*, ed. Komisja ad hoc ds. standaryzacji opisów, A. Laszuk trans., Warsaw 2000, [access: 5.02.2013], http://www.ica.org/download.php?id=1652; C. Williams, op. cit., pp. 111-113; *EAC-CPF*, op. cit.; *Encoded Archival Context…*, op. cit.

[171] http://www.loc.gov/standards/mets/

[172] http://www.loc.gov/standards/premis/index.html

scription and permanent preservation, because it accumulates mostly information about the environment in which archival records originate[173].

In both the DDR and the BRD, standardisation of archival description had been discussed during the second half of the 20th century. It was understood that it would improve the quality of inventories and make the work of archival projects easier. In the 1960s main works on records' describtion were published in both countries. There are many similarities between them as there had been some consultation among archivists in both countries on issues such as division into levels (fonds, unit, document) with elements of description for each. In the 1980s the spread of electronic databases requiring harmonisation was yet another reason for standards to become more common. The popularity of international standards in many countries, together with the fact that they did not require significant change in practices that were in place, positively influenced their implementation. The unification of Germany in the 1990s was a further strong stimulus, leading to the merging of archival networks and trending more towards openness, exchange and standardisation of information. The Bundesarchiv became the coordinator and implementer of new directions in international archival science. The project Digitalisiertes Archivgut in Online-Findbüchern <daofind> (Digitalised Archival Holdings in Internet Inventories)[174], financed by German Research Community and Andrew W. Mellon Foundation of New York was completed in 2004–2008. It was devoted to analysing archival standards and its findings were used to construct the German and European archival portal APE[175] and to adjust rules for processing archival holdings, creating electronic inventories and managing electronic objects to international standards.

There were notable changes in German archival methodology as a result of the introduction of international standards. Employing ISAD(G) and EAD forced the abandonment of old methods of description and to transition from unit through series to fonds (top-down approach) to a bottom-to-top approach, as already mentioned. As E. Kutzner emphasised, it has a decisive influence on speeding the process of making information accessible. as previously inventories could only be used once the whole archival arrangement and description process had been finished, which could take a very long time, especially at those institutions with few employees. It is now possible to make available the description of a fonds created at the very beginning of the process and gradually add descriptions of units as they are com-

[173] A. Menne-Haritz, *METP. Überblick und Anleitung*, [access: 31.07.2012], http://www.staff.uni-marburg.de/~mennehar/mellonprojekt/uebersetzungen/mets_erl.pdf; *<METS> Metadata Encoding…*, op. cit.; *PREMIS Data Dictionary…*, op. cit.; *Data Dictionary…*, op. cit.; *Digitalizacja…*, op. cit., p. 57.
[174] http://www.daofind.de
[175] www.bundesarchiv.de/sed-fdgb-netzwerk

pleted. Also generating and enabling the secondary use of inventories developed using EAD is possible with a few clicks of a mouse[176].

In summary, the issue of standards concerns the description of documents, their reproductions, archives, corporate bodies and persons, as well as technical metadata.

It is desirable that an database of archival holdings, especially of those that are born digital or have been reproduced by some digital process, contain metadata that has been prepared in accordance with EAD, EAC, EAG, METS and PREMIS. Thus, all required information for these archival materials could then be accumulated and their preservation would be facilitated, especially from the technical side. According to experts in these areas, such standardisation will be of great significance in the future. Given the current pace of technological development, having information about the environment in which electronic materials were created will facilitate access to those materials in the future. Ensuring that this information is gathered is a vital component of any cultural heritage preservation policy even now[177].

The compatibility of standards, for example of EAD and the descriptive standard ISAD(G), is their single most important advantage. It is also possible to develop crosswalks between two encoding standards, such as between EAD and MARC, the library encoding standard for bibliographic records. All the above-mentioned standards can work together and in the process of describing a particular fonds, for example ISAD(G), ISDIAH and ISAAR. The fact that they are in relatively widespread use in the world and used by different types of cultural institutions adds to their versatility. Moreover, they are available via the Internet free of charge and with no limitations on their use. They are also well-supported by documentation which makes them comprehensively useful for describing cultural heritage. A further advantage is that they are based on open and universal standards (for example, EAD uses SGML and XML), which allows for the flexible presentation of data while maintaining permanent file structure, and they can be implemented in both open-source and commercial software. Last

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[176] E. Kutzner, op. cit., *Von Papritz...*, pp. 274-275; N. . Bickhoff et al, op. cit., *Schlussbericht...*, pp. 14-15; *Digitalizacja......*, op. cit., p. 49.

[177] S. Ross, *Przesiadka w WIGAN...*, op. cit., p. 5, 31-33.

but not least, their structure is more or less stable; upgrades are relatively rare, which favours data exchange and communication among systems that have access to them[178].

Archival description provides access to the data that users require and allows for the management of those data. Electronic databases make it possible for users to access archival holdings without any knowledge of the structure of a fonds, because they allow for searching through all records[179].

This fundamental issue as a reason to employ standards, or to translate them into national languages and adapt them for use in local archival traditions, has not yet been mentioned. Despite high initial costs, the greatest benefit of applying standards in any archives lies in improving services to their users, by making information about their archival holdings available.

Among the drawbacks of standardisation are a range of terminological differences. For example the word "collection" (German "Sammlung") is understood in Germany as a group of leaflets, posters, or photos, but creators of the ISAD standard also include legacy. Standards require national interpretation, which, as B. Gau has emphasised, is not without difficulty, as the guides and detailed explanations of the standards are written in English. Another difficulty is that standards are made to serve their creators and, consequently, sometimes lack certain elements specific to a particular type of processed material or archival school. A preference for using specialised standards that allow for describing objects in a better way, is a further factor in the adoption of stanards[180].

It is worth highlighting that using such XML-based data models facilitates the exchange of nformation between different types of institutions and, above all, aids the creation of international internet portals, such as the above-mentioned APE and Europeana. Although Europeana uses a different metadata standard[181], computers can interpret through mapping its

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[178] B. Gau, op. cit., p. 54-57; K. Schmidt, *Od MARC do TEI – praktyczne znaczenie formalizowanego opisu maszynowego,* in *Archiwa w postaci cyfrowej. Materiały międzynarodowych warsztatów DELOS CEE. Standaryzacja. Od Międzynarodowego Standardu Opisu Archiwalnego ISAD (G) do formatu Kodowanego Opisu Archiwalnego EAD. Wdrożenia i najlepsze praktyki. Warsaw 25-26 kwietnia 2003 r.*, ed. E. Rosowska, Warsaw 2003, p. 32-33; B. Martin-Weber, Access to Archival Information – the Federal Archives' Online Services, in *Archives among the Memory Institutions. Paper of the International Conference Warsaw, May 28-29, 2004*, A. Biernat, ed. W. Stępniak, Warsaw 2004, pp. 120-123; N. Brübach, *Entwicklung…*, op. cit., p. 8; A. Pilger, *Was gehört in ein EAD-Profil für Archivportale?*, [access: 5.08.2012], http://www.archive.nrw.de/Archivar/hefte/2012/ausgabe2/Archivar_02-12_internet.pdf, pp. 205-208; N. Brübach, *Internationale…*, op. cit., pp. 130-133.
[179] K. Schmidt, *Od MARC…*, op. cit., p. 27; idem, *Digitalizacja…*, op. cit., ..., p. 61.
[180] B. Gau, op. cit., pp. 58-67; K. Schmidt, *Od MARC…*, op. cit., pp. 32-33.
[181] For more on the differences between Europeana and other archival models, see A. Sobczak, *Archiwa i Europeana…*, op. cit.

metadata standard to EAD. Of course it is not essential to adopt all fields, other than the obligatory ones, of a chosen standard[182]. This decision of which fields to use is up to the archives[183].

3.2. Archival description software

Information saved on a carrier without the context of its origin is worthless both for archivists and for the users of archives. Some data may obviously be acquired from the archival material itself, for example if it is a document containing all identification elements. However, it is more difficult in the case of other historical objects, which do not contain any clues and cannot be reproduced using any available method. In this situation, the only thing researchers can do is formulate hypotheses based on speculation.

Description of archives influences the possibility of providing access to them and, to a certain extent, the level of their preservation. Data collected using specialist tools can be managed more efficiently. This process should be started as early as possible in order to facilitate the creation of a more precise information context revealing the item's past. The later a description process is initiated, the more difficult it is to acquire additional pieces of information and to understand the available ones. As far as contemporary electronically produced materials are concerned, this is not difficult to achieve, as one can use relevant document manatment systems (DMS) to create a basic description during their creation. It is important that archivists have an influence on the creation of these materials and check them regularly – rather than wait until they are transferred to the archives. The metadata of a document can be immediately generated by a clerk using a DMS. This is a significant change, since the preparation of a part of a description is assigned to another person, whose role was previously limited to the naming of a file. Now that person has a significant influence on a future archival description, as the metadata created for documents at the point of their creation will be transferred to the archives, together with those documents. The use of DMS means that the concept and detail of archival description changes, as it is a single document that is described rather than

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[182] For example, APE documentation includes the standards adopted for this portal. In adopting the standards, its developers defined which values were to be collected and presented and no new fields were added to the standards. For examples of standards adoped for APE see: International archival standards [online], [access: 30.07.2012], http://www.apenet.eu/index.php?option=com_content&view=article&id=50&Itemid=65&lang=fi.
For more about software converting EAD for APE's requirements and different versions used in archives in different countries, see *Das Archivportal Europa* [online], [access: 30.07.2012], http://www.bundesarchiv.de/archivgut_online/laufende_projekte/APEnet/.
[183] N. Brübach, *Entwicklung…*, op. cit., p. 8; P. J. Miller, *Metadata…*, op. cit., pp. 227-249.

a unit, as in the past. Previously, detailed descriptions, even synopses, were created only for the oldest and unique records, such as ancient parchment documents[184].

Constant growth in the number of new records created[185] makes it very difficult and time-consuming to find a particular piece of information. In the DDR, it was calculated that it would take 100 researchers, browsing 30 A4 pages an hour, 266 years to search through 200,000 lm of records gathered by 1960.

One can imagine the process of filtering out a particular piece of information from such a huge amount of material. The previous system of collecting information on archival holdings was as follows. First, descriptions were gathered, on index cards or paper inventories, for example. In order to answer a particular question, one had to search through the finding aids first to be able to locate potentially relevant records, which was very time-consuming. That is why, due to the mass amount of records, the system failed. The main weakness of this system lay in the fact that, during the creation of those records, nobody predicted all possible user queries or the massive amounts of data that needed to be preserved for future generations[186].

In the 1960s, the automation of the search work of an archivist was attempted in both German states. They tested the use of punched cards[187] and tapes prepared for simple, standardised records having the same, repeatable features, e.g. court or statistical records. Diverse materials, such as personal papers, were also taken into account, but only experimentally. The method used required very brief and concise descriptions of units. Punched cards were used in addition to finding aids. Among the advantages of their use was the possibility of searching through information based on correlation. However, in order to make the system work, records must have been prepared in a uniform way, which required great amount of work and money. The idea of creating thesauruses for records also arose, which would make it possible for records to be described in a standard way. This solution was best applied to court, prison and technical records, which are formalised and unified to some extent. With a fixed closed dictionary the vocabulary used to describe recoreds could be limited to the specific vocabulary relevant to describe a body of records, which would also assist in searching the records. In the DDR, for example, there were attempts to create such a register for contemporary documentation produced by the administration; in the BRD a similar register was created

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184 C. Gränström, *Archives in the Modern Society*, op. cit., pp. 17-18.
185 It was calculated that, taking into account the speed of records growth in the 1960s and 1970s, as many new documents would be created during the following 30 years as had been created in the previous 1,000 years of German history.
186 H. Barczak, P. Nawrocki, C. Włodarska, op. cit., pp. 33-36.
187 The card is also called a 'manual punch card'; it enables the linking of individual pieces of data in a complex search, based on correlation.

for documentation prepared by the parliament. However, descriptions made for the purposes of punched cards were criticised because they were of lower quality than those offered in traditional inventories[188].
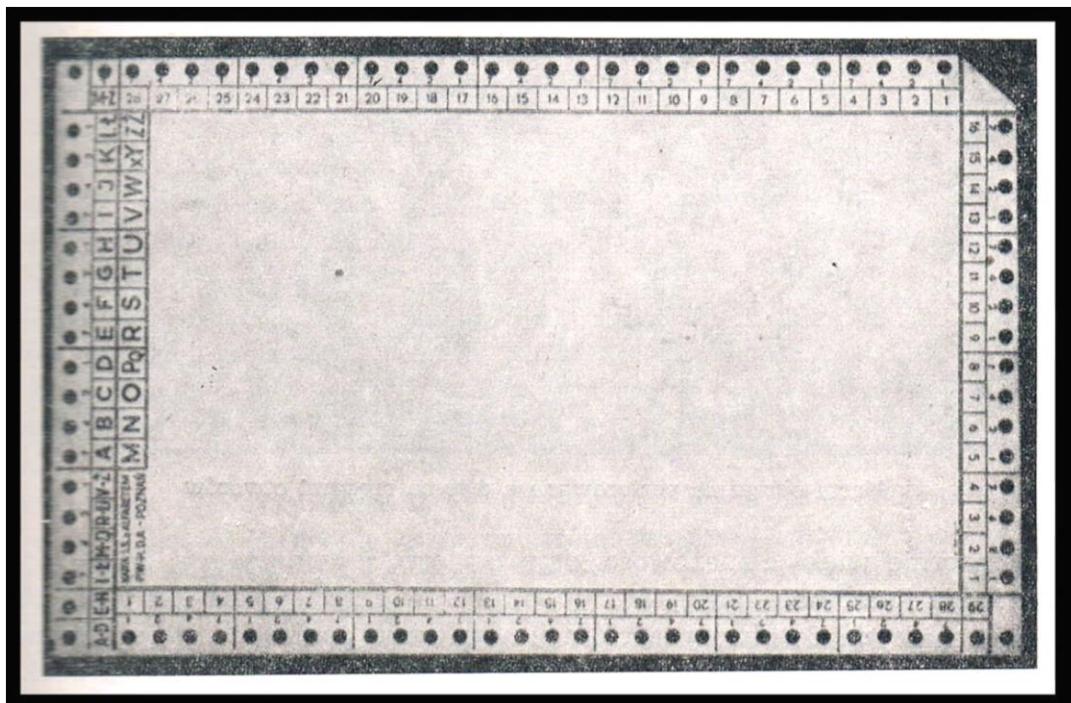

Illustration 1 A single edge-punched card, as illustrated in S. Nawrocki, *Kartoteka…*, ibid., p. 17

Punched cards were perforated manually or by machines. Initially archives used manually punched cards since they were much cheaper. Such a card consisted of two parts: the middle part, in which identification information was entered, and the perforated one- or two-line edges. From 100 to several hundred entries could be coded on a single card, depending on its type. Work with cards was time-consuming and consisted of several phases. The first phase involved the selection of the fonds to be described – many difficulties arose in this phase. Because each card had a limited capacity, one had to think whether the description should be prepared at the level of fonds, a unit, or maybe deeper. Each of the levels would require one

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[188] B. Lißner, op. cit., pp. 172-173; H. Herz, op. cit., pp. 101-103; *Archivwesen der Deutschen…*, op. cit., pp. 344-350; H. Weber, *Der Computer…*, op. cit., pp. 487-488; H. Höing, op. cit., pp. 149-158; A. Ullmann, *Der EDV-Ausschuß…*, op. cit., pp. 590; F. Belke, *Der gemeinsame Thesuarus der gesetzgegebenden Körperschaften des Bundes und der Länder (PARTHES). Ein Strukturmodell für die dokumentarische Erschließung. Referat (Kurzfassung) des 50. Deuschtschen Archivtages*, „Der Archivar" 1976, 1, [access: 17.02.2013], http://hdl.handle.net/2027/mdp.39015072446449, pp. 55-58; J. Milz, op. cit., pp. 271-272; P. Nawrocki, *Archiwum jako układ cybernetyczny*, op. cit., pp. 21-22; *Dyskusja i odpowiedzi referentów. Referat Stanisława Nawrockiego*, in *Powstanie – przepływ – gromadzenie informacji. Materiały I Sympozjum nauk dających poznawać źródła historyczne. Problemy warsztatu historyka. Kazimierz Dolny–Lublin, 23-25 IX 1976, Toruń 1978*, pp. 197-201; H. Barczak, P. Nawrocki, C. Włodarska, op. cit., pp. 47-48; A. Menne-Haritz, *Digitaler Lesesaal…*, op. cit., p. 5; *EDV und Archive*, op. cit., pp. 35-36.

card. Selection was also made on the basis of a fonds' complexity, as it influenced the length of archival description. Thus, it was recommended to select items characterised by consistent and coherent subject matter. Additionally, the material must have been properly prepared, with descriptions of units on their title cards that have been corrected and/or supplemented. There was a significant workload in the selection process. For example, one could select the following for a court records unit card: surname; occupation; place of residence' organisational affiliation; type of offence; trial date; and type of penalty. An inventory handed over with a fonds was helpful to some extent, as it was used for the systematisation and selection of entries, making it easier to create a list. Numbering of entries in the decimal system facilitated their management, as it made it possible to structure them. Ordered entries formed lists called codes. Then, during the processing, information was coded – that is, the code was synchronised with the perforation and an appropriate place on a card was punched and notched. One should remember that the code was an integral part of the created file. Without it, the punching of a card would be useless, as one would not be able to decode the meaning of individual holes. However, during attempts to create entries, numerous problems arose, as it was impossible to assign only one value to each description field. The manner in which cards are searched is also worth discussing at this point. At the time when there were no machines to support the process, metal rods were used. The rods – one for each search criterion – were plugged into holes representing its criterion. Then, the rods were raised and those cards that matched what had been searched for fell out, because of the notches that had been made in them previously[189]. According to tests performed, this method, which seemed very complicated, made it possible to speed up searching considerably in comparison to search techniques using the inventories and traditional files. The advantages of this solution also included the fact that one could put the cards that fell out at the beginning or end of a file, without looking for their original location. Punched cards did not replace any finding aids, despite their advantages in improving searching. The disadvantages of this method outweighed its advantages. It was found to be too time-consuming, and restricted to simple fonds, because punched cards could only accommodate only the briefest and most concise descriptions of materials format, limited in its ability to manipulate large numbers of cards (500 cards weighed about three kilograms) and requiring too much knowledge for searching[190].

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[189] The search in the case of complex inquiries was described in more detail by: P. Nawrocki, *Kartoteka…*, op. cit., pp. 21-22.
[190] H. Herz, op. cit., pp. 101-103; P. Nawrocki, *Kartoteka…*, op. cit., pp. 11-24.

The first electronic solutions supporting the preparation of archival descriptions and searching started to appear at the end of the 1970s and early 1980s. At first, databases in computing centres were used for the collection of archival information. Data were entered into programs in letter and number sequences separated by punctuation marks and typographic characters. They could only be used once they had been printed out on paper or microfiches. Over time, software with more user-friendly interfaces was developed. Data could be in put by users from forms. In the DDR, software typical for AIDOS and MIDOS information management centres was initially used. In the BRD, the following software was developed: AKABDA (Aktenabgabedatei) in Koblenz; AIDA in Hanover; HADIS in Wiesbaden[191], and MIDOSA in Stuttgart[192]. It was at this point in time that archives accepted that electronic solutions could support the day-to-day work of archivists who were able to use the available software[193].

In selecting software, one should consider its functionality and efficiency[194]. Technical requirements are also important. The main purpose of the adoption of computer software in archives has been to support the description of records, although it can also contain modules, such as making scanned copies and born-digital electronic records available on-line, customer service, and warehousing. It also enables the creation of various kinds of inventories, registers or statistics, for example by reference code, chronologically, alphabetically, by subject[195].

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[191] These three were software for mainframe computers with terminals.

[192] Software for PCs.

[193] M. v. Boetticher, *Zur neueren Entwicklung der EDV in den niedersächsischen Staatsarchiven. Möglichkeiten des Datentransfers bei AIDA, dem „ADV-gestützten Informations- und Dokumentationssystem für Archive"*, „Der Archivar" 1993, 3, pp. 423-432, [access: 17.02.2013], http://hdl.handle.net/2027/mdp.39015072446613; D. Hebig, K. Kleinwächter, op. cit., pp. 39-40; B. Fröhlich, D. Hebig, op. cit., pp. 59-61; P. Schlombs, op. cit., p. 64; K. Kleinwächter, op. cit., pp. 61-63; H. Scholta, op. cit., p. 134; B. Lißner, op. cit., pp. 172-173; W. Schüler, op. cit., pp. 527-546; B. Kappelhoff, op. cit., pp. 35-38; E. Büttner, *Internet-Präsentation…*, op. cit.; W. Moritz, op. cit., pp. 515-516; A. Menne-Haritz; *AIDA-SH…*, op. cit., pp. 503-514; H. Weber, *Der Computer…*, op. cit., pp. 488-491; H. Höing, op. cit., pp. 149-158; A. Menne-Haritz, *Indizierung…*, op. cit., pp. 407-414; H. Romeyk, *Zum Einsatz…*, op. cit., pp. 311-320; A. Menne-Haritz, *Digitaler Lesesaal…*, op. cit., p. 5; Also published in *Digitale Archive und Bibliotheken. Neue Zugangsmöglichkeiten und Nutzungsqualitäten*, eds. H. Weber, G. Maier, Stuttgart–Berlin–Köln 2000, p. 29; E. Büttner, *Das Archivverwaltungssystem BASYS als Voraussetzung für die Internetpräsenz des Bundesarchivs*, in *Online-Findbücher, Suchmaschinen und Portale*, ed. A. Menne-Haritz, Marburg 2002, series: Veröffentlichungen der Archivschule Marburg. Institut für Archivwissenschaft 35, p. 100; *Ein einheitliches IT-System von der Überlieferungsbildung bis zur Online-Bestellung – MIDOSA 21 im Landesarchiv Baden-Württemberg*, 9 p., [access: 14.08.2012], http://www.landesarchiv-bw.de/sixcms/media.php/1 20/49979/Midosa21_06_2009.pdf.

[194] A detailed analysis of software functionality can be found in A. Berger, *Eine vergleichende Untersuchung von Erschließungssoftware unter archivfachlichen und softwareergonomischen Gesichtspunkten. Transferarbeit im Rahmen des Referendariats für den höheren Archivdienst*, Münster 2005, [access: 8.07.2012], http://www.archive. nrw.de/lav/archivfachliches/transferarbeiten/Berger_Transferarbeit.pdf, p. 82.

[195] A. Berger, *Eine vergleichende Untersuchung…*, op. cit., pp. 2-3; M. Leibetseder, *Metadaten aus elektronischen Bürosystemen als Grundlage für die Erschließung im Archiv,* in *Benutzerfreundlich – rationell – standardisiert: aktuelle Anforderungen an archivische Erschließung und Findmittel*, series: Beiträge zum 11. Archivwissenschaftlichen Kolloquium der Archivschule Marburg, ed. F. M. Bischoff, Marburg 2007, pp. 135-138, 156.

It should be possible to search databases by various criteria, and not only by the hierarchy of a fonds. When creating a database, one should not simply apply a wholly traditional approach to finding aids. Computers enable the use of much more complicated search systems, beyond navigation through the hierarchical structure of a fonds. A limited perception of electronic tools results mainly from an inability to envisage the functioning of an ideal system and from reluctance to change and resistance to the development of new working models. This can also result from a tendency of archivists, mentioned by H. A. Taylor, as they create finding aids, to focus too much on their own needs and on reproducing the record creator's arrangement of records, instead of on the needs and interests of the users. In an electronic system, one can reconstruct every traditional inventory tool, such as index cards used for the description of records and searching methods, for example, alphabetical or hierarchical sorting. However, this does not really lead to the improvement of the efficiency of an archivist, who wants to obtain a list of potential units for further manual search, instead of entire finding aids[196].

One can purchase readymade software for the description of records from a commercial supplier, create it independently, or have it developed by an IT company. All solutions have positive and negative sides. If one chooses the first option, one gets a product that is ready to be installed and can start work as soon as it is configured. The second option is more time-consuming, but gives more freedom to develop software for particular needs. One can modify and add new functions, as well as improve and update them if required. This solution eliminates any of a service provider not understanding the specific character of an institution and creating/modifiying something that does not meet the client's requirements. Its drawback is that it requires highly skilled employees in software development, or else the project will involve the costs of employing and hiring new staff. Such an undertaking will also draw professional staff away from tasks they have previously performed, as their expertise will be needed during the definition of the software. The third option is limited to the creation of technical specifications for software and the assessment of the results of the service. It is hard to say which option is cheaper or better. In archives, developing their own software is recognised as a very good and practical solution, because the software can be developed and modelled in-house. In choosing this approach, an archives becomes the owner of the software's source code. An advantage of this, which is valued in longer term and in occasional projects, is that it can be

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[196] K. Schmidt, *Od MARC…*, op. cit., p. 27; H. A. Taylor, *Chip Monks at the Gate. The Impact of the Technology on Archives, Libraries and the User*, "Archivaria", 1991, 33, [access: 26.09.2016], http://www.archivaria.ca/index.php/archivaria/article/view/11808/12759, pp. 173-180.

installed on any number of computers without the problems that arise with licensed software. This is important particularly for projects in which employees are appointed only to perform a task periodically. Obviously, in choosing commercial solutions, one can also require that the source code is made available or that software is adjusted for a specific purpose, but this involves additional costs that must be worn in addition to the costs of the licence[197].

In some archives, ad-hoc databases are created in widely available database systems, such as MS Access, and the data in these databases are then transferred to relevant data stores[198].

In Germany, there are nine popular programs used for the description of records. The following programs are commercially available: AUGIAS (AUGIAS-Data); FAUST (LandSoftware Entwicklung); scopeArchiv (scope solutions ag); ACTApro (startext); MI-DOSA-Online (startext); and MidosaXML (startext). Software developed at the request of archives are: BASYS-S-Oracle (ProDV Software AG) for Bundesarchiv; and V.E.R.A. Verwaltungs-, Erschließungs- und Recherche-system für Archive (Management, development and archival research system for archives) (sartext) for Landesarchiv Nordrhein-Westfalen. Independently developed software includes: HADIS (Hessische Staatsarchive); AIDA (Niedersächsisches Landesarchiv); and ARIADNE Archival information and administration net-

[197] *Rozmowa z Rafałem Magrysiem, kierownikiem Oddziału Informacji i Zasobów Cyfrowych*, in *Narodowe Archiwum Cyfrowe…*, op. cit., pp. 72-73.
[198] R. Jacobs, M. Straßenburg, W. Valder, *Realisierung einer Migrations- und Präsentationssoftware für Access-Datenbanken*, „Mitteilungen aus dem Bundesarchiv" 2008, 1, [access: 15.08.2012], http://www.bundesarchiv.de/imperia/md/content/bundesarchiv_de/oeffentlichkeitsarbeit/fach-publikationen/mitteilungenausdembundesarchiv/heft_1-2008__16._jahrgang.pdf.

work[199] (LandSoftware Entwicklung). All programs enable data export and use of international standards and take into account the traditions of particular archives[200].
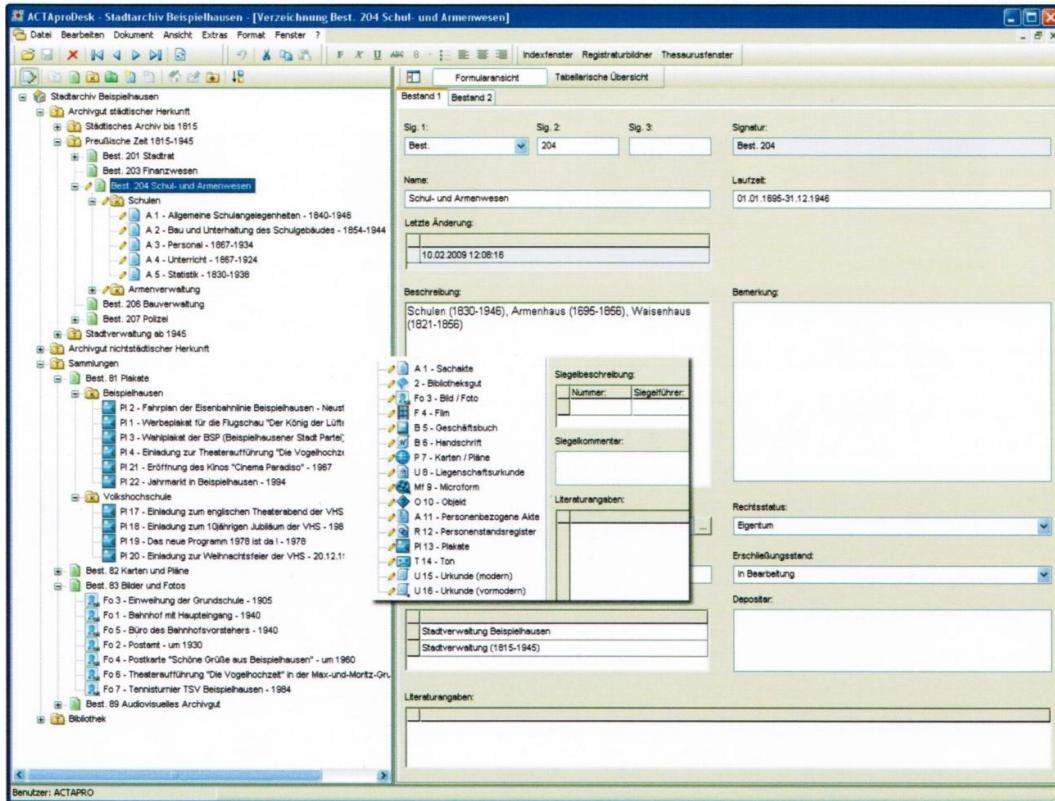
Illustration 2 Archival description with ACTApro software from: *Erschließen – Bewahren – Forschen. ACTApro. Die moderne Software für Archive*, p. 7.

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[199] http://ariadne.uni-greifswald.de

[200] A. Berger, *Eine vergleichende Untersuchung…*, op. cit., pp. 5-8.
More: G. Maier, *Fachinformationssysteme als Basis für archivische Dienstleistungen in der digitalen Welt*, in *Archivische Informationssysteme in der digitalen Welt*, eds. G. Maier, T. Fritz, Stuttgart 2012, series: Werkhefte des Staatlichen Archivverwaltung Baden-Württemberg Serie A/23, pp. 15-30; B. Weber, *BASYS 2. Unterstützung aller archivischen Arbeitsprozesse im Bundesarchiv mittels einer integrierten Archivverwaltungssoftware*, in ibid., pp. 105-122; B. Dorfey, *Ein DMS als Archivsoftware. Das Informationssystem der Landesarchivverwaltung Rheinland-Pfalz*, in ibid., pp. 123-136; M. Wiech, *Evaluierung der Archiv-IT im Landesarchiv Nordrhein-Westfalen*, in ibid., pp. 137-142; P. Flamme, *Das Fachinformationssystem des Staatsarchivs Hamburg*, in ibid., pp. 157-169; P. Graf, *Eines für alles. Das Fachinformationssystem AIDA des Niedersächsischen Landesarchiv*, in ibid., pp. 169-180; A. Hönnig, J. Burkardt, M. Black-Veldtrup, *Erschliessung – Bereitstellung – Magazinverwaltung. Entwicklung und Einsatz von V.E.R.A. im Landesarchiv NRW*, „Archivar" 2008, 3, [access: 22.07.2012], http://www.archive.nrw.de/Archivar/hefte/2008/ausgabe3/Archivar-03-2008_Internet.pdf, pp. 310-317; M. Wiech, *Archiv-IT auf dem Prüfstand Überprüfung der IT-Unterstützung des Archivischen Workflows im Landesarchiv NRW*, „Archivar" 2010, 3, [access: 22.07.2012], http://www.archive.nrw.de/Archivar/hefte/2010/ausgabe3/Archivar_3_10.pdf , pp. 319-324; F. M. Bischoff, *Das Projekt V.E.R.A. in Nordrhein-Westfalen – Nutzung der Internettechnologie für die Erschließung und archivübergreifende Verwaltung der Bestände*, in *Online-Findbücher, Suchmaschinen und Portale*, ed. A. Menne-Haritz, Marburg 2002, series: Veröffentlichungen der Archivschule Marburg. Institut für Archivwissenschaft 35, pp. 135-152; T. Kleindienst, F. Laufhütte, *Fragen – Suchen – Finden! BASYS 2-Invenio. Recherche in der Datenbank des Bundesarchivs*, „Mitteilungen aus dem Bundesarchiv" 2012, 1, [access: 30.07.2012], http://www.bundesarchiv.de/imperia/md/content/bundesarchiv_de/oeffentlichkeitsarbeit/fach-publikationen/mitteilungenausdembundesarchiv/mitteilungen_1-2012.pdf, pp. 10-15; E. Büttner, Das Archivverwaltungssystem…, op. cit.; P. Gut, *Program „Ariadne" – inwentarze archiwów z Pomorza Przedniego w Internecie*, [access: 6.08.2012], http://20090209.archiwa.gov.pl/repository/wydarzenia/Pawwel_Gut.pdf.

Computer software used in archives to describe records enables virtual arrangement and archival description. It is another finding aid, next to inventories of records, catalogues, indices or guides on records, which all differ in terms of the depth of the information they contain. Because it is in electronic form, the software offers advantages that other finding aids do not, as it enables practically unlimited data collection, because when additional requirements are identified, it can be reprogrammed and supplemented. The introduction of computers sealed the modification of the principle of *respect des fonds* for good, limiting the physical arrangement of records. A properly developed program will enable the presentation of results in any form and searching of records in a repository, regardless of how they are filed[201].
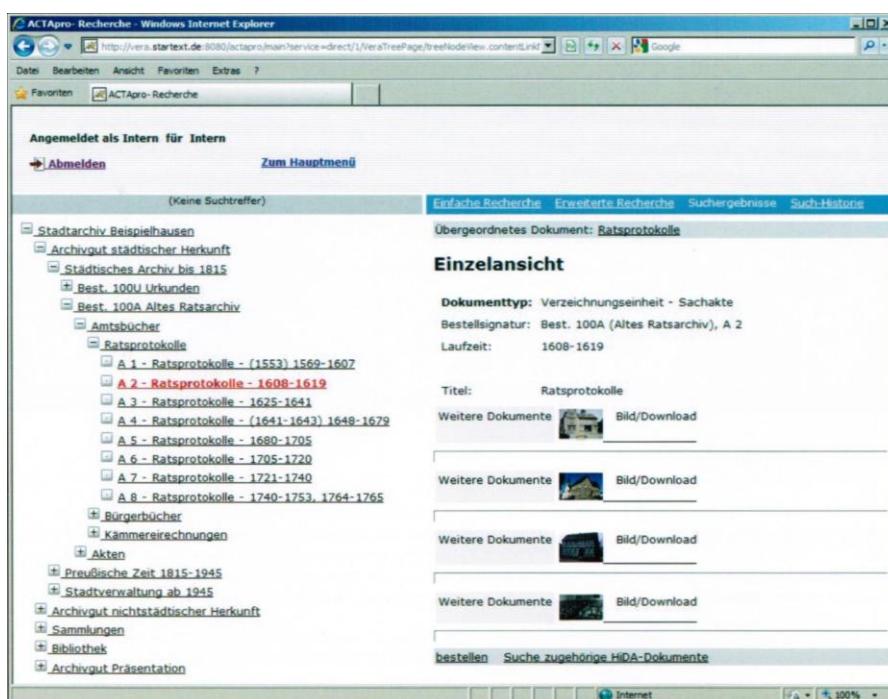
Illustration 3 Query with ACTApro software from: *Erschließen – Bewahren – Forschen. ACTApro. Die moderne Software für Archive*, p. 13.

Software for the processing of records should enable the following activities:

- managing one or several branches of an archives;
- creating the fonds structure based on its tectonics;
- specifying the registry or provenance;
- describing fonds (including the inventory introduction);

[201] W. Reininghaus, *Archivisches Erschließen in der Wissensgesellschaft,* in *Benutzerfreundlich – rationell – standardisiert Aktuelle Anforderungen an archivische Erschließung und Findmittel*, series: Beiträge zum 11. Archivwissenschaftlichen Kolloquium der Archivschule Marburg, series: Veröffentlichungen der Archivschule Marburg. Institut für Archivwissenschaft, nr 46, ed. F. M. Bischoff, Marburg 2007, [access: 10.06.2012], http://www.archivschule.de/uploads/Publikation/VOE46/Voe_46_3_Reininghaus.pdf, p. 26; Informacja o produkcie ACTApro [online], [access: 22.07.2012], http://www.startext.de/produkte/actapro/actapro.

- generating an inventory;

- classifying;

- assigning a reference code (manually or automatically);

- selecting appropriate record description forms, depending on types;

- building series;

- various processing levels;

- indicating date ranges;

- specifying the storage period;

- physical description of records;

- sorting;

- indexing;

- inserting comments;

- adding scanned copies[202].
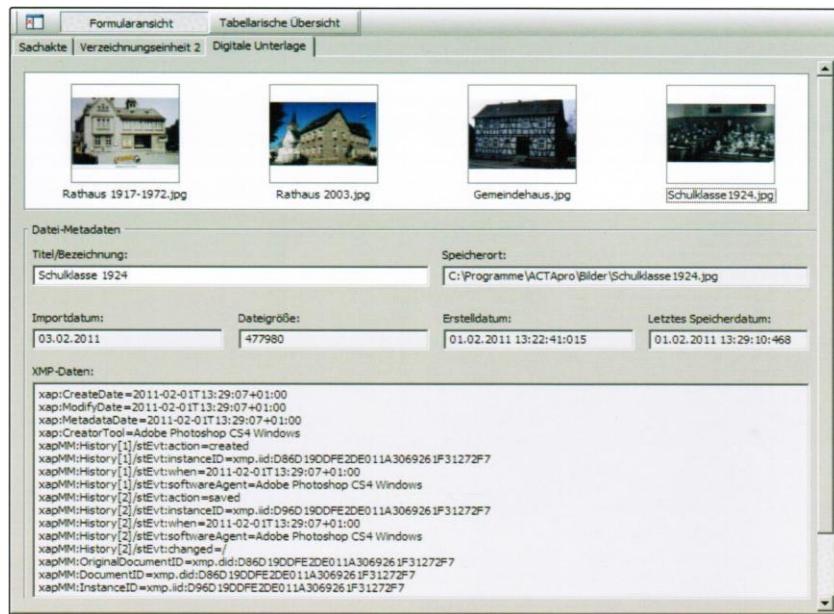
Illustration 4 Digitized objects in ACTApro software from: *Erschließen – Bewahren – Forschen. ACTApro. Die moderne Software für Archive*, p. 8.

It should be noted that the above list can be extended with additional functions, especially with the possibility of integration with systems used for the management of electronic records, digital archives (digitised and born-digital), logistics and reprographic databases or statistics, to obtain complete information on their holdings and copies. In the future, the soft-

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[202] A. Berger, *Eine vergleichende Untersuchung…*, op. cit., pp. 9-51.

ware can be extended by mechanisms enabling the users of archives to add descriptions, comments and other data, in accordance with the Web 2.0 concept. As software is constantly developed, it is becoming more and more a system for professional archival holdings management in areas related to:

- advanced searching of records by users;

- management of traditional and electronic repositories (providing storage location, processing users' orders, generating statistics);

- research room functions (ordering records and reproductions, customer account support, statistics);

- conservation work (information on progress with conservation of materials);

- reprographic work (customer order processing, digitisation and microfilming);

- providing access to finding aids and digital items in-house or on-line;

- records management (records transfer lists, database of subordinate institutions, planning);

- registration of correspondence received and sent by the archives, including those that are not related to records[203].

Moreover, good software should provide an intuitive interface, that is, it should intuitive. It should also be clear in terms of the navigation and should give explicit and unambiguous messages and descriptions, including in the terminology of the dialogue between program and user. Other important elements of its functioning include stability, namely the lack of errors

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[203] Examples of advanced software that goes beyond the description of records: MIDOSA 21 (developed on the basis of scopeArchiv, OLF: Online Finding Aids System (Online-Findmittelsystem) and Dimag: archives of electronic documents); BASYS 2; Dr. DOC (converted from a DMS system); V.E.R.A.; and the professional information system used by Staatsarchiv Hamburg (integrated software: scopeArchiv, MS Office; browser: PDF, images and audiovisual elements; e-mail client and other scripts, which limit the use of the full functionality of the computer, for example, mass printing, the use of external speakers). G. Maier, *Fachinformationssysteme…*, op. cit., pp. 15-30; T. Fritz, *MIDOSA 21. Das modulare Fachinformationssystem des Landesarchivs Baden-Württemberg*, in *Archivische Informationssysteme in der digitalen Welt*, eds. G. Maier, T. Fritz, Stuttgart 2012, series: Werkhefte des Staatlichen Archivverwaltung Baden-Württemberg Serie A/23, pp. 31-52; B. Weber, *BASYS 2. Unterstützung…*, op. cit., pp. 105-122; B. Dorfey, *Ein DMS…*, op. cit., pp. 123-136; M. Wiech, *Evaluierung…*, op. cit., pp. 157-169; P. Graf, *Eines für alles…*, op. cit., pp. 169-180; T. Fritz, T. Fricke, G. Maier, *Ein einheitliches IT-System von der Überlieferungsbildung bis zur Online-Bestellung – MIDOSA 21 im Landesarchiv Baden-Württemberg*, „Der Archivar" 2007, 3, [access: 22.07.2012], http://www.archive.nrw.de/Archivar/hefte/2007/Archivar_2007-3.pdf, pp. 221-228; A. Hönnig, J. Burkardt, M. Black-Veldtrup, *Erschliessung…*, op. cit., pp. 310-317; M. Wiech, *Archiv-IT…*, op. cit., pp. 319-324; F. M. Bischoff, *Das Projekt…*, op. cit., pp. 135-152; T. Kleindienst, F. Laufhütte, op. cit., pp. 10-15; E. Büttner, *Das Archivverwaltungssystem…*, op. cit., pp. 100-110; F. Laufhütte, *Archivmanagementsystem BASYS des Bundesarchivs*, 22 p. (PowerPoint in Bundesarchiv intranet; *MIDOSA 21. Projekt zur Einführung einer Softwarelösung für das Landesarchiv* [online], [access: 14.08.2012], http://www.landesarchiv-bw.de/web/45229; *Ein einheitliches IT-System…*, op. cit.; *Pflichtenheft für die landesweite Einführung einer einheitlichen Archivverwaltungssoftware in den Staatsarchiven Baden-Württembergs (Projekt "MIDOSA 21")*, ed. Ch. Keitel, 2003, [access: 14.08.2012], http://www.landesarchiv-bw.de/sixcms/media.php/120/midosa_pflichtenheft.pdf, pp. 1-23; B. Dorfey, *Digitalisate und Digitalisierung in der LAV – konzeptionelle Überlegungen* [typescript], p. 1.

in the program's code, and in its data processing capacity and to the capacity of the hardware generally[204].

In the future, software will also have to support the importing of metadata of electronic records produced in ICT systems, which will be gradually transferred to archives. This paints a new picture of the work of archivists, who will not have to prepare entire descriptions of records, as they will have been prepared by the creators of the records. The metadata of an item will develop through every stage of its life cycle, rather than in the archives. This means that archivists will be responsible for making sure that data exported from ICT systems is compatible with software used in archives and that descriptions are correctly prepared. Having ready-made descriptions of incoming records will facilitate and speed up access to those records[205].

3.3. Retroconversion and electronic inventories

Inventories of records are created for two main reasons – first, to enable the management of records and second, to facilitate users' access to information. This is reflected in official EU reports, which state that access to registers of documents is guaranteed by civil rights. Such a view is confirmed by Internation Council of Archives code of ethics for archivists adopted by the ICA General Assembly in Beijing in 1996. As others have noted, a person dealing with records is obliged to create aids to facilitate access to them[206].

The functions of inventories include recording and managing hybrid records, presenting their electronic reproductions, providing information on the contents and context of collections, providing information about the organisational structure of a record creator and enabling searching. In summary, inventories provide access to records. They support users in their decisions on what to order and enable preliminary interpretation of materials. Inventories can usually be divided into horizontal and vertical ones. Horizontal inventories gather information on numerous fonds, e.g. only at the top level, by subject or by type of records, such as textual or technical records. Vertical inventories contain information on one fonds, arranged hierarchically

[204] A. Berger, *Eine vergleichende Untersuchung…*, op. cit., pp. 52-78.

[205] M. Leibetseder, *Metadaten…*, op. cit., pp. 135-138; W. Buchmann, M. Hollmann, *Die „Zentrale Datenbank Nachlässe" und das Projekt eines Verbundfindmittels für Nachlässe in Deutschland,* in *Benutzerfreundlich – rationell – standardisiert: aktuelle Anforderungen an archivische Erschließung und Findmittel*, series: Beiträge zum 11. Archivwissenschaftlichen Kolloquium der Archivschule Marburg, ed. M. F. Bischoff, Marburg 2007, [access: 15.08.2012], http://www.archivschule.de/uploads/Publikation/VOE46/Voe_46_17_Buchmann-Hollmann.pdf, pp. 126-134.

[206] A. Choniawko, *Heurystyczne ograniczenia archiwistyki*, [access: 23.07.2012], http://adacta.archiwa.net/file/heurystyka.pdf, p. 1; *Kodeks etyczny archiwisty* [online], [access: 23.07.2012], http://www.sap.Waw.pl/node/27; *Raport o archiwach w Unii Europejskiej po rozszerzeniu…*, op. cit., [access: 11.08.2012]; A. Menne-Haritz, *The standards for…*, op. cit., pp. 36-38.

by levels, that is, from a fonds to a unit, or even to an item. Thanks to search mechanisms, modern technology makes it possible to combine these models and search across them. Increasingly, archives are deciding to apply advanced search engines in their websites or domestic and international portals. As a result, users can search archival holdings by numerous criteria – not only by the structured content tectonics of fonds or indices, but by any of the fields in a database. This makes it possible to approach information from a range of contexts. One can usually search by any word, similar to searching in Google, but the advanced search options allow for making more precise queries[207]. It often turns out that a search engine will retrieve information on a given subject from numerous fonds or even from other archives (in the case of websites). This extended retrieval can be very helpful for researchers, who may previously have been unaware that materials on the subject they study were also available in other places. Some of them have additional improvements enabling the creation of lists of favourite records, saving search results or remote ordering of materials for delivery to the reading room[208].

According to D. Heiden and M. Black-Veldtrup, electronic finding aids can be divided into three types: more or less precise reproductions of paper inventories; databases; or a combination of both. The first are electronic counterparts of traditional finding aids. They have the same structure and are navigated by the use of hyperlinks. After clicking on a hyperlink, the user is transferred to the selected place. This is not much different from the use of an analogue form. However, there is also an indisputable advantage resulting from the fact that an inventory can be made available on the Internet and can be searched using the simple mechanisms offered by browsers, enabling the search of words included in text published on a website. Some archival circles express the view that sticking to a classic inventory structure is essential for the user, as they will find in it basic information on a fonds included in the introduction and will be able to see its structure by analysing the table of contents. The second type – databases – enables searching based on selected elements of a description. One can, for example, narrow a search down to a selected time period or broaden it across sev-

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[207] For further detail on the presentation of on-line archival information of domestic archives, see T. Herrmann, *Online-Präsentation von Erschließungsinformationen. Deutsche Staatsarchive im Vergleich*, Marburg 2008, 50 p., [Bundesarchiv intranet: August 2010], and B. Dorfey et al, *Empfehlungen zur Weiterentwicklung der Präsentationen von Erschließungsinformationen im Internet*, 2009, [access: 10.06.2012], http://www.bundesarchiv. de/imperia/md/content/bundesarchiv_de/fachinformation/ark/vorlage_ark_erschlie_ung_online.pdf; B. Dorfey, *Erschließungsinformationen im Internet. Empfehlungen zur Weiterentwicklung der Präsentation im Netz*, „Archivar" 2010, 1, [access: 11.08.2012], http://www.archive.nrw.de/Archivar/hefte/2010/ausgabe1/Archivar_1_1 0.pdf, pp. 56-59.
[208] C. Williams, op. cit., pp. 71-72; P. Nawrocki, *Komputer…*, op. cit., pp. 13-34; A. Menne-Haritz, *Internet und Archive. Die Wiederentdeckung der Strukturen,* in *Online-Findbücher, Suchmaschinen und Portale*, series: Beiträge des 6. Archivwissenschaftlichen Kolloquiums der Archivschule Marburg, ed. A. Menne-Haritz, Marburg 2001, pp. 9-17; E. Büttner, *Internet-Präsentation…*, op. cit.; A. Menne-Haritz, *Digitaler Lesesaal…*, op. cit., pp. 6-7; A. Menne-Haritz, *The standards for…*, op. cit., pp. 36-38.

eral fonds. Depending on the sophistication of a search engine, one can formulate queries accordingly. The negative side of this type of search is that the user receives a list of units that may not seem structurally linked each other at first glance. However, the user can obtain information from more than one fonds. The third solution enables both hierarchical search, as in the case of electronic reproductions of paper inventories, and the searching of databases using a search engine. The user can check the fonds to which a retrieved unit belongs by navigating through its structure. The national archives in Germany use either databeses or combined finding aids[209].

Screenshot 2 An electronic finding aid of the fonds A4a Statistics and topography (*Statistik und Topographie*) LABW, [access: 25.06.2012], https://www2.landesarchiv.de/ofs21/olf/struktur.php?bestand=2962&archiv=1&sprungld=106804&letztesLi mit=suche

Archives started to use specialist software for archival description in the 1980s. Initially, the software was used to describe fonds that had not been processed. Next, paper inventories were created, and only after that was the processing of a particular fonds deemed complete. However, over time, approaches to accessing information in archives started to change. Databases and electronic inventories generated from those databases began to be published on the

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[209] D. Heiden, M. Black-Veldtrup, *Das Marburger Online-Findbuch. Konsequenzen für die Erschließung und Präsentation von Archivgut*, „Der Archivar" 1999, 3, [access: 15.09.2012], http://www.archive.nrw.de/Archivar/hefte/1999/Archivar_1999-3.pdf; M. Black-Veldtrup, *Das Online-Findbuch. Neue Perspektiven für die Erschließung und Benutzung*, in *Archive im zusammenwachsenden Europa. Referate des 69. Deutschen Archivtages und seiner Begleitveranstaltungen 1998 in Münster*, Siegburg 2000, pp. 227-243; A. Menne-Haritz, *The standards for…*, op. cit., p. 44.

Internet, once it was found that their functionality, particularly their search mechanisms, would help users find the data they were looking for. German archives, such as Bundesarchiv and Landesarchiv Baden-Württemberg, then began to attach great significance to the integration of their databases, together with data saved in text files and paper inventories, into one common archival information system[210].

Libraries conducted their first retroconversion experiments in the 1960s. At first, catalogue records were manually retyped, but as technology developed, scanning and OCR methods started to be applied. The term 'retroconversion' began to be used in 1989 and gradually became part of the professional vocabulary of archivists. However, as late as 2012 J. Ludwig, in a dictionary published on the Internet, defined the word as meaning a conversion of the unaltered contents of analogue finding aids to the electronic format, but this definition does not really reflect the reality. During retroconversion, descriptions are sometimes improved or supplemented, or are transferred from old, unused databases or files to new ones. Staatsarchiv Hamburg was one of the first German archives to use this method. At the end of the 1990s, it carried out the retroconversion of card indexes with lists of passengers leaving Hamburg's harbour between 1850 and 1934. Bundesarchiv and Landesarchiv Nordrhein-Westfalen also played a significant role, as they established standards, taking part in projects financed by the DFG[211].

Retroconversion covers the process of digitizing analogue finding aids, that is, inventories, cards and file plans. Finding aids could be written manually, printed, machine-made or prepared in the electronic form, for example, using a text editor. The main purpose of this process is to enable users to get to information on particular archival holdings mainly by publishing the information on the Internet in a searchable form. Furthermore, databases

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[210] *Digitalisierung im Bundesarchiv…*, op. cit.; *Strategische Leitsätze…*, op. cit.; F. Laufhütte, *Zusammenführung der Retrokonversionsdatenbank und der BDC-Datenbank mit den BASYS-Datenbanken*, „Mitteilungen aus dem Bundesarchiv" 2008, 2, [access: 15.09.2012], http://www.bundesarchiv.de/imperia/md/content/bundesarchiv_de/oeffentlichkeitsarbeit/fach-publikationen/Mitteilungenausdembundesarchiv/mittbarch_heft_2-2008__16._jahrgang.pdf, p. 17-18; D. Heiden, M. Black-Veldtrup, op. cit.; M. Schaupp, E. Koch, *Retrokonversion archivischer Findbücher im Staatsarchiv Ludwigsburg*, „Archivar" 2003, 2, [access: 22.02.2013], http://www.archive.nrw.de/archivar/hefte/2003/Archivar_2003-2.pdf, pp. 143-144; J. Ludwig, *Retrokonversion*, in *Terminologie…*, op. cit.

[211] H. Walberg, *Perspektiven für das Informationsmanagement in Spezialarchiven*, in *Elektronische Erschließung archivalischer Quellen in Gedenkstätten. Beiträge des internationalen Workshops in der Gedenkstätte und dem Museum Sachsenhausen am 23./24. März 2001*, series: Materialien der Stiftung Branderburgische Gedenkstätten, v. 1, eds. H. Coppi, W. Meyer, I. Schwarz, Münster 2002, pp. 103-109; E. Machowczyk, *Digitalisierung von Quellenmaterial in der Gedenkstäte Groß-Rosen. Ergebnisse, Erfahrungen und Perspektiven*, in ibid., pp. 42; M. Black-Veldtrup, *Das DFG-Projekt „Entwicklung von Werkzeugen zur Retrokonversionarchivischer Findmittel"*, in *Online-Findbücher, Suchmaschinen und Portale*, ed. A. Menne-Haritz, Marburg 2002, series: Veröffentlichungen der Archivschule Marburg. Institut für Archivwissenschaft 35, pp. 115-127; M. Black-Veldtrup, *Die Retrokonversion von Findmitteln im Landesarchiv NRW Abteilung Westfalen*, „Archivar" 2011, 2, pp. 253-256; J. Ludwig, *Retrokonversion*, op. cit.

make it easier for archivists to carry out their day-to-day records management, as they contain the information they need about the records they are responsible for. There are two retroconversion methods: data are retyped manually; or special software can be used to read written text and to transfer the text directly to appropriate database fields[212].

Migration of data from an analogue and electronic environment may be performed in three ways. Fonds may be described from scratch, which is the only possible solution if previously used finding aids have not been prepared in accordance with modern information quality standards or are illegible, missing, destroyed and otherwise unusable. The second approach involves manual retyping of existing finding aids, and the third and increasingly popular solution is the application of optical character recognition (OCR) software.

A sample diagram of a finding aids retroconversion project, developed on the basis of a model prepared by Editura GmbH and Bundesarchiv, which jointly implemented a project to digitize 150,000 inventory cards included in 143 fonds (4.5 linear metres of records), is presented below (Scheme 6). The 150,000 cards were processed in less than five months[213].

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[212] *Erträge der Antragsphasen* [online], [access: 4.12.2011], http://archivschule.de/forschung/retrokonversion-252/ergebnisse/ertraege-der-antragsphasen.html#Anteil; *Ergebnisse des Gesprächs zwischen ARK und DFG am 19. Februar 2008* [online], [access: 4.12.2011], http://archivschule.de/forschung/retrokonversion-252/newsretro/ergebnisse-des-gespraechs-zwischen-ark-und-DFG-am-19-februar-2008.html; *Ergebnisse des ersten Treffens der Teilnehmer an der Pilotphase zum DFG-Förderprogramm Retrokonversion am 28. November 2007* [online], [access: 4.12.2011], http://archivschule.de/forschung/retrokonversion-252/newsretro/ergebnisse-des-ersten-treffens-der-teilnehmer-an-der-pilotphase-28112007.html; *Arbeitstreffen zur Abstimmung eines gemeinsamen EAD-Austauschformats* [online], [access: 4.12.2011], http://archivschule.de/forschung/retrokonversion-252/newsretro/arbeitstreffen-zur-abstimmung-eines-gemnsamen-ead-austauschformats.html; *Pilotanträge zur Retrokonversion positiv begutachtet* [online], [access: 4.12.2011], http://archivschule.de/forschung/retrokonversion-252/newsretro/pilotantraege-zur-retrokonversion-positiv-begutachtet.html; *Einrichtung der bundesweiten Koordinierungsstelle Retrokonversion an der Archivschule Marburg* [online], [access: 4.12.2011], http://archivschule.de/forschung/retrokonversion-252/newsretro/einrichtungsstelle-retrokonversion.html; M. Black-Veldtrup, Das *DFG-Projekt…*, op. cit., pp. 253-256.

[213] For more information on the project, see *Aufgabe* [online], [access: 8.06.2012], http://www.retrokonversion.info/02_1_referenzobjekte_aufgabe.html; P. Rauschenbach, *Auf dem Weg zum bedarfsgerechten Angebot. Retrokonversion von Findkarteien in der Stiftung Archiv der Parteien und Massenorganisationen der DDR (SAPMO) im Bundesarchiv*, in *Archive im gesellschaftlichen Reformprozess. Referate des 74. Deutschen Archivtags 2003 in Chemnitz*, ed. R. Kretzschmar, Siegburg 2004, pp. 217-220.

| Selection of finding aids |
| Conservation |
| Specification of the process standards and results |
| Selection of a service provider or establishing a special team |
| Retroconversion process |
| Quality control |
| On-line presentation |
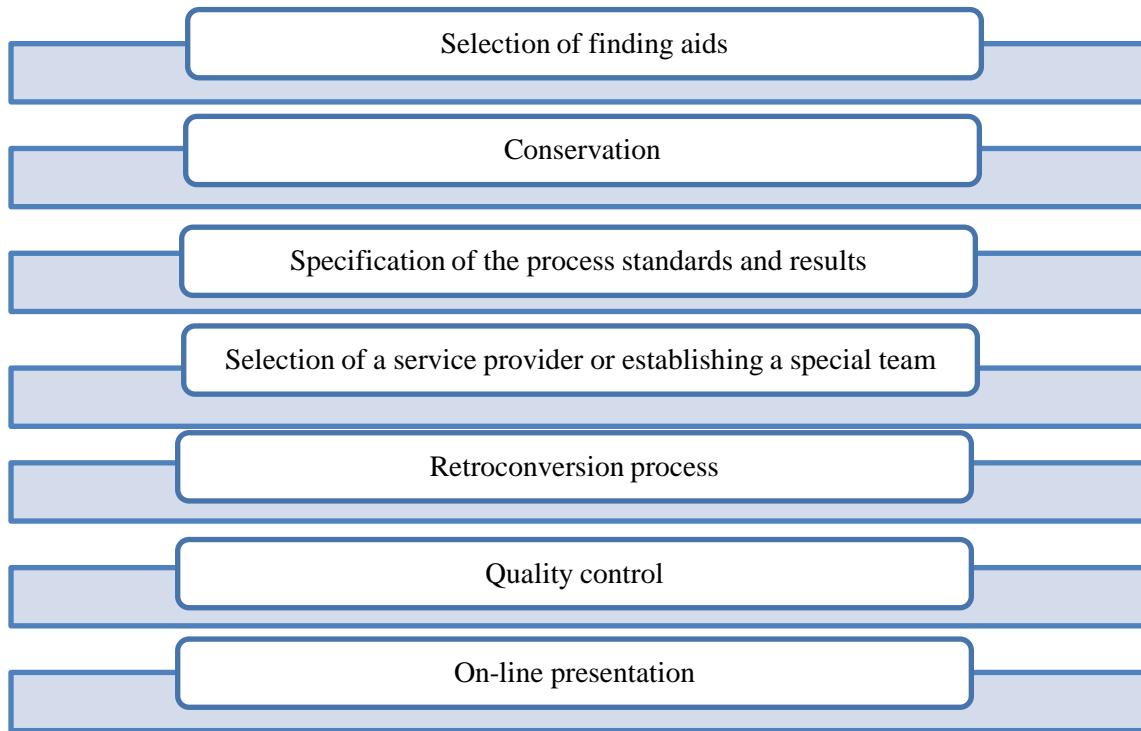
Scheme 1 Retroconversion process

Retroconversion, covering manual or computer-assisted reading of analogue data and their conversion into electronic form, consists of several stages. First, one specifies objects that are to be processed and check whether their condition allows it, as their conversion is usually done away from the archives. Then the manner of data preparation is selected and a decision on the entity that will perform the service (the archives or an external service provider) is made. In the next step, the individual elements of a finding aid description are mapped to database fields. Further steps depend on whether the data will be retyped manually or by machine.

If the data are to be transferred manually, the next step will be to scan the finding aids, in order to work with copies rather than the originals. This is usually done when the retroconversion process is outsourced. Then a production database, either one used by the archives, or another database from which data will be exported to the archives' database, has the data put into it. The second solution is most commonly used when the work is to be done by an external service provider. The data are then checked by the service provider's proofreaders [214]. This is an important element, especially if the service is outsourced. Then the data are transferred to the client for verification and are imported to the client's IT

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[214] For example, in the project implemented by Bundesarchiv and Editura, the level of accuracy in character reading and transfer reached 99.98%, and in assigning the fonds structure 99.995%, as cited in Aufgabe, ibid.

system, from which they can be made available online, either on the Internet or in an intranet. Manual retyping is very time-consuming and expensive, but it is sometimes the only available method.
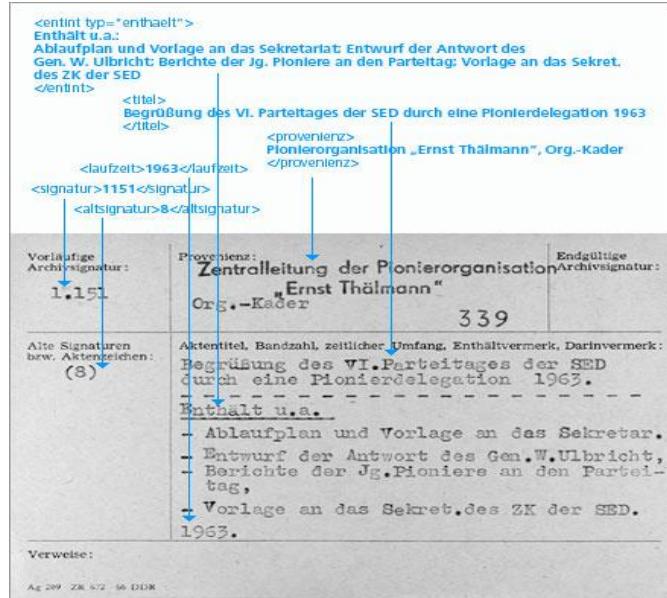
Illustration 5 The assignment of tags to the fields of an inventory card, as presented in *Abb: Beispiel für Feldzuweisungen*, [access: 8.06.2012], http://www.retrokonversion.info/02_2_2_loesung_erfassungsanweisungen.htm [215]
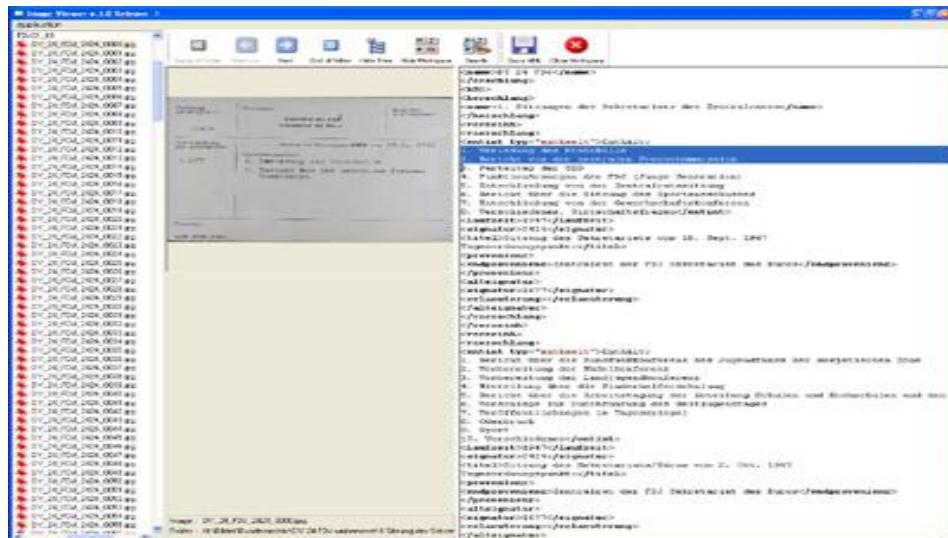
Screenshot 3. A draft view of a retroconversion of an inventory card, with a list of scanned copies of cards on the left, a reproduction of a sample card in the middle, and the read data on the right, as presented in *Abb: Screenshot der Erfassungssoftware*, [access: 8.06.2012], http://www.retrokonversion.info/02_2_3_loesung_erfassungsprozess.htm

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[215] For other examples of the mapping of finding aids, see P. Schieber, *Austauschformate bei der Retrokonversion und ihr Nutzen für die deutschen Archive*, in *Retrokonversion, Austauschformate und Archivgutdigitalisierung. 14. Archivwissenschaftliches Kolloquium*, Archivschule Marburg 10.01.2010, [access: 15.09.2012], http://www.archivschule.de/uploads/Forschung/Retrokonversion/Vortraege_Kolloquium/14_Schieber.pdf (Power Point).

In the automation of retroconversion of printed finding aids[216], inventories or cards are digitized and the characters are read by OCR software. The software needs to be configured so that it can identify which field of a finding aid goes into which field of a database. By defining the structure of an archival description, one can teach the software to recognize the elements of its structure and map them to the most appropriate part of the database record. The task of reading and transferring the data is performed automatically if all the pages or cards of a finding aid have the same of data structure and do not contain handwritten notes. Then the client proofreads and verifies the converted data. The process is now complete, if it has been done in the production database. Finally, the information is made available on-line on the Internet, or, in the case of data that has legal restrictions on its access, within the archives' ICT network. The process of preparing finding aids that were created electronically would be similar. Once the data in the electronic files were identified, they would be migrated to a temporary or production database. Then they would be checked to make sure that components of those files had been transferred to the appropriate database fields. To enable a better understanding of the paths presented above, a scheme giving possible retroconversion models is presented below[217].

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[216] In Germany, there were attempts to create software for the automation of retroconversion: M. Black-Veldtrup, M. Meusch, P. Przigoda, *Zugänglichkeit verbessern. Das DFG-Projekt „Entwicklung von Werkzeugen zur Retrokonversion archivischer Findmittel"*, „Der Archivar" 2002, 2, [access: 22.02.2013], http://www.archive.nrw.de/archivar/hefte/2002/Archivar_2002-2.pdf, pp. 111-117; B. Limberg, M. Plassmann, *Tagung „Entwicklung von Werkzeugen zur Retrokonversion archivischer Findmittel" im Nordrhein-Westfälischen Hauptstaatsarchiv*, „Der Archivar" 2004, 1, [access: 22.02.2013], http://www.archive.nrw.de/archivar/hefte/2004/Archivar_2004-1.pdf, pp. 59-61; *Abschlussbericht zum DFG-Projekt „Entwicklung von Werkzeugen zur Retrokonversion archivischer Findmittel"*, 2004, 51 p., [access: 25.05.2012], http://www.archivschule.de/uploads/Forschung/Retrokonversion/Abschlussbericht_Retrokonversion/Abschlussbericht_Retrokonversionsprojekt.pdf, p. 17-51.

[217] P. Rauschenbach, *Start des neuen Rahmenvertrages zur Retrokonversion von Findmitteln – Anlass für eine Zwischenbilanz*, „Mitteilungen aus dem Bundesarchiv" 2008, 1, [access: 15.09.2012], http://www.bundesarchiv.de/imperia/md/content/bundesarchiv_de/oeffentlichkeitsarbeit/fach-publikationen/Mitteilungenausdembundesarchiv/mittbarch_heft_2-2008__16._jahrgang.pdf, p. 102; N. Brübach, *Komplexe Findbücher? Erfahrungen mit der Retrokonversion durch Dienstleister und im Eigenbetrieb, 14. Archivwissenschaftliches Kolloquium der Archivschule Marburg 08.01.2010*, [access: 15.09.2012], http://www.archivschule.de/uploads/Forschung/Retrokonversion/Vortraege_Kolloquium/08_Bruebach.pdf, pp. 6-10 (PowerPoint); M. Black-Veldtrup, M. Meusch, P. Przigoda, op. cit., [access: 15.09.2012], pp. 111-113; B. Limberg, M. Plassmann, op. cit., pp. 59-61; *Abschlussbericht zum DFG-Projekt...*, op. cit., [access: 15.09.2012], pp. 13-51. In the article by M. Black-Veldtrup, M. Meusch and P. Przigoda, one can find a detailed description of the technical aspects of retroconversion.

Printed aids	Handwritten aids	Electronic files
Scanning	Scanning	–
OCR	Retyping directly to a database	–
Mapping	–	Mapping
Export to a database	–	Export to a database
Quality control		
Making available on-line or on the intranet		

Scheme 2 Retroconversion – paths depending on the form of a finding aid

In Germany, at the end of the 1990s, it was assumed that in the future, 10% of inventories would be available on the Internet; therefore, retroconversion began to be studied in more detail. As well as participating in numerous discussions at conferences, seminars and meetings of domestic archivists and others attended by colleagues from other countries, especially from Great Britain and the United States, researchers started to look for practical solutions to adapt to German traditions. At first, they gave some thought to a standard for storing information on holdings. EAD was chosen, mainly because of its universal character and widespread international popularity. The first experiments with digitizing finding aids were conducted between 2001 and 2006, as part of projects implemented by Landesarchiv Nordrhein-Westfalen, Bundesarchiv, Landesarchiv Baden-Württemberg, Hessische Staatsarchive, Sächsisches Staatsarchiv, and municipal archives. Based on these undertakings, researchers managed to work out a general retroconversion model. The next important step involved the publication of studies carried out by the DFG in 2006, concerning finding aids in German archives. It turned out that ca. 55-60 million descriptions of records were still in analogue form. This led to the idea of launching a project to support archives, modelled on the English Access to Archives project. To this end, he Koordinierungsstelle Retrokonversion (RK) (Retroconver-

sion Coordination Office)[218] at the Archival School in Marburg (Archivschule Marburg) was established in 2007[219].

From 2008 to 2012, archives in Germany had access to financial support from the DFG for projects concerning the digitization of finding aids through the RK[220]. The support for the retroconversion process covers multi-stage activities performed both by archives and by service providers. Some stages are specified in the agreement and result from the experience developed during the above-mentioned experimental phase. The first thing an archives interested in digitizing its finding aids must do is to familiarize itself with the project guidelines. The next step involves preparing an application, in which an archives has to specify the object of retroconversion, that is, to select the finding aids for digitization. Then the application is submitted to the DFG through the RK and, after its approval, an agreement is signed. The three years of funding is counted from the signing of the agreement. During this time, an archives must transfer, at its own cost, 50% of its finding aids into digital form. Then, the subsequent stages of the retroconversion process, mentioned above, are implemented. At the very end, the results are checked by the RK[221].

By 2010, thirty-two archives (federal, state, county, municipal, of research institutions and churches, economic) managed to prepare, in cooperation with RK, almost 1,000 inventories in the electronic form. This constitutes approximately 1.8 million archival units, which means that only around 3% have been digitized. These figures show how time-consuming implementing the plan will be. The cost of the undertaking, excluding the maintenance

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[218] The Office's tasks include: consultancy on filing applications to the DFG; assessment of the proposed costs of retroconversion; consultancy on mapping finding aids to required data exchange formats; supporting archives in the implementation of SAFT-XML and EAD-XML standards; assessment of the quality control of retroconversion results; supporting archives in supplying data to web portals. *Koordinierungsstelle Retrokonversion* [online], [access: 4.12.2011], http://archivschule.de/forschung/retrokonversion-252/koordinierungsstelle-retrokonversion/.

[219] F. M. Bischoff, A*ufgaben und Erfahrungen der DFG-geförderten Koordinierungsstelle Retrokonversion an der Archivschule Marburg*, [access: 15.09.2012], http://www.archivschule.de/uploads/Forschung/Retrokonversion/Vortraege_Kolloquium/06_Bischoff.pdf, pp. 3-8, 14 (conference PowerPoint: Retrokonversion, Austauschformate und Archivgutdigitalisierung 14. Archivwissenschaftliches Kolloquium, 10.01.2010, Marburg); *Abschlussbericht zum DFG-Projekt…*, op. cit., [access: 15.09.2012]; W. Reininghaus, *EDV und Neue Medien: Die Retrokonversion von Findmitteln in Deutschland – ein DFG-Vorprojekt*, „Der Archivar" 2005, 3, [access: 15.09.2012], http://www.archive.nrw.de/Archivar/hefte/2005/Archivar_2005-3.pdf, p. 201; M. Black-Veldtrup, *DFG-Projekt…*, op. cit.; U. Fischer, W. Reininghaus, *DFG-Vorstudie „Retrokonversion archivischer Findmittel". Die wichtigsten Ergebnisse des Projekts*, „Der Archivar" 2006, 4, [access: 15.09.2012], http://www.archive.nrw.de/Archivar/hefte/2006/Archivar_2006-4.pdf, pp. 329-330; M. Black-Veldtrup, M. Meusch, P. Przigoda, op. cit., [access: 15.09.2012], pp. 111-112.

[220] F. M. Bischoff*, Aufgaben und Erfahrungen…*, op. cit., pp. 4, 14.

[221] Erträge…, op. cit.; *Übersicht der Archive, deren Retrokonversionsprojekte bisher durch die DFG gefördert bzw. bewilligt wurden* [online], [access: 4.12.2011], http://archivschule.de/forschung/retrokonversion-252/antragsstellung/uebersicht-archive.html; *Ergebnisse des Gesprächs…*, op. cit.; *Ergebnisse des ersten Treffens…*, op. cit.; E. Büttner, *Internet-Präsentation…*, op. cit; F. M. Bischoff, *Aufgaben und Erfahrungen…*, op. cit., pp. 1-14.

of a retroconversion unit and the archives' own expenses[222], was approximately 1.9 million euro. It can also be concluded that the financial aspect may be the main obstacle for some archives' participation, as not all archives can afford a financial contribution at the level of 50% and, therefore, do not sign up for the project[223].

Apart from bringing about improvement in the quality of services, retroconversion forces archives to undertake inventory work to check that current finding aids match actual warehouse inventories. Sometimes new, unprocessed records and records that have been considered lost are found. It can also happen that, during the arrangement, something turns out to be missing, although it is recorded in the inventory. Additional work that may hinder or slow down the process includes the improvement or expansion of old inventories with new elements, e.g. indices, which were not used in the past. The role of retroconversion in the digitization process, pointed out above, is also noteworthy. A fonds without an electronic inventory will not be digitized, as it will not be possible to link scans with their descriptions[224].

Electronic inventories, which should today be, in fact, recognized as databases[225], not only facilitate searching, but also enable quick access to information on particular records. They also solve the issue of printing and the infrequency of publication of guides to records, which enabled archives to reach a wider range of clients. Electronically shared archival information increases the probability that the published data are up-to-date – assuming, of course, that an archives updates and synchronizes the online databases[226]. This information can also contain detailed descriptions, which was previously limited because the number of published pages was limited by physical and financial factors. Electronic inventories are increasingly extended with reproductions of the records they describe. The Landesarchiv Baden-Württemberg started to provide access to electronic fonds in the 2010s, yet initially without providing access to the records the records themselves. In the future, they intend to provide access to an inventory for hybrid fonds, which may contain records, databases, photographs or audiovisual materials of various origin (analogue and electronic ones). Moreover, the archivists at this archives

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[222] An archives participating in the project bears 50% of the costs of the whole finding aids digitization project. *Fragen & Antworten zur Antragstellung* [online], [access: 4.12.2011], http://archivschule.de/forschung/retrokonversion-252/antragsstellung/fragen-antworten-zur-antragstellung.html.

[223] *Erträge…*, op. cit.; *Übersicht der Archive…*, op. cit.; *Ergebnisse des Gesprächs…*, op. cit.; *Ergebnisse des ersten Treffens…*, op. cit.

[224] M. Schaupp, E. Koch, op. cit., pp. 143-144; *Digitalizacja…*, op. cit., pp. 41-42.

[225] Initially, with the development of websites, archives provided access to inventories in the form of text files or text and graphic files.

[226] For the sake of safety, production databases should not be made available on the Internet, as they can be damaged intentionally or by technical problems.

found that as the number of inventories made available on the Internet increased, the number of users in the research room started to grow[227].

For many researchers, the publication on the Internet of detailed information about holdings seems obvious and is perceived as a natural step in the future developmentof archives. They are considered as regular tasks for inclusion in the package of services provided by archives. However, the development of available tools is not positively assessed in terms of information detail, functionality or the amount of contents. Their specific character causes a problem related to the requirement of having basic specialist knowledge in order to be able to use them correctly. Comparing the situation of the on-line publication of inventories at the end of the first decade of the 21st century, with the assessment performed in 2003 by DFG experts, it can be concluded that their number has not grown considerably, nor has online publication of inventories become a common solution used by all state archives. Moreover, their functionality has not been improved and they offer nothing more than the possibility of searching or ordering records and printing orders. In the future, they could be developed in the spirit of Web 2.0, that is, enabling active contact with customers, which will make it possible to create lists of favourite records, save search results, add tags[228], comments, or even one's own reproductions of records (private ones or copied from a particular archives) or interact with other users. This could also be a good development trend, as users would add their own information to inventories or would report errors. Some enthusiasts can identify places, events, persons and objects in photographs and may be able to share knowledge on other, similar materials or publications related to them. Archivists are not able to describe everything in great detail, due to the lack of time or specialist knowledge. That is why the cooperation with users would contribute to increasing the value of descriptions, as additional information[229] would be provided and items from private collections would be added. This could also speed up the digitization of holdings, thanks to the sharing of digital copies created by users on their own equipment during their research. This aspect of the customer relationship would obviously need to be managed

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[227] M. Black-Veldtrup, *Erschließung…*, op. cit., pp. 609-619; A. Choniawko, op. cit., [access: 9.06.2012], p. 4; *Inventar. Elektronische Unterlagen* [online], [access: 9.06.2012], http://www.landesarchiv-bw.de/web/50811#2.
[228] A keyword that can be assigned to a selected digital item. A user could tag selected documents to improve searching options for others.
[229] In Bundesarchiv, information and sample literature concerning a given fonds is added to some inventories.

carefully to protect online databases from vandalism, but it should not disturb the natural character of this contact[230].

[230] M. Black-Veldtrup, *Erschließung…*, op. cit., pp. 609-610; P. Ławniczak, *Archiwum przyszłości. Udostępnianie informacji o archiwaliach za pośrednictwem Internetu*, in *Pamiętnik IX Ogólnopolskiego Zjazdu Studentów Archiwistyki. Archiwistyka wczoraj, dziś i jutro*, eds. M. Jabłońska, P. Ławniczak, Toruń 2010, p. 206; B. Martin-Weber, *Die „Benutzungsrecherche" – weitere Optimierung der Benutzung im Bundesarchiv*, „Mitteilungen aus dem Bundesarchiv" 2008, 1, [access: 9.06.2012], http://www.bundesarchiv.de/imperia/md/content/bundesarchiv_de/oeffentlichkeitsarbeit/fach-publikationen/mitteilungenausdembundesarchiv/heft_1-2008__16._jahrgang.pdf, pp. 33-35; T. Herrmann, op. cit., pp. 29-30; A. Menne-Haritz, *The standards for…*, op. cit., pp. 38-39; M. Glauert, *Archiv 2.0…*, op. cit., pp. 47, 51; T. Klüttig et al, *Die deutschen Archive in der Informationsgesellschaft – Standortbestimmung und Perspektiven*, „Der Archivar" 2004, 1, [access: 22.02.2013], http://www.archive.nrw.de/archivar/hefte/2004/Archivar_2004-1.pdf.

"Information should be free (...). Only unlimited exchange of knowledge releases maximum human inventiveness".

- (PL: „*Informacja powinna być wolna (...). Tylko swobodna wymiana wiedzy pozwala na wyzwolenie maksimum ludzkiej pomysłowości.*") K. Jałochowski, *Era hakera*, „Cywilizacja 2.0. Świat po rewolucji informatycznej. Niezbędnik inteligenta plus. Polityka wydanie specjalne" 2011, 8, p. 4.

4. Digitization of records

4.1. Equipment and studio

Digitization is a process that involves the use of specialist equipment in a properly organized workplace, that is, a digitization studio. There are three kinds of digitization studios: in-house (established within a given institution); outsourced (located at the service provider's premises or at a given institution); and mobile (consisting mainly of portable equipment that can be moved to any location in which it is needed).

If a digitization studio is organized in-house, its location should be well thought-out before it is altered and specialist equipment installed. The room should be situated near warehouses in which materials intended for digitization are stored. This makes it easier to transport the records and lowers the risk that something will happen to them in transit. During the scanning process, storage conditions in the studio should not differ from those in which the records are normally stored. One should also ensure security measures, not only safes, but also other security devices, such as alarms or detectors, including fire alarms and sensors monitoring humidity and heat. It is good to use air conditioners or similar devices to maintain stable conditions. One should also consider the size of the room, which must be big enough for the specialist devices as well as for additional equipment, such as furniture. It must comply with occupational health and safety regulations. Possible flood or natural disaster risk as well as structural properties should be taken into account. One should not forget the size and weight of scanners and thus the room's ceiling height and floor loading, as professional equipment and digitized materials may overstress the structure. The studio, regardless of the sort that has been chosen, should also be specifically prepared to ensure its cleanliness, in order to protect records, equipment and people working in it. That is why it is recommended to use antistatic flooring and to choose furniture with easy to clean surfaces. The colour of the room is also an important element and should not interfere with the perception of colours during scanning and calibration of devices, as it could affect the quality of reproductions. Ideally the colour should be neutral – dark grey. Other important factors associated with the digitization of materials such as records, books or photographs include the lighting in the room, which can distort the colours of scans if scanning surfaces are unnecessarily exposed. Any daylight that comes into a room must also be limited to the minimum. The position of the Earth in relation to the Sun during the day makes it difficult to maintain stable lighting in the room, therefore darkening foils, roller-blinds and blinds are used. Obviously their colour must be neutral to prevent any distortion of the colours of reproductions. Light from scanning devices as well as artificial lighting can have a de-

structive influence on records. That is why it is recommended to pay particular attention to technical standards and properties. Proper arrangement of scanning devices to avoid any interference is also important. Light cannot only be harmful to the quality of scans, but can also have a negative effect on people's health. Working in a room with limited daylight and with additional darkening interrupted by flashes of light from a scanner, may be harmful. That is why in Germany special attention is paid to the working conditions of scanner operators, in order to make them as comfortable as possible. The last element related to the room is the employees' clothing. Neutral colours are recommended, because clothing colours can also influence a scanner operator's perception of colours. One should obviously not go to extremes in adjusting standards and recommendations, but should find the middle ground between people's working comfort and protection of archival materials and equipment[231].

Different types of materials require different types of digitization equipment. Basically, the three types of equipment used to digitize materials such as documents, maps, plans and microfilms are: scanners; hybrid devices[232]; and digital cameras[233].

Scanners used for records (e.g. documents – technical, cartographic photographic; posters) and microfilms include:

- flatbed scanners, also called desktop scanners;
- planetary scanners, also known as large format scanners, sometimes also called book scanners;
- document scanners;
- drum scanners;
- hybrid scanners, scanning and microfilming during a single exposure;
- automatic scanners for microforms[234].

  In general, the above-mentioned scanners consist of:

  o a photosensitive element (matrix);
  o an analog-to-digital converter;
  o lamps;
  o an optical system;

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[231] *Digitalizacja piśmiennictwa*, op. cit., pp. 68-73; *Draft Digitisation Guidelines for Creating Digital Still Images*, Alexander Turnbull Library National Library of New Zealand Copying and Digital Services, 2003, [access: 7.11.2012], http://www.natlib.govt.nz/downloads/Creating_digital_still_images.pdf; A. E. Bülow, J. Ahmon, *Preparing Collections for Digitalization*, London 2011, pp. 160-170.

[232] Used for scanning and simultaneous creation of microfilms.

[233] Particularly recommended in situations requiring mobility or for specific materials that cannot be scanned on any of the available scanners.

[234] *Digitalizacja…*, op. cit., pp. 79-102; *Wytyczne dobrej praktyki. Aplikacje…*, op. cit., pp. 199-200; A. Trembowiecki, *Digitalizacja…*, op. cit., pp. 80-92.

- an area (usually a glass pane) on which the scanned object may be put or through which it is shifted (a slot), e.g. on flatbed scanners;
- closing lids, e.g. on flatbed scanners;
- a cradle enabling proper placement of a work, e.g. in planetary scanners;
- drums to which materials are fixed during scanning: e.g. on drum scanners.

Sample photographs presenting types of scanners used in German archives:

Illustration 6 Flatbed scanner: EPSON Expression 10000XL Photo Scanner, [access: 4.11.2012], http://www.epson.com/cgi-bin/Store/jsp/Product.do?BV_UseBVCookie=yes&sku=E10000XL-PH#1

Illustration 7 Planetary scanner: Omniscan 14000 A1 LS, [access: 4.11.2012], http://www.zeutschel.com/products/color_scanner_os14000_a1.html

Illustration 8 Document scanner: Fujitsu fi-6670 Color Duplex, [access: 4.11.2012],
http://www.fujitsu.com/us/services/computing/peripherals/scanners/production/fi-6670.html

Illustration 9 Drum scanner: AZTEK PREMIER, [access: 4.11.2012],
http://www.aztek.com/Products/AZTEKPremier_sml.gif

Illustration 10 Hybrid scanner for microfilms: OM 1600, [access: 4.11.2012],
http://www.zeutschel.com/products/microfilm_scanner_om1600.html

Depending on the type of scanner, a flat object can be:

- put on a glass pane with the contents facing the pane, then pressed with a lid and read by the scanning mechanism located beneath, moving along a rail – a flatbed scanner;
- put on a table or a cradle with the contents face up, then pressed with a glass pane or pressed against it from below, and read by the scanning mechanism located above it, moving along a rail – a planetary scanner;
- fixed to a drum and scanned gradually as it rotates along a glass pane, under which the scanning system is located – a drum scanner;
- put on an automatic feeder and automatically scanned by the device – document scanner;
- scanned as it is wound from one reel to another – it is used for microfilms[235].

When a camera is being used, a digitized object can lie or hang in any position, depending on what it is and its physical condition. A spatial object can be scanned in two ways: photographed sequentially around, creating a 3D image; or scanned with a special 3D scanner. Audiovisual recordings are digitized using appropriate copying devices, which are vary according to the recording's carrier.

All reproductions, after they are scanned and/or converted into a digital signal, are sent to a computer, then usually displayed on the screen and saved as a file in the selected area of the central processing unit or server. This can be done automatically, but it is better if a scanner operator can confirm that the reproduction meets quality standards and have the scan repeated or corrected if it needs to be[236].

When making a decision about the purchase of a scanner for flat materials – the most popular in archives – one should take into account the conditions of the environment in which the studio is located, the type of records to be scanned, financial issues, repair time, warranty terms and conditions, reliability, compliance with standards (digitization standards, as well as others, such as environmental protection standards), software provided, user-friendliness (specialist training can increase the costs) and equipment modernization possibilities. Technical parameters should also be taken into account, such as:

- resolution[237],

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[235] A. E. Bülow, J. Ahmon, *Preparing…*, op. cit., pp. 97-104.

[236] H. Dudała, J. Dziwoki, *Wykorzystanie skanera we współczesnej archiwistyce – wady i zalety – dotychczasowe doświadczenia*, in *Archiwa i archiwiści w dobie społeczeństwa informacyjnego. Pamiętnik IV Powszechnego Zjazdu Archiwistów Polskich, Szczecin 12-13 września 2002 r.*, ed. D. Nałęcz, v. 1, Toruń 2002, p. 78.

[237] This is important as it determines the quality of reproductions and the maximum number of pixels per inch that can be captured and stored – the higher the resolution, the better the scans.

- format of scanned objects[238],

- acceptable weight of scanned objects[239],

- colour depth, also called bit depth[240],

- optical density, also called scanner dynamics or optical depth[241];

- colour profiles[242],

- speed and efficiency of the equipment[243],

- load: determines how many scans can be made within a given time;

- minimum brightness at which the scanner can work;

- minimum opening angle of a stitched object[244],

- exposure time, also called shutter speed[245],

- scanner operation conditions[246],

- power consumption[247],

- weight and dimensions of the scanner[248],

- photosensitive system (matrix),

- optical system[249],

- noise[250].

The above list does not cover all the criteria that could be mentioned and taken into account when selecting a device, but it is long enough to show the complexity of the selection decision[251].

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[238] Only objects that are in formats that the scanner can handle can be scanned.

[239] Placing materials that are too heavy on scanning equipment may damage it and may distort reproductions,.

[240] This influences the reproduction of the colours of an object.

[241] Colour and greyness saturation.

[242] Profiles support the management of scanner settings; separate profiles can be saved for scans of documents or maps.

[243] The higher its parameters and the number of additional actions, for example, prescanning (preview of a scan to check whether the appropriate settings have been chosen), required, the slower the scanner will work; speed is calculated as the time required for one reproduction using particular settings or the number of reproductions made per minute.

[244] It is important to prevent structural damage when any force is needed to open an object so that it can be placed on a scanner.

[245] Specifies the length of time scanned objects are exposed and ensures that scanned images are neither under- or overexposed.

[246] If not properly adjusted to the studio's conditions, scanners may not produce good results.

[247] Using a lot of electrical equipment will result in higher energy bills.

[248] The weight of the equipment must not exceed the floor loading of the building and its size must easily fit the dimensions of the allocated space.

[249] Includes lamps and mirrors, which influence scanning quality and the exposure of objects.

[250] Affects the comfort of workers and may be a significant issue when several devices are used.

[251] *Digitalizacja…*, op. cit., pp. 75-79; *Poradniki DGM…*, op. cit., p. 153; *Standardy w procesie digitalizacji obiektów dziedzictwa kulturowego*, ed. G. Płoszajski, Warsaw 2008, pp. 196-197; A. E. Bülow, J. Ahmon, *Preparing…*, op. cit., pp. 94-97; *Bestandsaufnahme…*, op. cit., pp. 75-77.

As shown in the following table of scanner parameters, not all of this information is available on manufacturers' websites. Those items of information that are not available are indicated by 'n.d.'(no data). A tendency that can be observed is that the more specialist and automatic a scanner is, the fewer technical details its manufacturers provide on the Internet. Another problem is that descriptions contain parameters with different units of measurement. For example, resolution may be provided in dpi (dots per inch) or ppi (pixels per inch), which are commonly recognized as synonyms, although there is a difference between them. Dpi specifies the resolution of a device can output, whereas ppi indicates the resolution of the images that are produced. Although there is a special resolution unit for scanners – spi (sample per inch) – it has not come into popular usage. It is also important whether the resolution is provided as one value (e.g. 300 dpi) or as two values (e.g. 800×1200 dpi). In the first example, we can assume that a scanner will read within an accuracy of 300 dots per inch both vertically and horizontally, whereas in the second we know that the vertical and horizontal values differ. Similarly, as far as the scanning format is concerned, the dimensions are provided in inches, millimetres, or as ISO symbols (e.g. A4) or their German and American equivalents (DIN and Letter). In order to facilitate the interpretation of the table, all values have been converted to ISO formats, when it was possible. Weight and dimensions have also been converted to the units commonly used in Europe. Only data concerning the speed of scanning have not been converted because of their great variance. One can, of ourse, ask a manufacturer to provide the parameters of their products in a particular form[252].

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[252] For further information about scanner manuafactures and their products, see: *EPSON Expression 10000XL-Photo Scanner*: http://www.epson.com/cgi-bin/Store/jsp/Product/Specifications.do?sku=E10000XL-PH&BV_Use BVCookie=yes; *Zeutschel Omniscan 14000 A1 LS*: http://www.zeutschel.com/products/pdf/color_scanner_os1400 _a1.pdf; *Fujitsu fi-6670 Color Duplex Document Scanner* [access: 4.11.2012]: http://www.zeutschel.com/products/ pdf/color_scanner/fi-6670a_fi-6670.pdf; AZTEK PREMIER Drum Scanner: http://www.aztek.com/premier.html#; *Zeutschel OM1600*: http://www.zeutschel.com/products/pdf/microfilm_scanner_om1600.pdf; http://www.zeutschel .com/products/microfilm_scanner_om1600.htm.

Producer	EPSON	Zeutschel	Fujitsu	AZTEK	Zeutschel
Model	Expression 10000XL- Photo Scanner	Omniscan 14000 A1 LS	fi-6670 Color Duplex Document Scanner	PREMIER Drum Scanner	OM1600
Scanner type	flatbed	planetary	document	drum	microfilm
Resolution (dpi)	2400	600 ppi	600	n.d.	600
Format	A3	A1	A3	304 x 304	16/35
Bit Depth BW/C (bit)	16/48	12/36	8/24	n.d.	n.d.
Optical resolution (D)	3.8	n.d.	n.d.	3.88	n.d.
Speed	2400 dpi (color, working): 16ms/line	A1 600 ppi: 24s	A4 200dpi (color, horizontal): 90p./min	n.d.	30.5m rolls (grey scale) in 12-18 min
Daily Duty Cycle	n.d.	n.d.	15.000/1	n.d.	n.d.
Weight/Dimensions (kg/mm)	18/655x457x198	n.d./1360x1432x2310	17/641x432x300	76.2/n.d.	27/279x533x483
Power Consumption	45W	n.d.	216W	n.d.	n.d.
Noise	n.d.	n.d.	n.d.	n.d.	n.d.
Image Sensor	CCD	n.d.	CCD	n.d.	n.d.
Light Source	xenon	n.d.	cathodal	halogen	n.d.
Operating Environment	Operating Humidity: 10-80%	n.d.	Temperature: 5-35°C Operating Humidity: 10-80%	n.d.	n.d.
Scannable objects	photographs, negatives, small leaflets	documents, maps, technical documentation (most of all types of flat objects)	documents (very good conditions)	newspapers, posters, slides, negatives, photographs	microfilms

Table 4 Technical specifications of scanners

To sum up, there are many devices – from simple to very complex and automated ones – available in the market, which enable the digitization of records on various carriers. That is why the selection is not easy, especially the analysis of their properties. As well as the purchase price of the equipment, the costs of its maintenance and replacement with more modern solutions must be taken into account. The preparation of rooms and logistics may also require some effort. These are all expenses that must be incurred during in preparing for such digitization. The more professional the approach adopted, the better its final outcomes will be, in terms of producing quality scans that will be able to be processed and used numerous times.

4.2. File formats for scanned archival materials

Archival materials require not only different scanning devices to accommodate their different types of carriers; they also need to be scanned to different file formats. The selection of file format depends on the capacity of scanners and the software provided. Moreover, standards that have been adopted in a project and any strategy for long-term preservation of scanned materials must also be taken into account. Other factors include purposes for which reproductions are used[253].

In Germany, national archives usually digitize two-dimensional materials using of raster graphics. They do not use optical character recognition yet, as its interpretation of texts contained in records is poor, because many records contain handwriting alongside typed text. Experiments carried out so far have proved that manual typing is faster[254].

Scanned documents can be divided into masters, that is preservation copies, and working copies, also called use copies. The former are scanned to the highest parameters and saved in lossless compressed or uncompressed formats. No changes are made to improve their clarity. The latter, on the other hand, depend on the purpose for which they are used. They are usually small, due to the use of lossless compression with image quality that is sufficient for use on the Internet or in a digitization studio. Masters, apart from securing analogue originals, are in fact used only for the production of use copies. They are also made available for reproductions needed for book and press publications, posters and similar purposes, but hardly ever on the Internet due to their large size.

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[253] M. Kowalska, op. cit., pp. 47-50; *Draft. Digitisation Guidelines…,* op. cit.; *Standardy w procesie…*, op. cit., p. 123.
[254] Ibid, p. 24; H. Dudała, J. Dziwoki, op. cit., p. 79.

Working reproductions can be found in archives' electronic publications or, in particular, in electronic critical editions[255] and on web portals[256].

Formats / Characteristics	TIFF (Tagged Image File Format)	JPEG 2000 (Joint Photographic Experts Group)	JPEG (Joint Photographic Experts Group)	PNG (Portable Network Graphic)	GIF (Graphics Interchange Format)	DjVu	SID (MrSID- Multi-resolution Seamless Image Database)
Basic							
Created	1992	2000	1990	2003	1987	1996	1996
Creator	Aldus Corp.	Joint Photographic Experts Group	Joint Photographic Experts Group and Independent JPEG Group	World Wide Web Consortium	CompuServe Interactive Services Incorporated	AT&T Labs	LizardTech
Copy							
Masters	x	x		x			
Use copies		x	x	x	x	x	
Compression							
Lossy	x	x	x			x	x
Lossless	x	x		x	x	x	x
Colors							
Black-White	x	x	x	x	x	x	x
Grey scale	x	x	x	x	x	x	x
Color	x	x	x	x	x	x	x
Common							
Yes	x		x		x	x	
No		x		x			x
Scannable objects							
Documents, technical documentation, maps, leaflets	x	x	x	x	x		x (esp. for maps!)
Photos	x	x	x	x		x	x
Standards							
ISO	x	x	x				
W3C				x			
Patent					x		x
License							
Open/free	x	x	x	x	x	x	
Proprietary	x	x	x			x	x
System environment							
Windows	x	x	x	x	x	x	x
Macintosh	x	x	x	x	x	x	x
Linux	x	x	x	x	x	x	x

Table 5 File formats for digitization used by archives in Germany[257]

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[255] Published on CDs or DVDs.
Ch. Reinicke, *Neue Nutzungsformen…*, op. cit., pp. 76-82; idem, *Digitalisierung im Landesarchiv Nordrhein-Westfalen Personenstandsarchiv Brühl – Die Edition Brühl wird „100''*, „Archivar'' 2006, 4, pp. 359-360, [access: 22.02.2013], http://www.archive.nrw.de/archivar/hefte/2006/Archivar_2006-4.pdf.

[256] M. Kowalska, op. cit., pp. 47-50; *Draft. Digitisation Guidelines…,* op. cit.; *Standardy w procesie…*, op. cit., p. 123.

[257] K. Ober, op. cit., p. 62; A. Trembowiecki, *Digitalizacja…*, op. cit., pp. 56-58, 61-66; G. Maier, *Qualität…*, op. cit. pp. 148-164; *Digitisation. Standards Landscape…*, op. cit., pp. 54-58; *Bestandsaufnahme…*, op. cit., pp. 82-84; *Ochrona dziedzictwa cyfrowego…*, op. cit., p. 133; H. Dudała, J. Dziwoki, op. cit., p. 79.

For preservation copies of records (documents, ephemera, cartographic or technical) and photographs: TIFF or JPEG2000 formats are usually used, for use copies: JPEG and PNG formats.

When selecting formats, one has to decide what types of scanned objects can be reproduced in them. Because of the prevalence of documents in archives, the choice of formats is limited to graphic formats or, possibly, text formats if OCR software is used for text recognition. Other important elements include the identification of the purpose of reproductions, that is, whether they will be used as masters or use copies. Masters must always be of top quality, reproducing as much detail of the original as possible. Use copies can be processed more freely, depending on the needs of users, and ease of use is more important than high quality. They can, therefore, be modified or improved. The third important criterion is related to the popularity of formats. It is obviously recommended to use formats that are open and most frequently used by institutions and in society generally and are most widely implemented in a range of system environments. This will ensure easy access, requiring no additional installations by the end user, and facilitates the organization of security measures. It is widely believed that the most popular formats are most likely to be developed long into the future, so this improves the probability that such formats, and reproductinos stored in them, will survive as technology changes. The table below presents formats recommended by several national and international projects and used by the German national archives[258].

Specifications for documents, technical documents, leaflets, photographs, maps, glass negatives and parchments					
International					
Minerva 2008					
Masters	TIFF 600 dpi (photographs)		JPG (depends on equipment)		
Working copy	JPG	PNG 72 dpi	GIF 72 dpi	SVG	
Calimera					
Masters	TIFF				
Working copy	Flash	JPEG	GIF	PNG	SVG
National					
DFG					
1996					
Masters	TIFF 400-600 dpi BW[259] (compression LZW) – printed text400 dpi GS[260], BW - manuscripts, pencil drawings, typings, photographs (BW, C[261])				
Working copy	Not applicable				
2009					

[258] A. E. Bülow, J. Ahmon, *Preparing…*, op. cit., pp. 42-43; *Digitalisierung von Archivgut in den Staatlichen…*, op. cit., p. 9.
[259] BW – black and white
[260] GS – grey scale
[261] C – color

Masters	TIFF min. 300 dpi (compressionless) GS 8 bit, C 24 bit 400 dpi – especially manuscripts, maps 600 dpi (compression LZW) BW 1bit		
Working copy	JPEG	GIF	
FRAUNHOFER IAIS			
Masters	TIFF min. 300 dpi recommended 600 dpi (BW 1 bit, GS 8 bit, C 24-48 bit)	JPEG2000	PNG
Working copy	PNG 75-300 dpi	JPEG 75-300 dpi	
German archives[262]			
Bundesarchiv			
Masters	TIFF		
Working copy	PNG 75-100 dpi	PDF	
Die Staatlichen Archiven Bayerns			
Masters	JPEG2000 300 dpi 24 bit C – documents and books (original size, 2 pages/scan), posters (bigger than A1, in parts, 200 dpi), parchments, photographs: print, glass: (bigger than 9x12 cm, 600 dpi, smaller than 9x12 cm 800 dpi), slides, maps, plans (bigger than format A1, in parts)		
Working copy	JPEG		
Landesarchiv Berlin			
Masters	n.d. 640 dpi 8 bit GS – index cards 300 dpi 8 bit GS – glass negatives		
Working copy	n.d.		
Landesarchiv Baden-Württemberg			
Masters	TIFF 300 dpi C 24 bit 300 dpi GS – documents (colorless)		
Working copy	PNG	JPEG	PDF
Landesarchiv Nordrhein-Westfalen			
Masters	(scanning)	(archiving)	

[262] Bundesarchiv: *Digitalisierung in der SAPMO. Auswertung der bisherigen Erfahrungen*, Berlin 2011, [access: 1.12.2012], http://www.bundesarchiv.de/imperia/md/content/abteilungen/sapmo/texte/evadigitextmh14_03_11_inet.pdf, p. 14; Die Staatlichen Archiven Bayerns (DSAB): *Digitalisierung von Archivgut…*, op. cit., pp. 4-6; Landesarchiv Berlin (LAB): *Bestandsaufnahme…*, op. cit.; Landesarchiv Baden-Württemberg (LABW): T. Fricke, *Digitalisierungsworkflow und Onlinepräsentation im Landesarchiv Baden-Württemberg*, in *Archivische Informationssysteme in der digitalen Welt*, eds. G. Maier, T. Fritz, Stuttgart 2012, series: Werkhefte des Staatlichen Archivverwaltung Baden-Württemberg Seria A/23, pp. 66-67; Landesarchiv Nordrhein-Westfalen (LANRW): J. Kistenich, *Archivgutdigitalisierung im Rahmen der Bestandserhaltung. Die Praxis im Landesarchiv Nordrhein-Westfalen*, [access: 9.11.2012], http://www.archivschule.de/uploads/Forschung/Retrokonversion/Vortraege_Kolloquium/20_Kistenich.pdf, pp. 5-11; J. Kistenich, M. Wiech, *Auf dem Weg zum elektronischen Landesarchiv*, in *Archive im digitalen Zeitalter. Referate des 79. Deutschen Archivtages in Regensburg*, ed. H. Schmitt, Siegburg 2010, pp. 141-142.
Thüringisches Hauptstaatsarchiv (THSTA): Email from the Thüringisches Hauptstaatsarchiv Head B. Post dated: 30.11.2012 and 3.12.2012; Landesarchiv Greifswald (LAG): Email from the Landesarchiv Greifswald Head M. Schöbel dated: 5.12.2012; Landesarchiv Saarbrücken (LAS): Email from the Landesarchiv Saarbrücken Head M. Sander dated: 11.12.2012 and 18.12.2012; Landesarchiv Rheinland-Pfalz Landeshauptarchiv Koblenz (LRP LHAK): Email from B. Dorfey from the Landesarchiv Rheinland-Pfalz Landeshauptarchiv Koblenz dated: 29.11.2012; B. Dorfey, *Digitalisate…*, op. cit., p. 6; Niedersächsisches Landesarchiv Hauptstaatsarchiv Hannover (NLHAH): Email from D. Busse from the Niedersächsisches Landesarchiv Hauptstaatsarchiv Hannover dated: 10.12.2012.

	TIFF 300 dpi – documents 400 dpi – from A0, parchment	JPEG2000
Working copy	JPEG 150 dpi, 75% quality	
Landesarchiv Rheinland-Pfalz Landeshauptarchiv Koblenz		
Masters	TIFF 300 dpi	
Working copy	JPEG 72 dpi	
Landesarchiv Saarbrücken		
Masters	TIFF 300 dpi (format A4, smaller more dpi)	
Working copy	JPEG 300 dpi (format A4, smaller more dpi)	
Landesarchiv Greifswald		
Masters	TIFF 300 dpi	
Working copy	SID	DjVu
Niedersächsisches Landesarchiv Hauptstaatsarchiv Hannover		
Masters	TIFF	
Working copy	JPEG	
Thüringisches Hauptstaatsarchiv		
Masters	TIFF 300 dpi C	
Working copy	n.d.	
Microfilms		
Intrnational		
DFG		
1996		
Masters	TIFF 350-400 dpi BW 250-300 dpi GS	
Working copy	Not applicable	
2009		
Masters	300dpi	
Working copy	n.d.	
German archives		
Die Staatlichen Archiven Bayerns		
Masters	JPEG2000 300dpi 8bit GS	
Working copy	JPEG	
Landesarchiv Nordrhein-Westfalen		
Masters	JPEG 150 dpi, 100% quality	
Working copy	JPEG 150 dpi, 75% quality	
Thüringisches Hauptstaatsarchiv		
Masters	300 dpi GS	
Working copy	JPEG	

Table 6 Digitization parameters

Analysing Tables 5 and 6, one can see that German archives use TIFF format for the creation of masters (preservation copies) and JPEG or PNG formats for working cop-

ies[263]. These formats are open source, although some of their additional properties can be restricted by licences. Their advantages include the fact that they are standardized, for example, as ISO standards, and technical documentation is available for them. The selected file formats are widely used in and are supported by the most popular operating systems. The preferred resolution for masters is 300 dpi, which allows for the capture of a high level of detail of scanned object. Digitization with the highest possible parameters is recommended for all materials, not just for sensitive, unique and difficult to reproduce objects, so that the originals do not have to be scanned again. In spite of the great technical possibilities of modern scanners, for some types of records, greyscale or even bitonality is sometimes used if colour reproduction will not produce better visual effects. Black and white records are usually copied in greyscale. By using a smaller colour range it is possible to save storage space, as the file size is smaller. Landesarchiv Nordrhein-Westfalen and Staatliche Archive Bayerns are among a few archives that decided to use JPEG2000 format, which has much better lossless compression than TIFF. In the DFG recommendations from 1996 and 2009, one can observe the effects of technological development. In mid 1990s, colour scans, which required powerful computers, were not considered. Generally all the formats are quite young. The oldest is almost 30 years old, and the youngest about 13 years old. The fact that GIF has been around for 30 years does not guarantee that it will survive technological change or be further developed. Microfilms, depending on the content reproduced on them, can be scanned using a bitonal colour range for records without graphic elements, through to greyscale and colour, if illustrations are scanned.

4.3. Process

In starting a digitization project, one might think that all that is needed is a scanner or a digital camera. However, this is a misconception, as one can see, when one considers individual issues, such as what the parameters and functions of the produced substitute for the original will fulfil, to see that digitization is a complex process. It consists of several stages and to get through them effectively, one must start by preparing a good plan. Tasks to be performed must be placed in a workflow, to determine their order and thus guarantee that no task is omitted. It is necessary to set goals, results and selection criteria, create a project outline, adopt relevant standards and decide who the target user is. Ideally, each project undertaken should also plan for risk management and for long-term preservation of the digital output

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[263] PDF format is also used so that users can download scans available through archival portals.

of the process. A digitization project requires a very precise planning and numerous factors must be taken into account[264].

According to one of the Minerva working groups, a digitization project covers the following stages:

- project and planning:
    - planning,
    - assigning roles to the participants,
    - risk management;
- preparing for scanning:
    - selecting materials for scanning,
    - providing training to employees,
    - choosing between outsourcing and in-house,
    - equipment and software,
    - scanning,
    - formats,
    - carriers,
    - preservation planning for masters,
- metadata, standards, interoperability:
    - web publication
    - browsers and protocols,
    - accessibility,
    - security,
    - authenticity,
    - user authentication,
    - search engine optimization,
    - Web 2.0 and 3.0;
- access methods:
    - identification,
    - access;
- reuse by third parties;
- legal issues[265].

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[264] M. Kowalska, op. cit., pp. 43-44; *Wytyczne dobrej praktyki. Aplikacje…*, op. cit., pp. 16-17, 197-198; *Poradniki DGM…*, op. cit., p. 151.
[265] *Minerva. Technical Guidelines…*, op. cit., pp. 17-71.

This model has been worked out on the basis of analyses made of sample digitization projects implemented in EU states by archives, libraries and museums. It is obviously not obligatory and can be modified freely. However, it is mainly focused on the provision of services to users and on meeting their expectations. Similar models were created during the preparation of the recommendations by the Fraunhofer IAIS and the DFG.

Stages according to Fraunhofer IAIS recommendations:

- planning:
  - goals,
  - concept,
  - selection of objects;
- preparation of materials:
  - scanning,
  - equipment and software,
  - scanning,
  - quality control;
- storing and managing masters:
  - formats,
  - pagination,
  - storage,
  - carriers;
  - processing:
    - metadata;
  - presentation:
    - search;
  - preparation and access,
  - long-term preservation,
  - application[266].

This model, like the one described below, has been created as a common model for all cultural institutions. Although there is a focus on the use and justification of costs incurred in digitization, there is no pressure to adjust to the user's needs, as there is in the Minerva project.

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[266] *Bestandsaufnahme…*, op. cit.

Stages according to DFG recommendations:

- goals and selection:
    - specifying goals,
    - selecting materials for scanning,
    - checking duplicates;
- digitization of printed works and unique documents:
    - preparation of materials and conservation control,
    - scanning:
        - scanning parameters:
            - resolution and quality of scans,
            - colour depth;
        - formats;
- full-text generation (text recognition techniques):
    - coding text characters,
    - marking structures of printed works,
    - composition,
    - entering text;
- long-term preservation[267].

In the above model, one can observe intentional focus on the digitization of library resources, for example the use of OCR. This results from the fact that it was created mainly on the basis of experience of these entities. The quality of the final product and the need to share it is particularly important. One can observe that importance of access to records is mentioned in all guides.

A digitization project model prepared by Staatliche Archive Bayerns is also noteworthy. It covers elements such as:

- preparation activities:
    - selection of fonds,
    - restoration and conservation,
    - processing;
- digitization;
- quality control and editing;
- long-term preservation;

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[267] *Wissenschaftliche Literaturversorgungs-…*, op. cit.

- creation and functioning of the processes of providing access.

The concept describes in detail not only the workflow of the planned digitization and technical standards, as well as metadata, that should be taken into account, but also the workflow for processing users' orders[268].

In setting up a process for digitization, one needs to establish an action plan which specifies how it should be implemented and any risk scenarios to predict any possible threats. Digitization projects are hardly ever identical, as some factors always differ. That is why there should always be a planning process from the very beginning. The models presented above have four common features: preparation of materials; scanning; providing access; and preservation. It is hard to assess individual stages on the basis of comments made by the institutions that presented them. All of them seem equally important. However, it can be observed that, of all these institutions, it is the Fraunhofer IAIS that is most focused on the use of digitized scans for purposes other than presentation in an archives or on a web portal. It puts more emphasis on commercialization.

During the project preparation, decisions are made on what materials will be digitized, in what order, what equipment will be required, what is its capacity, who will be responsible for the project, what skills do they have, when and where it will be implemented, what costs will be incurred, how the results of individual tasks will be assessed and what will happen with reproductions. A detailed procedure needs to be specified for the digitization process, in order to reduce the risk of failure to accomplish an undertaking when things happen that should have been predicted before. It also includes goals for the project, the most popular being access and preservation. Moreover, a focus on education can sometimes be observed, but this is rather uncommon in German archives, although some are actively involved in archival education or archival training for schoolchildren and students. Then the basis for material selection is defined to facilitate the selection of objects to be scanned; possible conservation work that must be performed because of the condition of some materials is also specified. It is also necessary to decide who will be responsible for the digitization, whether it will be outsourced or performed in-house, whether in-house personnel or an external company will be engaged. Each of these choices has different consequences. Scanning performed by in-house personnel guarantees permanent control of the records, eliminates the need to transport them, and avoids any problems arising from poor performance under the agreement. Although the quality of the final product can be checked on an ongoing basis, this does not guarantee that a project

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[268] *Digitalisierung von Archivgut…*, op. cit., pp. 5, 11-12.

will be completed or that no personnel problems will arise. For instance, unexpected absence of sick employees may inhibit progress significantly. If the task is outsourced, an external company has the responsibility of finding a solution that will enable them to meet agreed deadlines. Outsourcing makes it possible to avoid expenditure on scanners and other required tools, as well as the problem of technology obsolescence. One can assume that it is possible to find a service provider that will use the latest proven solutions. That provider will have an appropriate workflow and extensive experience that may be useful in the case of objects that are difficult to scan. Choosing this approach, the archives does not have to train their own employees. Another great advantage is the fact that project costs are known before project implementation, although it is also possible for hidden costs to occur if the agreement is inaccurately or inadequately specified or if things happen that have not been provided for. However, using external services usually involves the need to transport records outside the archives or to let an external company's employees enter the premises and adapt a room for use as a digitization studio. Outsourcing reduces the amount of time that an archives must devote to project implementation – although during initial projects it may take up 30-40% of the entire time. Experience gained during projects financed by the DFG shows that the outsourcing of scanning can be more effective than in-house scanning. In the next phase, one should plan primary conversion, quality control, storage of scans and secondary conversion to formats that are usable in presentation through on-line and off-line portals. In order to facilitate this process, it is recommended to use IT project management models, for example, the British PRINCE (Projects in Controlled Environments), or the recommendations and specialist software already discussed in this thesis[269].

In preparing a digitization project, it is useful to refer to any institutional digitization strategy so that the project is consistent with the intended goals for the further development of the institution. Such a strategy outlines the main direction in which an archives is heading in the long-term in digitizating its records and developing electronic services for users

In Germany, there is no central digitization strategy for all cultural institutions, and certainly none for archives. However, there appear to be some recommendations that are supposed to coordinate digitization in archives to some extent, and the establishment of bodies with relevant competencies is planned. Strategies intended specifically for archives include the one related to the digitization and preservation of records prepared by the ARK in 2008.

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[269] A. E. Bülow, J. Ahmon, *Preparing…*, op. cit., pp. 47-49; *Wytyczne dobrej praktyki. Aplikacje…*, op. cit., pp. 96-100, 120-121; M. Kowalska, op. cit., p. 44; M. Glauert, *Dimensionen der Digitalisierung…*, op. cit., pp. 2, 8-11; M. Dörr, op. cit., p. 103-111; *Wissenschaftliche Literaturversorgungs-…*, op. cit., pp. 14-15.

It explains how digitization should be understood and planned. It also points out that new ways of producing copies do not replace existing ones and should not detract from expenditure on traditional methods of preserving records. The role of the strategy is mainly limited to supporting the preservation of records in a more accessible form and creating a positive image of archives as keeping up with technological and social change. However, it has been treated rather as a recommendation. In such a situation, archives can create digitization plans freely and follow their own criteria, which often arise from the specific nature of their holdings or from an archival tradition and influence prioritization. Almost all archives undertaking digitization, both in ongoing and short-term projects, have worked out their own strategies or are developing them. Some of them have documented their strategies, formally named them as such and made them available on their websites. Two of the most notable are those of Bundesarchiv and Landesarchiv Baden-Württemberg, whose strategies contain their strategic goals, which cover improving access to records through digitization, sharing information about records and scans through on-line services and ensuring their long-term preservation. The documents also cover the issue of directing more attention to streamlining activities carried out in archives by archivists and users, especially those supported by computer software. Moreover, the Bundesarchiv has set a goal of providing on-line access to basic information on 100% of its holdings, to 10% of its published inventories and to 1% of its digitized records. In the Landesarchiv Baden-Württemberg's strategy, the focus was more on the need to integrate information on holdings and all their representations, such as microfilms, scans, etc. This is supposed to streamline not only the management of records, but also their search and preparation for digitization. If information about all holdings is collected in one system, it is easier to check whether a microfilm is available or whether the original will be digitized. The strategies, even though they are very general, practically set out the entire digitization project, showing its most important elements – preparing the descriptions of records, scanning and access. Moreover, the strategies also present the way digitization is perceived by archives, thus facilitating later understanding of their activity in this area[270].

While preparing for a digitization project, the status of a fonds is specified in terms of legal regulations related to property rights and their management, protection of personal data that might be contained in the fonds, and copyright and related rights. Legal issues are impor-

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[270] *Strategische Leitsätze…*, op. cit.; *Digitalisierung im Bundesarchiv…*, op. cit.; *Das Landesarchiv Baden-Württemberg in der digitalen Welt…*, op. cit., also published in „Archivar" 2008, 1, pp. 14-19; B. Martin-Weber, *Access…*, op. cit., p. 120; Email from P. Sander…, op. cit. A detailed comparition of both strategies: A. Sobczak, *Strategie digitalizacji na przykładzie Bundesarchiv i Landesarchiv Baden-Württemberg*, „Archiwista Polski" 2012, 3, pp. 121-127.

tant, as they can sometimes hinder the plans of digitization projects, sometimes leading to their extension or preventing their completion. Another element is the selection of objects that will be digitized, which takes into account various criteria. In the next step, decisions need to be made about what equipment will be required, about the number of employees and about the possibility of outsourcing the service. Once these decisions have been made, formats and specifications of reproductions can be defined, taking into account the characteristics of originals and the main purpose of digitization. Preservation measures for electronic copies then need to be specified to avoid repeated scanning, not only because of cost considerations, but also because of potential exposure of records to damage. The final consideration is the best way of presenting the digitized records to make them accessible to a wide range of users[271].

4.3.1. Selection

The need to select records for scanning arose because, among other reasons, it was accepted that it would be impossible to digitize all materials in the near future owing to the financial outlays and technologies needed for the process, It is assumed that archives are able to digitize only 1-10% of their holdings which means that various criteria and priorities must be applied to narrow down the selection options and prepare an efficient action plan. As already mentioned the three most important criteria, according to UNESCO, are content, popularity and physical condition. It is, nevertheless, difficult to specify common selection criteria appropriate for all archives to follow. Traditions that have grown out of the specific holdings of records in archival institutions or from archival methodology have a great influence as well. The general goals of any given institution, the characteristics of its users characteristics and cooperation with other partners are also very important. The purposes of digitization, which can differ depending on a project's requirements and plans for its further use, should also be taken into account. Sometimes the physical condition of the originals can influence decisions. Some archives take into account the requests of users, usually genealogists and historians. Anniversaries of historical events are also sometimes taken into account in selecting materials for digitization[272].

Selection criteria found in source literature can be divided into:
- content-related:

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[271] A. E. Bülow, J. Ahmon, *Preparing…*, op. cit., pp. 49-51.
[272] Ibid, pp. 47-53; Ch. Reinicke, *Neue Nutzungsformen…*, op. cit., pp. 76-82.

- o age and historical value of a material[273],
- o intellectual value,
- o academic value,
- o educational value,
- o significance for the country, region or local community,
- o uniqueness,
- o copyright and related rights[274],
- o usefulness for non-professionals,
- o interest[275],current need resulting from a forthcoming anniversary, cooperation or financing opportunities or use in a publication,
- o fonds processing level[276],
- o possibility of further use of digital copies for various purposes[277],
- o digitization strategy of an archives,
- o purpose of digitization and use of scans,
- o subject matter of the digitized object,
- o users' needs and expectations;
- technical:
  - o equipment and time required for the digitization and technical requirements of ecords[278],
  - o physical condition of an object[279],
  - o storage place (including conditions)[280],

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[273] Older materials almost always have a higher historical value. This may be because there are fewer of them or because there are no regulations limiting their use, which means that they are more likely to be digitized.

[274] The most common issues that arise in digitizing photographs.

[275] The materials that are usually the first to be scanned are those most frequently reproduced and ordered for a research room, or are likely to become so in the future. Some researchers see this is as the most practical and rational criterion, since it protects such materials against excessive wear. In financial terms it is practical too, as the digitized materials will be used immediately. This criterion is particularly relevant for archives in which the same records are used again and again every year.

[276] Unless there is an archival description of a fonds in a database, it is difficult to use scanned copies of its contents tp provide access to that fonds.

[277] As digitization becomes more widespread, this criterion is becoming more and more popular. It results from wanting to show the value of the large amounts of money spent on this process by specifying uses that go beyond access in an archives or archival portal. It is important when trying to attract private-sector partners to invest in and support the digitization of records.

[278] If archival material is fairly uniform in its physical form and condition, it can be scanned quickly and easily. If form and conditions vary, scanning may require the adjustment of the equipment and workstation.

[279] In some cases, materials that are damaged or fragile can be scanned and their digital copies made available to reduce their exposure to additional damage. Sometimes physical condition makes it impossible to digitize an object until conservation work has been done on it or even to digitize it at all.

[280] Materials are sometimes stored in various locations, which can make the digitization process difficult and expose them to potential threats related to their transport.

o physical properties of an object: format, type, manner of storage, added elements of a different nature, such as seals requiring different digitization conditions[281],

o improvement of the quality of records: especially those that are hardly legible or have been so far made available on microfilm[282],

o existence of other copies from which scans can be produced to reduce exposing the originals to damage[283],

o scope of digitization (partial, full)[284],

o possibility of using OCR technology[285],

o the size of fonds[286];

• financial and economic[287].

Not all German archives digitize their records on a large scale, for several reasons, most of which are related to financial issues and to an awareness that projects do not end with the production of the last scan. Digitization is, on the contrary, a continuous process, since the copies produced by the process must be preserved in digital form, which is very expensive. Digitization, like other IT-related projects, is mainly carried out by archives that can afford

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[281] This criterion has a great influence on the digitization process, especially on its duration. The more complicated an object is, the longer a scanner operator and others engaged in the process must spend. Large and heavy records are difficult to transport and to place on a scanner. Sometimes a scanner needs to be replaced with a digital camera in the scanning process. The frame must be changed for every sheet of a different format before it can be scanned. Cardboard sheets must be placed under transparent materials, so that text from the next sheet is not copied.

[282] It is commonly believed that users prefer electronic copies to microfilm.

[283] Depending on physical condition, physical properties, the value of an object or the wish to speed up the process, scans from different representations of objects are produced. This usually happens when there is little difference in the quality of reproductions. Some materials are digitized from microfilms.

[284] Sometimes, for content-related or technical reasons, such as physical condition or physical properties that available technology cannot reproduce, some objects in a fonds are not digitized.

[285] For the time being, OCR cannot be used for records on a large scale. It is suitable for contemporary documents, as they are prepared using typewriters or wordprocessing software and are most uniform in the language use. The use of OCR for materials from earlier periods requires the adjustment of dictionaries used by the software and involves additional costs.

[286] O. Porubović-Vidović, op. cit., pp. 114-125; J. Franke, *Digitalizacja dokumentów piśmienniczych – strategie rozwoju*, in *Cyfrowy świat dokumentu*, ed. H. Hollender, Warsaw 2011, p. 150; *Wytyczne dobrej praktyki. Aplikacje...*, op. cit., pp. 198, 216; *Digitalizacja...*, op. cit., pp. 33-34; A. E. Bülow, J. Ahmon, *Preparing...*, op. cit., pp. 63-64, 74-89, 109-133; *Digitalisierung von Archivgut im Kontext...*, op. cit., p. 3; Ch. Reinicke, *Neue Nutzungsformen...*, op. cit., p. 75; *Digitalisierung im Bundesarchiv...*, op. cit., p. 8; B. Post, op. cit., p. 9; Email from the Thüringisches Hauptstaatsarchiv…, op. cit.; J. Kistenich, M. Wiech, op. cit., pp. 143-145; M. Glauert, *Dimensionen der Digitalisierung...*, op. cit., pp. 7-8; Email from S. Barteleit from Bundesarchiv dated: 7.12.2012.; T. Fricke, G. Maier, *Automatische Texterkennung bei digitalisiertem Archiv- und Bibliotheksgut*, in *Digitale Archive und Bibliotheken. Neue Zugangsmöglichkeiten und Nutzungsqualitäten*, eds. H. Weber, G. Maier, Stuttgart–Berlin–Köln 2000, p. 221; G. Maier, P. Exner, *Wirtschaftlichkeitsüberlegungen für die Digitalisierung von Archiv- und Bibliotheksgut*, in ibid., pp. 222-229; Digitalisierung in der SAPMO…, op. cit., p. 14; Email from the Landesarchiv Greifswald Head M. Schöbel dated: 5.12.2012; Email from D. Busse…, op. cit.; *Wissenschaftliche Literaturversorgungs...*, op. cit., p. 16; J. Kistenich, op. cit., pp. 5-10; *Bestandsaufnahme...*, op. cit., pp. 63, 244; *Digitalisierung von Archivgut...*, op. cit., pp. 4-5.

[287] They depend, among other things, on: the volume of records to be scanned; the required parameters; technology used; competitiveness in the market of service providers and equipment; data carriers; the need to transport materials, to process scans and to prepare materials for scanning, especially if conservation is required.

to maintain expensive IT solutions. Resistance to new technologies and lack of awareness of the importance of digitization providing access to and preserving records can generally be ruled out as reasons for not digitizing records.

In Germany, the most important selection criteria, which can be found in digitization strategies, source literature and correspondence with archivists from surveyed archives, include: current and future use of the fonds; its nature; its significance in research; a need to prepare a publication and/or an exhibition; the existence of a microfilm[288]; condition of the records[289]; and the possibility of publishing on the Internet. Other important elements include the availability of finding aids and their quality, as well as their presence in a computer database. Another factor that is often mentioned is a wish to improve the comfort in using materials, especially those that are hardly legible or are available in less convenient forms than a scan, usually on microfilms[290].

There are a many criteria to be taken into account in the selection of materials for digitization, as presented in the above list, which could probably be extended with additional issues for specific projects. Moreover, the selection of materials depends also on the specific nature and interest of the entity implementing the project, the kind of material, project goals and its target users, as well as the time that the project was carried out. Other, more prosaic, reasons include the popularity of selected topics and a desire to enhance one's prestige by implementing a digitization project. However, financial issues can be identified as the most important factor in both facilitating and hindering any undertaking. The criteria also depend on the person that prepared them and the time that they were prepared. In the distant future, as scanning technology develops further, it will be possible to depart from selection for digitization and digitize everything[291].

4.3.2. Scanning

In the 1990s, it was found that digital technologies could be used to create surrogates of selected analogue records and thus become a very useful solution in the preservation of archival materials. Over time, the idea of publishing reproductions on the Internet emerged,

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[288] In some archives, microfilms are digitized so that originals are not exposed to damage.
[289] Digitization can extend the life of extremely damaged records.
[290] *Digitalisierung in der SAPMO…*, op. cit., p. 14; *Digitalisierung im Bundesarchiv…*, op. cit., p. 8; B. Post, op. cit., pp. 9-10; B. Dorfey, *Digitalisate…*, op. cit.; Email from the Thüringisches…, op. cit.; J. Kistenich, M. Wiech, op. cit., pp. 143-145; M. Glauert, *Dimensionen der Digitalisierung…*, op. cit., pp. 7-8; Email from D. Busse…, op. cit.; Email from the Landesarchiv Saarbrücken…, op. cit.; *Digitalisierung von Archivgut…*, op. cit., p. 3.
[291] K. Schmidt, *Digitalizacja…*, op. cit., pp. 51, 58; Email from the S. Barteleit…, op. cit.

enabling their further use on other Internet platforms or to create other works, such as in mash-ups[292].

Conservation of records plays a very important role in the digitization process. Because of the condition of some materials, it may be impossible for all materials to be digitized.

For some materials, however, reproduction on another carrier may be the only option for preserving their contents. In such cases, the fragile materials are scanned despite the risk of further deterioration in their physical condition. Sometimes severely damaged objects are not scanned, for reasons such as the cost of their conservation and the extension of project time that would be necessary. A decision to omit a less important fragment of a record may not have a negative influence on the completeness of the information contained in the remaining part. Only some minor damage can be repaired by the scanner operator. The most frequent of these are fold marks, creases of corners or entire sheets, small tears, etc. In such cases, it is enough that the operator spends some time smoothing out the sheet and taking more care when scanning the object[293].

The task of conservators is to give an expert opinion before materials are scanned on whether they are suitable for digital copying. Conservation work that is most frequently needed includes smoothing sheets, removing dirt and dust, separating joined pages and removing any fastenings, stitches and similar things that could lower the quality of a scan or even damage records or scanning equipment. Other activities that can precede these conservation measures include deacidification, fighting micro-organisms and repairing mechanical damage.

Once materials have been scanned a conservator will reassemble the pages with original or substitute measures. They are also responsible for specifying how objects are to be treated while they are being scanned, that is, at what angle they can be opened, how they should be carried etc. If more serious damage occurs, further repair may be more complex, time-consuming and expensive. Consequently, it is very important to properly assess the physical condition of records and all conservation work during the selection of materials for digitizing. The use of software for the managing information about the condition of records makes work much easier, as it makes available information on whether something can be digitized immediately, whether prior conservation work is required, whether something is currently undergoing conservation treatment, making it necessary to wait until it is repaired. Another activity involves

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[292] J. McDonough, M. Jimenez, *Video Preservation and Digital Reformatting. Pain and Possibility*, in *Archives and the Digital Library*, eds. W. E. Landis, R. L. Chandler, London-New York 2006, pp. 168-169; O. Seneviratne, A. Monroy-Hernández, *Remix Culture on the Web: A Survey of Content Reuse on Different User-Generated Content Websites*, [access: 19.11.2012], http://journal.webscience.org/392/2/websci10_submission _109.pdf.

[293] A. E. Bülow, J. Ahmon, *Preparing...*, op. cit., pp. 53-54, 137-141.

the numbering of pages, if this has not already been done. This reduces the probability that some elements will be omitted during copying. It also facilitates aspects of transporting materials and of the arrangement and control of produced scans. For standard records, this is done using machines that print page numbers or reference codes of units, fonds and archives[294]. Three digital reproduction methods are available – indirect, direct and mixed reproduction of records. In the first one, a microfilm or other form of reproduction is used. It is sometimes used to speed up the digitization of materials, which, when scanned, were not of significantly higher quality than the output of the digitization of a copy. The approach of scanning primarily from microfilm was adopted e.g. by the Landesarchiv Baden-Württemberg, if microfilm is available and its condition allows it. The second method is based on direct scanning or, in the case of objects that cannot be scanned or microfilmed for some reason, photographing with a digital camera. The most frequent cases when digital cameras are used are when a format of objects such as posters, maps; three-dimensional objects such as seals, and the opening of bound objects exceeds the surface of the scanner. The third digital reproduction method is a combination of microfilming and scanning, which can be performed simultaneously thanks to the latest technologies. Previously they had to be done separately; it was recommended that a microfilm be made first, which was then scanned. Previous technology did not make it possible to obtain good quality reproductions. This solution was treated as less invasive than scanning due to shorter exposure. At first, scanning devices featured low quality matrices. Over time, their general operation was speeded up and higher capacity was obtained, which translated into better output. Moreover, warm light was no longer used, because it had a negative influence on originals. Direct scanning, on which the following paragraphs focus, became popular when the quality of its output became higher and higher[295].

Few people realize that the first scan was produced in 1957, using a drum scanner and the US National Bureau of Standards SEAC (Standards Eastern Automatic Computer)[296]. The picture had 176×176 pixels and its size was 500 x 500 mm; it was black and white, grainy and out of focus. It was hard to recognize the person in the image. However, the scan was a breakthrough in the digital revolution. In 2003 the picture was rated by the editors of *Life*

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[294] Ibid, pp. 110-158.

[295] H. Weber, M. Dörr, op. cit.; K. Ober, op. cit., pp. 14-16; T. Fricke, op. cit., pp. 65-66; P. Exner, Verfilmung und Digitalisierung von Archiv- und Bibliotheksgut, in *Digitale Archive und Bibliotheken. Neue Zugangsmöglichkeiten und Nutzungsqualitäten*, eds. H. Weber, G. Maier, Stuttgart–Berlin–Köln 2000, pp. 113-127.

[296] A first-generation electronic computer built at the NBS in 1950. It was one of the first computers to be controlled remotely.

magazine among 100 photographs that changed the world. It was not for another 40 years that archives became interested in digitization[297].

Illustration 11 First scan in the world, NIST reference code: 57HIS001, [access: 5.11.2012], http://patapsco.nist.gov/ImageGallery/details.cfm?imageid=342

Illustration 12 First scanner, NIST reference code: 57HIS003, [access: 5.11.2012], http://patapsco.nist.gov/ImageGallery/details.cfm?imageid=341

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[297] M. E. Newman, *Fiftieth Anniversary of First Digital Image Marked* [online], [access: 5.11.2012], http://www.nist.gov/public_affairs/techbeat/tb2007_0524.htm; Ch. Reinicke, *Neue Nutzungsformen…*, op. cit., p. 74.

Illustration 13 Computer used for the first scan, NIST reference code: 57HIS001, [access: 5.11.2012], http://patapsco.nist.gov/ImageGallery/details.cfm?imageid=340

Before setting about the digitization, one must prepare the workplace. If it is being created from scratch, once the furniture and equipment are in place, one should check their location is appropriate, devices connected, and the required software installed so that the scanner operator can communicate with the equipment, and ensure the devices are calibrated.

Calibration of the equipment used in the scanning process – usually a scanner and a monitor[298] – is very important, as it ensures the correct reproduction of colours. Specialist software and spectrophotometers, also called calibrators or colorimeters, are used for this purpose. These devices check the accuracy of the reproduction of colours displayed on a monitor or reproduced by the scanner. The market offers general solutions supporting more than one type of device and enabling the measurement of colour on any surface. In simple terms, this activity involves the comparison of colours displayed on a monitor or scanned by a scanner with a colour pattern. On this basis, an appropriate colour profile is prepared. It contains colour values that must be requested by the computer, so that the input or output device reproduces the selected colour properly. It is important to introduce a colour correction in the equipment used for scanning. Calibration should be repeated regularly, depending on need. In some projects it is performed every day, before work begins[299].

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[298] Not all devices can be calibrated – only professional ones that have certain features and functions.

[299] J. Brady, *Profiling your monitor, projector and printer is easy with ColorMunki Photo* [online], [access: 20.11.2012], http://xritephoto.com/ph_product_overview.aspx?id=1115; *Profilowanie skanera* [online], [access: 20.11.2012], http://youtu.be/eXJQU8KWUVs.

Illustration 14 Calibrator ColorMunki Photo, [access: 20.11.2012],
http://xritephoto.com/images/products/CMUNPH_M2.jpg

Then scanning parameters are set, the frame is selected and a preliminary scan is made. Light is cast over the object on or beneath the glass pane or on the drum[300]. It is reflected off the matrix and sent to the analog-to-digital converter. Once a file is created, it is displayed on the operator's monitor, and, if the scanning has worked well, the file is saved in the selected format. This is the phase of primary conversion. Then a digital object is usually placed on a server, where files, named according to a given pattern, are stored in catalogues or can be imported to scan management systems. In German archives, the former option is commonly used, partially due to the fact that the software to manage digital objects in scan management systems that is available on the market – Goobi[301] and Hermes[302] – has been created for use in libraries and for the mass digitization of documents in companies, but not for the archives. However, it should be noted that the Landesarchiv Baden-Württemberg has its own software, bildCMS, to support the management of reproductions. It places masters in the image archives and uses them to produce use copies, as well as combines them with inventories on the Internet. Use copies made from the masters can later be edited in order to improve their presentation or clarity. The most frequent modifications include: changes in brightness, light exposure, contrast, colours, geometry, sharpness, and bit depth; cutting and removing inessential elements;

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[300] The scanning process of a drum scanner differs from that of a flat-bed scanner. The optical system illuminates an object as it rotates with the drum and directs the reflected light beams to RGB filters and photomultipliers, where an analogue signal is generated and sent, as in other scanners, to a transducer that converts it into a digital signal.

[301] *Goobi.Production. Workflowmanagement für die Digitalisierung – skalierbar und flexibel* [online], [access: 9.02.2013], http://www.goobi.org/software/goobiproduction/.

[302] *Hermes Digital. Der leistungsstarkeCampus-Lieferdienst*, [access: 9.02.2013], http://zeutschel.de/zeutschel/export/sites/zeutschel/media/downloads/brochures/de/hermes_digital_software_de.pdf.

retouching damage registered from the original (removing dust, scratches, discolouration); and adding watermarks of an archives' logo or special security codes[303]. However, any modifications of use copies increase project costs and extend its implementation, especially in the phase between the production of a scan and its publication. No changes are made to masters, due to their functions[304].

As mentioned above, archives usually digitize parchments, documents, registers, photographs, maps and posters. as well as microfilms, but rarely audiovisual materials. Microfilms, if they are of good quality, are the easiest to scan, as they are scanned by equipment that scans automatically, frame by frame. Materials of varying format are the most difficult to process. These are usually parchments with seals, maps or registers with numerous additional materials such as maps, certificates etc. Large format materials sometimes need to be scanned in sections, not only because scanners cannot always support their large format, but also because of the size of the file that would be output. Many computers could have a problem with opening or, generally, handling such large files. As well as the size of materials, another very important factor is the material of which records are made and their condition, which may mean that they require careful treatment. The thickness of material may cause problems. If it is very thin, additional sheets, usually black ones, must be put underneath each sheet so that fragments of the following pages are not also copied and to ensure better contrast[305].

Apart from the above-mentioned purely technical aspects, the issue of the quality of scans is also important. In large projects, when thousands of scans are produced, it is impossible or impractible to check each scan. According to American models, it is recommended to check a sample of 10% of scans, which can involve even hundreds, if not thousands of checks. In the process of manual scanning, the first check of a scan is always performed by the operator. Their work should be verified by another person, who will look at it more objectively and maybe more critically, especially if there is any doubt about its quality. The standard check covers the number and order of pages, framing, accuracy of colour reproduction and sharpness. If errors are identified, scans are made again. In the Bundesarchiv, for instance, during the acceptance of scans from service providers, the following elements are checked:

- technical parameters: format, resolution, size in pixels, number of pages per scan, colour depth and file names;

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[303] Codes are not visible with the naked eye, as they are incorporated into a file. They enable the identification and investigation of claims when objects made available on-line are used illegally; they are not used by the German archives.
[304] *Standardy w procesie…*, op. cit., pp. 123-124; T. Fricke, op. cit., pp. 67-86; *Digitisation. Standards Landscape…*, op. cit., pp. 54-58; *Bestandsaufnahme…*, op. cit., pp. 91-92; G. Maier, *Qualität…*, op. cit., pp. 166-175.
[305] P. Exner, op. cit., pp. 113-127.

- quality: optical comparison of scans with original records;
- completeness of the scanning of provided materials[306].

Similar elements are checked in other archives, whereas different emphasis may be placed on certain ones in some. In the Landesarchiv Nordrhein-Westfalen, there is greater focus on clarity and completeness in the analysis of scans. Visual consistency, that is, whether all scans look similar, is also checked, as consistency is very important in presentation. In the Staatlichen Archiven Bayerns scans prepared by external companies are checked more carefully than those made in-house. The Fraunhofer IAIS also recommends paying particular attention to duplicates of scans, creases (usually on corners) and the visibility of devices or hands holding scanned materials. It is also suggested to encourage quality control by the user in confirming accuracy of presentation and metadata, when materials are being used. Several other factors have a direct influence on the quality, including equipment and software capacity, the properties of scanned materials and the skills of the scanner operator. The person operating the device must place materials to be scanned properly on it, select an appropriate background and pay attention to the sharpness, colour reproduction, tone as well as other possible issues that may arise unexpectedly. In Germany, no quality control standards have been worked out so far, so responsibility for quality remains with individual cultural institutions[307]. In the case of archives, very often the knowledge and experience gained during microfilming is used. Both processes have much in common with each other[308].

During scanning, one must also take into account the risk of damaging materials while they are being handled by copying devices and the people using them. This is particularly important when roller scanners, drum scanners and robots are being used, as their use involves mechanical treatment of materials. Both personnel training and focusing on the quality of equipment and its technical specifications, including not exceeding its capacity, are also very important[309].

The scanning phase presented above shows its complexity, which varies in accordance with the properties of the materials selected. The more unique something is, the longer

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[306] Workflow zur Kontrolle der eingehenden Digitalisate (Digitizing Quality Control Workflow - internal document); M. Dörr, op. cit., p. 109; *Bestandsaufnahme…*, op. cit., pp. 78-79; G. Maier, *Qualität…*, op. cit., pp. 137-148.

[307] In the Netherlands, principles for the quality of scans have been worked out: 'Metamorfoze' project, implemented by the National Archives and the National Library of the Netherlands, which includes the Universal Test Target. (UTT).

[308] *Workflow zur Kontrolle…*, op. cit.; M. Dörr, op. cit., p. 109; *Bestandsaufnahme…*, op. cit., pp. 78-79; G. Maier, *Qualität…*, op. cit., pp. 137-148; K. Ober, op. cit., p. 23; *Standardy w procesie…*, op. cit., pp. 234-236; *Digitalisierung von Archivgut …*, op. cit., p. 12.

[309] A. E. Bülow, J. Ahmon, *Preparing…*, op. cit., pp. 91-95; K. Schmidt, *Digitalizacja…*, op. cit., pp. 54-56.

the digitization will take and the more attention and financial outlay it will require. Supporting systems that are integrated into the entire records management system would make digitization much easier. It would enable the control of the whole process – from the selection of fonds or units or objects to be scanned according to the plan through to the user's request. Such a solution should support quality control and then the export of appropriate files to a digital archives and the preparation of use copies that are automatically connected with electronic inventories. It could additionally prepare materials that are to be shipped to a user who placed an order. Unfortunately, most of the above-mentioned activities are currently performed manually, using various kinds of editing software or the combination of reproductions with databases made available on-line. As can be seen, both archivists and IT specialists have much to do in order to increase automation and speed up the whole process[310].

4.3.3. Preservation

The problem of the preservation of electronically created and processed data (digital preservation) appeared as soon as electronic data were developed. It is quite complex and goes far beyond creating backup copies and placing them in various locations that are sufficiently distant from the central repository.

At the beginning, archivists concentrated on issues related to the durability of carriers. For example, in the DDR, a Workgroup for the Valuation of Information on Modern Carriers found that magnetic materials used at that time could be preserved very easily. It was enough to allocate more funds to the improvement of storage conditions, use high-quality carriers and copy them regularly onto new ones. With the development of technology, in particular the obsolescence and modification of applied solutions, more attention started to be attached to the archiving of data, approaches to which evolved significantly[311].

Born-digital and digitized records are preserved in order to guarantee their availability in the distant future, regardless of technological changes. This is a very important, but

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[310] *Digitalisierung von Archivgut…*, op. cit., p. 15.
[311] M. Wettengel, *Überlieferungssicherung in Verwaltungen ohne Papier?* „Der Archivar" 1995, 1, [access: 17.02.2013], http://hdl.handle.net/2027/mdp.39015072446779, p. 34; H. Weber, *Moderne Speichertechniken…*, op. cit., pp. 63-66; *EDV und Archive*, op. cit., p. 57; E. Suckow, op. cit., pp. 189-190; H. Weiß, op. cit., pp. 83-85; P. Kaufmann, *Elektronische Datenspeicherung auf Computerband*, „Archivmitteilungnen" 1978, 2, pp. 63-64; *Archivwesen der Deutschen…*, op. cit., p. 182; B. Lißner, op. cit., pp. 172-173; Ch. Keitel, *Guideline on Digital Preservation*, 46 p., [access: 29.02.2012], http://www.digitalpreservationsummit.de/presentations/keitel.pdf (conference PowerPoint: Digital Preservation Summit, 18.10.2011, Hamburg); M. Wettengel, *Maschinenlesbare Datenträger: Zusammenstellung archivrelevanter Normen und Standards elektronischer Speichermedien*, „Der Archivar" 1995, 3, [access: 17.02.2013], http://hdl.handle.net/2027/mdp.39015072446779 , pp. 461-472.

at the same time very difficult task. In choosing any given method, one has no guarantee that it will be effective; therefore, a combination of several methods – at least two – is recommended. According to experts from the DFG and elsewhere, no single, universal digital archiving method that could be used for all kinds of objects has been developed so far. One has to use several, which makes digital preservation even more complex and expensive. That is why the situation of digital records in archives with low budgets is very uncertain[312].

In the European Commission's recommendations on digitization and access to reproductions and born-digital heritage, including the holdings of on-line archives, the question of long-term preservation was raised. It was recommended that national strategies be specified, describing how digital preservation should be implemented and who should be responsible for it. The desirability of exchanging this information among EU states was also recommended to help in the standardization of archiving principles. The authors mentioned the need of to adjust laws, so that copying materials and/or changing their carriers or formats was permitted for the purposes of the preservation of cultural heritage. In Germany, during the ARK held in 2008, an important opinion on including digitization in records preservation policy was presented. It emphasised that this was important not only because of the possibility of using scans to provide access to records, but also because of the costs of scanning and managing its output. Similar opinions have been presented by the Fraunhofer IAIS in its report on digitization application possibilities[313].

Preservation can be divided into the passive and active preservation. The former is based on the protection of records against unauthorized access, accidental damage or loss of data. It involves the physical control of user access to the server room and the system in which records are stored. Other elements include ensuring the integrity of materials as well as storage supervision and disaster recovery. Active preservation covers the ongoing creation of new reproductions of objects when new technologies appear. This requires following of their development constantly, as well as detailed preparation of a strategy. Passive and active preservation

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[312] *Wissenschaftliche Literaturversorgungs…*, op. cit., p. 12; S. Ross, *Przesiadka w WIGAN…*, op. cit., pp. 34-35; T. Fricke, op. cit., p. 64; *Bestandsaufnahme…*, op. cit., pp. 100-101; *Ochrona dziedzictwa cyfrowego…*, op. cit., pp. 128-131; *Methoden der Langzeitarchivierung digitaler Objekte* [online], [access: 18.11.2012], http://www.fes.de/archiv/spiegelung/langzeitsicherung/01_einleitung.htm; J. Arora, *Digital Preservation* [online], 23.04.2007, [access: 2.06.2012], http://youtu.be/qmBds9Ufl5I; C. Lee, *Digital Curation* [online], [access: 3.06.2012], http://youtu.be/RHy9CW_vMp4 (lecture series: *Information in Life. Digital Video Series University of North Carolina at Chapel Hill School of Information and Library Science*).
[313] *Zalecenie Komisji z dnia 24 sierpnia 2006 r. w sprawie digitalizacji…*, op. cit.; *Digitalisierung von Archivgut …*, op. cit., pp. 4-5; H. Weber, M. Dörr, op. cit.

complement each other and should be implemented simultaneously. However, sometimes only the passive approach is applied, which does not guarantee proper preservation[314].

Early planning for digital preservation was based on the traditional practice of storing analogue carriers, so the focus was on the carriers, and no significance was attached to whether it would be possible to use their contents. The focus has now shifted and the main activities are currently aimed at ensuring access to saved data. Storage media are of secondary importance, therefore less attention is attached to them. A file can be saved on various carriers during its life-cycle, but what is of greatest importance are the data in that file[315].

Only the best and the most durable carriers should be used for storing digital records. The most popular and commonly used ones are:

- CD/DVD[316];
- tapes[317];
- disks[318];
- paper[319];
- microfilm[320].

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[314] A. Brown, op. cit., pp. 100-120.

[315] M. Evans, G. Hunter, *Challenges of Digital Preservation* [online], [access: 3.06.2012], http://youtu.be/lyBWuu Xa-hg (webinar series AIIM fom 15.08.2008).

[316] These carriers are useful for small amounts of data – it is difficult to manage a large number of CDs. Those generally available on the market are relatively cheap but have a short life. Discs that are designed for archiving are characterized by their greater strength and durability. Glass carriers can survive more than 100 years. Only carriers that enable data to be written on them once should be used.

[317] Suitable for storing large volume of all kinds of data. They are relatively cheap, but it is difficult to search data on them. They are not durable, they must be copied regularly.

[318] The two basic kinds of disks are magnetic and flash disks. The former are not as damage-resistant as the latter, because of their design, but are cheaper. Flash disks are more expensive, but enable faster recording and reading of stored data.

[319] Some born-digital materials can be printed and thus easily and cheaply stored. The lifespan of currently used paper is 100 years. However, by printing born-digital records onto paper any properties characteristic of electronic documents are lost. Paper is not used as a preservation carrier for scans.

Illustration 15 In the background are containers holding microfilms with the most precious German cultural assets stored on them, located in a specially adapted Barbara drift in the Black Forest, [access: 13.11.2012], http://www.tagesspiegel.de/images/315532_0_8124cf4b-jpg/1653192/2-formatOriginal.jpg.

The main purpose of long-term preservation is to ensure the functionality, authenticity and integrity of digital objects. There is no single method that could be used for all types of materials. Every file format requires the use of a properly selected solution, provided, however, that certain common activities specified in an institution's security policy are carried out. First, the strategy and its goals are planned and the objects to be archived are specified in detail. In the case of digitization, only masters, saved in the format that best suits the kind of records

[320] The Fraunhofer IAIS presents microfilming of digitized objects as the only solution for long-term archiving. This view is also supported by the ARK and was reflected in its 2008 strategy. Other German specialists share this opinion. Experts have estimated that microfilm should survive 500 years if proper storage conditions are ensured (the oldest stored copy of a microfilm is 140 years old). It should also be noted that the solution is used in archives only for scanned documents and registers. Access to documents saved on microfilm does not require the use of specialist equipment – a magnifying glass is enough. Best quality microfilms can be re-digitized and used to produce good quality scans. In Germany, this solution is commonly recognized as the safest medium for the preservation of scanned cultural assets. This was also confirmed in the research project: 'Neue Möglichkeiten und Qualitäten der Zugänglichkeit zu digitalen Konversionsformen gefährdeter Bücher und Archivalien (New Possibilities and Quality of the Access to Digitized, Converted Forms of Endangered Books and Records) in 1995-1996. H. Weber, *Moderne Speichertechniken…*, op. cit., p. 68; *Wissenschaftliche Literaturversorgungs-…*, op. cit., p. 12; *Presseinformation. Farbiges Erbe. Farb-Mikrofilme schützen für Jahrhunderte*, 15.03.2010, [access: 13.12.2012], http://www.ipm.fraunhofer.de/content/dam/ipm/de/PDFs/Pressemitteilung/2010/Fraunhofer_IPM_ARCHE_Laserb elichter_Web_tcm91-167431.pdf, p. 3; *Wytyczne dobrej praktyki. Aplikacje…*, op. cit., pp. 20, 118, 221-222; G. Fürmetz, *Kulturschutz digital? Neue technische Perspektiven in der Sicherungsverfilmung*, in *Für die Zukunft sichern! Bestanderhaltung analoger und digitaler Unterlagen. 78. Deutscher Archivtag 2008 in Erfurt*, ed. H. Schmitt, Fulda 2009, pp. 61-73; *Ochrona dziedzictwa cyfrowego…*, op. cit., pp. 151-153; K. E. Lupprian, *Rematerialisierung…*, op. cit., p. 120; Ch. Reinicke, *Neue Nutzungsformen…*, op. cit., p. 74, B. Post, op. cit., pp. 7-8; H. Weber, M. Dörr, op. cit.; H. Weber, *Digitale Konversionsformen…*, op. cit., pp. 208-211, 215-216; P. Exner, op. cit., pp. 113-127; G. Maier, *Qualität…*, op. cit., pp. 128-178; *Digitalisierung von Archivgut…*, op. cit., pp. 4-5; *Wissenschaftliche Literaturversorgungs-…*, op. cit., pp. 12-13; *Bestandsaufnahme…*, op. cit., pp. 100-101.

from which they are reproduced can survive. The method of their preservation then needs to be specified. Contrary to the recommendations, it is rare that more than one method is selected, unless the records are to be microfilmed or printed. The available methods are[321]:

- emulation[322],

- virtual computer, also called virtual machine[323],

- migration[324],

[321] A. Brown, op. cit., pp. 82-93; H. Weber, M. Dörr, op. cit.; Ch. Keitel, *Elektronische Archivierung…*, op. cit., p. 115; *Ochrona dziedzictwa cyfrowego…*, op. cit., pp. 131-132, 134-135, 138-151; K. E. Lupprian, *Rematerialisierung…*, p. 118; *Migration im engeren Sinne* [online], [access: 18.11.2012], http://www.fes.de/archiv/spiegelung/langzeitsicherung/03_migration_im_engeren_sinne.htm; *Migration im weiteren Sinne* [online], [access: 18.11.2012], http://www.fes.de/archiv/spiegelung/langzeitsicherung/02_migration_im_weiteren_sinne.htm; *Emulation* [online], [access: 18.11.2012], http://www.fes.de/archiv/spiegelung/langzeitsicherung/04_emulation.htm; *Migration oder Emulation* [online], [access: 18.11.2012], http://www.fes.de/archiv/spiegelung/langzeitsicherung/09_migration_oder_emulation.htm; P. Worm, *Migration und Standardformate als Strategie für digitale Überlieferung*, in *Handlungsstrategien für Kommunalarchive im digitalen Zeitalter. Beiträge zu einem Workshop im Rathaus Oberhausen 14.12.2005*, Münster 2006, pp. 74-86; J. Arora, *Digital Preservation 2* [online], 23.04.2007, [access: 2.06.2012], http://youtu.be/3ciib3Nc59g; K. Jeffery, *Digital Preservation What Why Which When With?* [online], [access: 3.06.2012], http://youtu.be/ksDyH64h4X0 (lecture series: Alliance for Permanent Access, Espoo, Finlandia, 22.11.2010); M. Evans, G. Hunter, *Challenges…*, op. cit.; S. Ross, *Przesiadka w WIGAN…*, op. cit., pp. 34-35; H. Weber, *Digitale Konversionsformen…*, op. cit., pp. 216-220.

[322] Emulation involves the reproduction of the original environment in which a file was used sometimes including the duplication of operating systems, software or equipment. Emulation programs imitate the original conditions, enabling an object saved in a format not supported by modern computers to be opened. The most advanced programs are able to reproduce the entire environment. However, if an emulator is to be used in the future, it must be adjusted to new solutions (re-hosting emulation) or have another emulator developed for it (chaining emulation). Emulation can fail in the long term because of the complexity of creating new software or modifications. It requires access to technical specifications, file formats and equipment. It is sometimes recognized as migration.

[323] The virtual machine is a solution very similar to emulation. An environment imitating the obsolete equipment is created, which makes it possible to run the software virtually, that is, without the obsolete equipment. The software enables the virtualization of commonly used architectures. The building a universal computer, on which a range of systems could run, was attempted. However, for it to be feasible, it would need elements in common with every new electronic environment. IBM and the Dutch Koninklijke Bibliotheek have conducted research in this area.

- 'museum of technology'[325],

- downgrading[326],

- software redevelopment[327].

Planning for data preservation is facilitated by the top-down specification of supported formats, unless a universal and intelligent method, preferably enabling access to files independently, is developed. The most common formats, which have the greatest chance of surviving, are those that are most widely used. By specifying the supported formats, costs are controlled and a narrower research area is focused on. However, there is a risk that some materials will not be preserved at all, since their formats will be excluded or accessible with only limited functionality, because it has been converted into one of the formats specified in the preservation strategy.

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[324] Migration involves converting an unused or outdated file format into a new one. It is not a perfect solution either, as it can cause the loss of data (estimated at the level of 2-3%), their integrity and functionality during the transformation. Transferring objects from one carrier to another to manage the risk that it will be impossible to read them can also be treated as migration. This can be done using the same or different kinds of carriers. It is assumed that because of rapid technological development, this method will be expensive in the long term. Other serious problems include the lack of common features between formats from a given category, for example when documents generated using software available in the market have different functions and properties. This makes migration difficult, since it is necessary to create separate or more complex solutions for every format to enable the conversion of numerous types of files at the same time. The need to migrate through various versions of a given format may also be troublesome. If a file in a given format was used in version 1 in 1995 and the current version is 10, some experts recommend that the file should go through all mutations between each of those two versions. This may increase the extent of information loss. A similar situation can occur if a certain format has been replaced with another one. Migration specialists argue about whether one can omit intermediate formats and versions if there are tools that enable it. Because there are numerous activities having a considerable influence on records, it is very important that their features are documented precisely in technical metadata. Migration can be done at different moments: after the creation of records; after the expiry of a deadline for their transfer to archives or after the transfer. Migration may occur following transfer to an archives: systematically (changing a format whenever a new or updated one appears, which is probably the best solution, but it also the most expensive); at a user's request (files are stored in the original format and the migration is performed when a user wants access to it – performed automatically by specially designed browsers, or performed manually by technicians); at the last minute (when a format is withdrawn from use – seemingly the cheapest solution; it enables the use of the latest solutions without the need to experiment with data transfer. Data loss may eventuate because of the risk that no tools enabling direct conversion into the latest format have been developed, so it will have to be done gradually. There is also the risk that delaying conversion too long may mean that no migration solutions are available any more.

[325] 'Museum of technology' is an easy solution to apply. It involves retaining old equipment and software for the reuse of data created using that equipment and software. It enables access to materials in their natural environment, thus making it easier to interpret them. It can be treated as a short-term method, which will later have to be replaced with a more reliable solution. The use of this approach requires someone who is still able to operate the available equipment,. This solution is very unreliable, because if a replacement part is unobtainable or there is insufficient operational knowledge about the obsolete equipment and software, it can not be applied.

[326] Some software that is available in the market still supports earlier format versions. Using this solution involves the risk that the software manufacturer will cease to use or develop a given feature. It also involves a high risk of losing access to data because of dependence on external partners, who have no incentive to cooperate and provide additional services.

[327] Software redevelopment covers adjusting the latest system environments by updating and recompiling the source code. It may require the development of the software from scratch in the same or another programming language, because of a number of technological changes. This solution can be used on a large scale for software for which the source code is available, especially open-source software. It is currently illegal to decompile commercially available software. To do so requires the consent of the software manufacturer or the owners of the source code. This method is very costly and time-consuming.

In the case of reproductions, a limited number of formats are used, which potentially makes it easier to preserve them. The use of open solutions is recommended[328].

The greatest problem related to the preservation of digital data is technology obsolescence and lack of awareness of the need to conserve data when they are no longer used and, obviously, during their use. It is still quite common to treat digital records like analogue records and take no action on the basis that digital records are like paper records, which once they are deposited in an archival warehouse, remain readable over time without any preservation intervention. Apart from the above-mentioned carriers and methods used for the preservation of digital records, it is important to apply solutions used for the creation of backup copies. They provide security in case of system failure or human error and enable the recovery of recently stored data. Nevertheless, the existence of backup copies does not solve the problem of technology obsolescence[329].

As well as considering the above-mentioned problems, it is also important to apply measures to prevent unauthorized use of digital materials – especially born-digital materials – and their manipulation, for example, in traditional or electronic publications, including on-line. This has rarely happened in archives so far, but the probability that this phenomenon will escalate as more and more materials are made available on-line cannot be excluded[330].

Archiving large amounts of digital data should not overwhelm researchers in the future, as tools, especially using artificial intelligence, enabling their processing will presumably be developed. The problem of storage should also be eliminated as the capacity of carriers increase and their prices fall[331].

In the future, ideally people dealing with long-term data preservation should influence technological development, so that the manufacturers devote more attention to ensuring long-term access to data saved in old technologies rather than to creating new ones that are not always backwards compatible. Greater standardization and interoperability of commercial and open solutions will also be required[332].

In preparing a security policy, digital preservation factors that should be taken into account include:

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[328] A. Brown, op. cit., pp. 94-95; *Ochrona dziedzictwa cyfrowego…*, op. cit., pp. 134, 137-138; M. Evans, G. Hunter, *Challenges…*, op. cit.; *Wytyczne dobrej praktyki. Aplikacje…*, op. cit., p. 221; G. Maier, *Fotografie und Digitalisierung. Möglichkeiten und Grenzen in der archivischen Praxis*, „Unsere Archive" 2006, 51, [access: 13.12.2012], http://www.landeshauptarchiv.de/fileadmin/download/archivePDF/Heft-51.pdf, pp. 30-33.
[329] *Wytyczne dobrej praktyki. Aplikacje…*, op. cit., p. 216.
[330] *Poradniki DGM…*, op. cit., p. 153.
[331] S. Ross, *Przesiadka w WIGAN…*, op. cit., pp. 23, 27-28; *Wytyczne dobrej praktyki. Aplikacje…*, op. cit., p. 216.
[332] M. Werla, op. cit., pp. 42-45.

- properties of archived objects,

- technology obsolescence,

- physical deterioration of carriers,

- durability of carriers,

- easy data manipulation,

- data change dynamics,

- data life cycle,

- data creator,

- future data users,

- infrastructure development and maintenance costs,

- effectiveness of preservation methods,

- preservation of metadata, with particular focus on technical metadata,

- data authenticity and integrity guarantee,

- data access control both by employees and users,

- monitoring technological development,

- monitoring users, including awareness of new user groups with different expectations of the solutions offered,

- possibility of automating the whole process or selected elements of it,

  natural disasters, fire, robbery, flood and other possible risks[333].

Although in Germany preservation of digital holdings is not a newly discovered issue and is developing rapidly, policies for long-term storage of scans are currently not very common, since some archivists assume that the originals still exist and can be digitized again if necessary. However, others, such as J. Kistenich and M. Wiech, claim that the digital output of the scanning process should be covered by long-term preservation strategies, particularly the scans of endangered archival materials, which digitization is intended to protect. Yet, greater priority is usually given to the conservation of born-digital data, which is reflected in the goals of various projects, including those related to digital preservation, such as Nestor. Digital preservation is cheaper than its recovery, which can be extremely difficult and often impossible. Preservation of scans is supported by the ARK's strategy, which sets the main goals and tasks of digitization. Their recovery or rescanning would involve huge costs, and it may be that not

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[333] *Wytyczne dobrej praktyki. Streszczenia…*, op. cit., pp. 17, 26; Ch. Keitel, *Guideline…*, op. cit., pp. 23-30.

all records that have been digitized already will be preserved in conditions enabling their redigitization[334].

If only a small amount of data is intended for short-term preservation, the most popular carriers used by archives for their preservation are CDs/DVDs. Tapes and hard disks are used when there is a large number of scanned records. Microfilms are very popular for the protection of reproductions of the most precious originals. In order to enhance preservation, at least two solutions should be used. However, many archives cannot afford to do this. It is common to store use copies on hard disks and their masters on several tape copies and microfilms. The last solution is increasingly popular due to the possibility of lowering the costs of the storage of masters, which, by definition and function, are more rarely used. However, one should remember that none of the carriers guarantee data access. Due to this fact and the obsolescence of formats, one should also consider using a long-term reproductions' preservation policy. This seems to be relatively straightforward, thanks to the limited number of formats in which digital copies of original records are saved[335].

4.3.4. Access

Electronic access to archival materials dates back to the beginning of 1970s, when Michael S. Hart typed as e-texts the Declaration of Independence of the United States of America, the Bible and selected Shakespeare works, the first works in the first digital library, Project Gutenberg. In the following years, libraries considered the possibilities of using modern technology to provide on-line access to their holdings. Official projects began towards the end of the 1980s. The first one was the American history project, American Memory[336], which the Library of Congress continues to maintain today[337].

In 1970, an archivist predicted that computers would be used to provide access to the holdings of from home, not only to information about holdings, but also to the holdings themselves. This vision started to become true 20 years later, as a result of the growing popular-

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[334] S. Ross, *Przesiadka w WIGAN…*, op. cit., pp. 28, 42; M. Kirstein, K. E. Lupprian, *Das Digitale Archiv der staatlichen Archiven Bayerns – Konzeption und Planung*, [access: 1.11.2012], http://www.staatsarchiv.sg.ch/Home/auds/14/_jcr_content/Par/downloadlist/DownloadListPar/download_4.ocFile/Text%20Kirstein%20Lupprian.pdf, p. 46 (conference paper: 14. Tagung des Arbeitskreises „Archivierung von Unterlagen aus digitalen Systemen", 1-2 März 2010, München); *Projektgeschichte* [online], [access: 18.11.2012], http://www.langzeitarchivierung.de/Subsites/nestor/DE/Header/Ueberuns/Projektartikel.%20html;jsessionid=9E02D1D26DE6FB076471ACD41763C570.%20prod-worker4; J. Kistenich, M. Wiech, op. cit., p. 146; *Digitalisierung von Archivgut…*, op. cit., pp. 1, 4-5; Email from P. Sander…, op. cit.
[335] *Wissenschaftliche Literaturversorgungs-…*, op. cit., pp. 12-13, 15.
[336] https://memory.loc.gov/ammem/index.html
[337] M. Kowalska, op. cit., pp. 69-70 (see: footnote 5).

ity of the Internet and the constant development of tools enabling the use of its communication potential. At first, simple websites containing basic information on archives and their holdings started to appear on the Internet. They have now advanced to become highly developed web portals enabling research[338].

Providing access is essentially about enabling interested parties to reach the information they search for. The two most important factors in achieving this are providing access to context information about archives, that is, archival description, and access to the archives themselves[339].

Making archival materials available to users depends on relevant archival law and on regulations related to the protection of personal data and public information. In European countries, regulations related to access to state archives and their holdings are very liberal and, thanks to cooperation among countries, very similar. In general, every citizen can use materials collected in archives after they have been kept for 20-30 years, provided that they have not been covered by any provisions and other factors that exclude or limit free access, such as their physical condition or temporary withdrawal for other purposes, e.g. for digitizing[340].

On 17 July 2000, the Committee of Ministers of the Council of Europe adopted the *Recommendation on a European Policy on Access to Archives*, which points out the need to develop solutions aimed not only at promoting the policy, but, more importantly, at introducing legal regulations to guarantee wide access to holdings collected in archives. An appendix to the recommendation defines the term 'access' as the function of archives to make their holdings available to users. 'Access to archives' has also been defined as the possibility to consult them in conformity with national law, which may be limited by significant public interest or by requirements for the privacy of individuals. Six years later, the European Commission recommended that member states should optimize the economic and cultural potential of their cultural assets, which was to be achieved by the provision of public access to digital reproductions on the Internet, on a multilingual platform gathering all potential content suppliers

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[338] E. Suckow, op. cit., p. 188; *Dyskusja i odpowiedzi referentów…*, op. cit., p. 201.
[339] A. Brown, op. cit., p. 127.
[340] C. Gränström, *A Society of Information…*, op. cit., pp. 44-45. More: R. Depoortere, *Access to Current Records and Archives – Data Protection*, in *Archives in the Society. ICA Pre-Congress Meeting – Vienna 2004. Papers of the International Conference Elbląg, May 22-24, 2003*, ed. W. Stępniak, Warsaw 2003, pp. 132-150.

in Europe. The idea has partially realized by portals, such as Europeana and Archives Portal Europe[341].

When planning access to records, one should take into account issues such as:

- kind and content of materials;

- rights or licences[342];

- explicit presentation of information on licences / ownership of published materials[343];

- scope of access to materials for users[344];

- technological research and development[345];

- monitoring existing and potential users;

- observing changes of users' attitudes and expectations[346];

- kinds of services: introducing paid services, beyond the standard services provided by archives;

- costs of infrastructure development and management;

- use of the materials by users[347];

- possibility to reuse and share the presented holdings[348];

- ability to use Web 2.0 solutions[349].

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[341] *Rekomendacja nr R(2000)13 Komitetu Ministrów do państw członkowskich w sprawie europejskiej polityki accessu do archiwów* (Recommendation No. R (2000)13 of the Committee of Ministers to Member States on a European Policy on Access to Archives) [online], [access: 9.11.2012], https://wcd.coe.int/ViewDoc.jsp?id=366202 45; *Zalecenie Komisji z dnia 24 sierpnia 2006 r. w sprawie digitalizacji…*, op. cit.; D. Nałęcz, *Europejska polityka accessu do dokumentacji i archiwów*, Warsaw 2004, [access: 13.11.2012], 20090209.archiwa.gov.pl/repository/arc hiwa/eupolityka.pdf, pp. 3-24.

[342] They define the terms of access and mechanisms to control violation of rights, both by the entity providing access (for example, anonymization tools) and on the part of the user (for example, mechanisms that prevent the copying of an item).

[343] It makes it easier for users to recognize the terms under which records can be used for private purposes, for research or for commercial projects.

[344] Access may be free or may be controlled by registration on an access portal.

[345] Portals offered to users need to be modernized to keep them attractive and, more importantly, to improve their functionality, especially for research purposes. A user wants results that are as accurate as possible and to have many ways of formulating queries on the basis of the searched entry, period or other criteria to refine their search, and thus their results.

[346] Customers of archives are mostly people involved in research activities (researchers (including students), clerks, genealogists, journalists, hobbyists and tourist guides), or people who need certificates for various purposes. They also include people who come to see an exhibition, participate in a lecture or expand their knowledge.

[347] Users can use materials passively, searching and analysing them by focusing on the searched information, or actively, by adapting materials to create new works or using them on other portals.

[348] Reuse/sharing covers providing access as part of other on-line services or for users' purposes. Users might gather them into their private collections, share or convert them and make them available on another or the same portal. In the development of social networking sites, one can observe that re-mixing is usually used for audio recordings and graphic presentations. In this process digitization of analogue materials and easy access to conversion software play an increasingly important role. This can be recognized as a new way of creating and developing a culture.

Digital reproductions of records can be made available to users on-line, in specially prepared portals, or off-line, on various carriers (used by those with no infrastructure to present scans), or in the internal networks of archives. Internal networks are usually used for providing access to records containing sensitive data or covered by regulations restricting their presentation on the Internet, and by archives whose external electronic services are not well-developed. Files are typically ordered through catalogues and opened using basic software available at a computer station, or on special platforms. The Landesarchiv Nordrhein-Westfalen has implemented such a system. V.E.R.A. software enables the search of records that ordered hierarchically, according to the inventory arrangement. Various solutions are used in Germany, depending on the specific nature of records or archives. There is no single, commonly applied practice, but there is a tendency for access to be provided mainly in electronic form or on microfilm. This is supposed to reduce access to original records and is consistent with DFG policy, which requires that institutions who get support from the DFG for digitizing their archival holdings publish the output of their digitization programmes online[350].

The importance of the professional presentation of records in the virtual world has been described as part of the research project, Neue Möglichkeiten und Qualitäten der Zugänglichkeit zu digitalen Konversionsformen gefährdeter Bücher und Archivalien (New Possibilities and Quality of Access to Digital Converted Forms of Endangered Books and Records), implemented by the Landesarchiv Baden-Württemberg in the mid 1990s. Among other things, it answered two questions: What does the publishing entity want to achieve as a result of the presentation?; and How should sources be prepared for these purposes?. Traditional publications, materials for classes offered to schools, brochures, catalogues and leaflets were used in the analysis because few on-line presentations of materials were offered by cultural institutions at that time. The research showed that the aim of presenting sources online is to reach the users or a particular group by preparing materials that they might be interested in or by drawing attention to a certain topic. When it comes to considering the interaction of customers of archives with online presentation of sources, they fall into three groups: those for whom superficial contact with the source is sufficient; those who want to examine them; and those who want to see them as if they were in an exhibition. The first two groups will be satisfied with a basic

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[349] Ch. Keitel, *Guideline…*, op. cit., p. 30; D. Simpson, *Contracting out for Digital Preservation Services Information Leaflet and Checklist*, 2004, [access: 18.04.2012], http://www.dpconline.org/index.php?option=com_docman&task=doc_download&gid=354, p. 14; O. Seneviratne, A. Monroy-Hernández, op. cit.; A. Witowiak, op. cit., p. 215; M. Werla, op. cit., pp. 45-46; P. Nawrocki, *Możliwości zastosowania…*, op. cit., pp. 107-127 (also published: „Archeion” 1974, 60, pp. 7-21).

[350] M. Kowalska, op. cit., p. 51; *Wytyczne dobrej praktyki. Aplikacje…*, op. cit., p. 204; *Digitisation. Standards Landscape…*, op. cit., pp. 54-58; *Bestandsaufnahme…*, op. cit., pp. 96-100.

description online, whereas the third one will require a wider context. It is important that this is taken into account in preparing electronic presentations, as the evidence suggests that basic information available in inventories will be sufficient for most users. It was also observed that three types of presentations are usually used: presentations of the most valuable materials; thematic presentations; and presentations without a thematic orientation. Guidelines on the preparation of presentations of library and archival materials were developed as a result of the research. They cover the following criteria, which were comprehensive for the mid 1990s:

- basic criteria:
    - size of a digital item ensuring readability[351],
    - item identification elements (reference code, storage place),
    - metadata,
    - navigation (leafing through forward and backward);
- additional criteria:
    - access independent of the place and time,
    - multidimensional access,
    - development of navigation features,
    - description at the level of a document with a context,
    - integration with structure and a context,
    - reading support aids;
- technical criteria:
    - programming languages: HTML from version 4.0, DHTML, Java Script,
    - avoiding use of commercial programming languages, such as: Java, Active-X,
    - browsers: Netscape-Navigator/Communicator 4.x and Microsoft Internet Explorer 4.x,
    - resolution: 800×600dpi, in the future: 1024×786 dpi,
    - file formats: JPEG, in the future: PNG and Wavelet[352],
    - file representations: preview, full page and detail view – preview shows a thumbnail of an image, so that the user can get a general idea of the source, full page view makes it possible to see the whole item, and detail view enables comfortable reading;

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[351] The technology available at that time could not handle the publication of large files, so it was necessary to reduce their size while keeping them readable.

[352] A format used for large raster graphic files, particularly maps, for example MrSID (see table 5: Graphic file formats used by German state archives).

- additional information: storage place, reference code, location in a unit, archival description (size of the original, material, restoration, damage);
- technical information: format, size as well as tools and activities used in converting a file from a master into files for presentation.

For records made accessible in presentations without a thematic orientation, the presentation arrangement to be displayed on a user's monitor was specified in detail. It covered recommendations that the middle part should present the source (70% of the height and 100% of the width) and the upper part should contain the title, storage place, reference code as well as the zoom button. The bottom part should contain buttons that enable the display of a description and next pages (up to 10 – if there are more pages, it is recommended to place navigation buttons on the left). Moreover, maps and posters should have an additional window containing the legend and necessary explanations as well as rotation buttons[353].

The preparation of one item in accordance with these guidelines, without automation and using equipment available at that time, took almost two hours. It was too long and extremely costly, disproportionate to the benefit. There were also other technical problems associated with advanced technology, which did not enable the presentation of large files or their adjustment to the requirements of presentation. In the recent years, archives providing on-line access to records have implemented most of the recommendations, thanks to the possibilities of more modern technology. For example, bildCMS software used by the Landesarchiv Baden-Württemberg enables the publication of multiple scans in several minutes[354].

Ten years later, the DFG formulated guidelines for the presentation of scans for all institutions that receive its financial support for their projects. The most important included mainly the combination of good quality items and their metadata in structures corresponding to their real links, based on simple navigation and metadata searching. It was supposed to facilitate interpretation during studies and research. The importance of user friendliness and independence from factors such as system platforms and Internet browsers or Internet connection speed, which, if too low, could make it difficult to use the published reproductions, was also mentioned. Some archives use presentation software offered by the DFG, which meets all the above-mentioned requirements[355].

The Fraunhofer IAIS points out that services that present records on-line should be as user friendly as websites. They suggest using guides prepared as part of the European Mi-

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[353] K. Uhde, *Kontextbezogene…*, op. cit., pp. 233-244; H. Weber, *Digitale Konversionsformen…*, op. cit., pp. 212-215; G. Maier, *Qualität…*, op. cit., pp. 175-178.
[354] K. Uhde, *Kontextbezogene…*, op. cit., p. 245; T. Fricke, op. cit., pp. 67-86.
[355] *Wissenschaftliche Literaturversorgungs-…*, op. cit., pp. 20-22.

nerva project. The ARK, in its strategy for preservation and digitization of holdings, observes that on-line access to records has a positive influence on the image of an archives and makes it possible to attract new users. Consequently, it recommended that archives should present their records on-line more than they had before[356].

The inventory of the Landesarchiv Baden-Württemberg is an example of one of the best-prepared on-line inventories containing digital reproductions of records. It features options for searching according to the organization of archives' branches and fonds structure, or meta-data searching. In order to make it easier to browse digitized items, they can be enlarged and rotated, have the number of pixels changed and their brightness adjusted. PDF documents are available for download and bookmarks can be inserted to automatically create a list of favourite items. It can be printed out or used to navigate through interesting materials by means of hyperlinks. If only analogue originals are available, a basket symbol appears next to items, enabling remote ordering for direct delivery to the reading room.
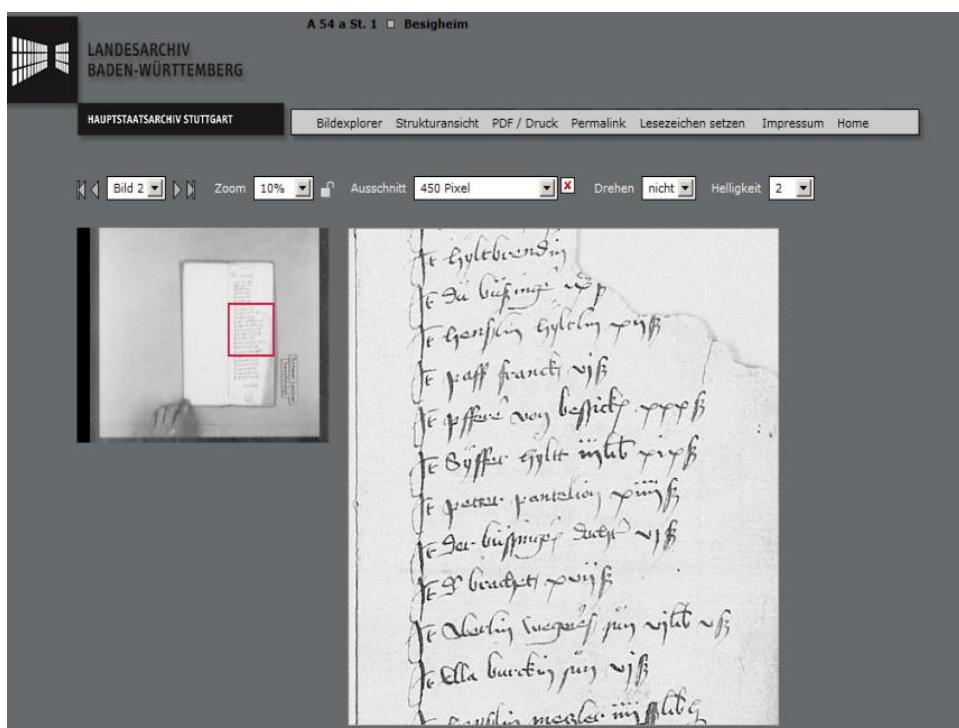
Screenshot 4 An example of mechanisms for using scans presented on the Internet by the Landesarchiv Baden-Württemberg, access: 28.11.2012], https://www2.landesarchiv-bw.de/ofs21/bild_zoom/zoom.php

Access depends largely on the quality of the descriptions of archival holdings. Good quality descriptions, together with efficient software, guarantee quick access to searched items. In Germany, digital records are presented mainly on the websites of archives, on *land* web por-

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[356] *Bestandsaufnahme…*, op. cit., pp. 96-100; *Digitalisierung von Archivgut…*, op. cit., p. 2.

tals or thematic portals, such as those offered by the Bundesarchiv. No common portal for institutions collecting records has been created so far, but it is discussed increasingly often in Germany and a national concept is currently being prepared[357].

Another important element of on-line presentation is ensuring permanent access to it, especially to guarantee the possibility of quoting from material presented on it. If a given source is cited in a research paper, other researchers should be able to verify it by getting access to it and reanalysing it. Achieving this is assisted by using a uniform format of addresses for items placed in the virtual space. The Persistent Uniform Resource Locator (PURL) is an example of a permalink, which works similarly to mail getting through to the addressee on the basis of the provided address. The item locator, that is, its permanent name, serves as its identifier. An example of the fixed address for an item with the locator, 1-10023, is http://www.landesarchiv-bw.de/plink/?f=1-10023. If any element of the address preceding the locator is changed, the control mechanism of the permalink will find the item by its locator 1-10023. Such a solution is used, along with others, in Landesarchiv Baden-Württemberg's electronic inventories[358].

Reaching as many users as possible is becoming one of the reasons for publishing the output of digitization projects. New electronic tools can support the acquisition of new groups of users. In the 21st century, the promotion of access portals on social networking sites, such as Facebook, visited by a great number of users, can play a particularly important role. Archives that started to intensively promote their records as well as their research and popularization activities on social networking sites recorded an increase in user numbers. Unfortunately, German state archives are not among these archives. In some countries, this method is used to recruit volunteers who are prepared to give their free time to help with processing, digitization or other tasks for which archives, owing to financial constraints, usually lack personnel.

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[357] Examples of the on-line presentation of records can be found in chapter 5: 'Archives on the Internet'.
[358] *Wissenschaftliche Literaturversorgungs-…*, op. cit., p. 19.

If it cannot be found on the Internet, it does not exist.

5. Archives on the Internet

5.1. Websites

Before the advent of the Internet, public institutions could build their image in two ways: by means of the actions of their employees and their contacts with customers, and through their buildings. Making a proper impression was supposed to reflect an entity's power and build confidence. The transfer of the citizen–institution interaction from the real world to the virtual world resulted in numerous changes. It caused websites, which serve as business cards in the virtual world, to become important elements for all public institutions, including archives. It is usually the first point of contact with users, and should, therefore, be treated very seriously. Its quality decides the positive image of organization on the Internet and helps establish good contacts with customers, which is an important aspect of public relations[359].

Websites can be classified according to various criteria. Those discussed in the following chapter are of public institutions and fulfil informative, administrative and research functions, with particular focus on their informative function[360].

The purposes of a website include presentation of information about an entity. It covers an entity's identity, activities, mission, networks of similar archives to which the entity belongs, and the legal grounds for its operation. A website can perform many other functions, including the popularization of cultural heritage, education, providing services for archives' customers and specialists, as well as promoting an archives or an archival environment. Looking at a website from the business point of view, its purpose is to atract new customers, enhance the organization's prestige, provide appropriate service and institutional information to regular visitors and deliver and promote goods and services on the Internet[361].

The significance of institutions' websites, especially their quality, was underlined by the European Union during its attempts to coordinate and speed up digitization. In 2001,

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[359] K. Olszówka, *Kształtowanie wizerunku firmy w Internecie,* in *Strategie i modele gospodarki elektronicznej*, eds. C. M. Olszak, E. Ziemba, Warsaw 2007, pp. 73-96; H. Krajewska, *Public relations w archiwach w Austrii i Niemczech*, in: *Public relations w archiwach*, ed. M. Jabłońska, series: Studia i materiały konferencyjne Stowarzyszenia Archiwistów Polskich, Poznań 2010, pp. 151-152.

[360] V. Kinle, *Gut vorbereitet ins Archiv – Benutzerorientierte Angebote in archivischen Internetpräsentationen*, „Der Archivar" 2003, 3, pp. 249-250; M. Klein, *EDV und Neue Medien: Neues Intranetangebot des Landesarchivs Berlin für die Berliner Verwaltung*, „Der Archivar" 2004, 3, pp. 236-238; A. Ullmann, P. Rösler, op. cit., p. 5.

[361] *Handbook for Quality…*, op. cit., pp. 43-48; K. Olszówka, *Kształtowanie…*, op. cit., pp. 78-79; P. Michalak, *Rola stron internetowych w popularyzacji wiedzy o archiwach*, in: *Archiwa w nowoczesnym społeczeństwie. Pamiętnik V Zjazdu Archiwistów Polskich Olsztyn 6-8 września 2007*, eds. J. Poraziński, K. Styjkowski, Warsaw 2008, pp. 425-429.

during a meeting of experts for digitization in Brussels[362], the debate was summed up in the presentation of the Brussels Quality Framework. It was pointed out that institutions' websites are a perfect medium for the presentation and promotion of digitized culture in the global network. However, it was explained that they must meet certain criteria. Publications of Minerva eEurope project workgroups, concerning websites of cultural institutions created as part of these coordination works, are also noteworthy. One of them mentions the main features of the appearance and design of a website and its contents, which cover: clarity; making a good impression; maintenance and updating; easy access regardless of the technology used and disability; user friendliness; multilingualism; interoperability and lawfulness[363]. In the same year, the first of the three guides, entitled *Handbook for Quality in Cultural Web Sites. Improving Quality for Citizens,* was published. It explains how an Internet policy should be shaped in an institution, so that it meets users' expectations and supports promotion. The creation and management of a website was presented as a process that consists of two important elements: identification of an organization; and specification of users and their needs (with particular focus on the disabled). The table presented below shows the structure of an archives' website that meets the above-mentioned recommendations[364].

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[362] *The Digitisation of European Cultural Heritage on the Web*, 17.07.2001, Brussel, metting organized by the European Commission and Belgian presidency.

[363] These aspects have been discussed in detail in: *Quality Principles…*, op. cit.

[364] J. Nielsen, H. Loranger, *Optymalizacja funkcjonalności serwisów internetowych*, Gliwice 2007, 431 p.; P. Flamme, U. Herkert, V. Viergutz, op. cit.; K. Uhde, *Archive…*, op. cit.; K. Uhde, *Das Internet-Archive*, op. cit., p. 19; *Quality Principles…*, op. cit.; *Handbook for Quality…*, op. cit., p. 195; *The Brussels Quality Framework. Context*, op. cit.; *The Brussels Quality Framework*, op. cit.

Main navigation	Secondary navigation	Third level navigation
1. The Archive	**History**	Founding Collections Building
	Activity	Research Acquisitions Reforms Publications Didactic
	Opening Hours	
	About us	Structure Offices
2. Our Records	**History of Records**	Sections Collections
	Information system	Records Finding Aids Creators
	Conditions of access	IPR and privacy rules
3. Web Resources	**Other Archives**	
	Archival Portals	
	Thematic Resources	
	Search Motors	
4. Services	**Library**	Catalogue New Accessions
	Didactic Services	Thematic Paths Guided Tours Lessons for Schools, Groups Downloadable Material
	Special Schools	Information Periodicals Teachers
	Reproduction Services	Conditions Download digital copies
5. Events / News	**Events in the Archive**	
	News of the Web Site	

Table 7 Website navigation proposal, from: Example # 1-Planning the Website of an Archive (Thematic area: Our Records), in *Handbook for Quality…*, op. cit., p. 122.

The last Minerva guide: *Handbook on Cultural Web User Interaction* describes Web 2.0 solutions and signals the arrival of another revolution – Web3.0[365]. A new generation of web applications enables users to generate their own content, just like on social networking sites such as Facebook. The new type of an Internet user is not only a passive consumer but also

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[365] Web 3.0 aims to create mechanisms using semantics and artificial intelligence that analyses Internet contents in order to find the answer that an Internet user is really looking for. A new generation of the virtual world would differ in that it would offer tools able to control the flow of information that has so far been chaotically shared on the Internet, and to find information that a user needs. For further information, see *Handbook on cultural web user interaction* [online], ed. Minerva EC Working Group Quality, Accessibility and Usability, 2008, [access: 13.08.2011], http://www.minervaeurope.org/structure/workinggroups/userneeds/documents/cwqp-uk.htm, p. 135 - 148.

a content creator, that is, a prosumer[366]. There are numerous Web 2.0 solutions that make a user a part of a tribe gathered around a certain topic or project, as S. Godin describes it. This makes it possible to maintain a user's attention and interest in a website for longer, provided, of course, that they find it attractive. If website owners somehow manage to establish communication within the community around them, they will automatically become its leader and be able to use that community to build and develop their portal. The paradigm shift in user–institution interaction resulting from website use and the spirit of Web 2.0 is recognized as very important, since it enables the creation of a portal that will fully satisfy its users. For most archives, the Internet is becoming a new way of communicating with users and enhancing their transparency. According to S. Gutsch, the most practical Web 2.0 tools used in the archival world are blogs, wikis, crowdsourcing, social networking and photo sharing[367].

The German archives that created the first websites in the 1990s were often guided by articles written by K. Uhde, P. Flamme, U. Herkert and V. Viergutz, which were the results of the following studies: 'Neue Möglichkeiten und Qualitäten der Zugänglichkeit zu digitalen Konversionsformen gefährdeter Bücher und Archivalien' (New Possibilities and Quality of Access to Digital Converted Forms of Endangered Books and Records) and the DFG's suggestions for libraries and documentation centres. That is why they are noticeably similar[368].

In his work, K. Uhde mentions that it should be obligatory to publish on a website information on an archives, lists of fonds and inventories with digitized items. These elements, apart from the last, can be found on all websites of German archives. As far as technical aspects are concerned, the author recommends the use of the latest commonly accepted website development standards, the appointment of editors responsible for the contents, the use of a heading and a footer, a link to the home page (for example hidden in the logo), limiting the length of texts and possibly dividing them into fragments, and obeying the law relevant to published content. The suggestions of the other three authors refer to more detailed descriptions, such as those used in guides to archives, and underline the differences and the importance of lists of general and detailed fonds. Like K. Uhde, they focus mainly on technical issues such as website coding language, servers, databases and costs. As regards the organization of website con-

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[366] 'Prosumer' is a combination of producer and consumer. Web users can now produce and use their own content at the same time. A. Toffler, *Trzecia fala*, Poznań 2006, pp. 305-329.

[367] *Handbook on cultural…*, op. cit., pp. 11-74; S. Godin, Plemiona 2.0*. Zostań internetowym przywódcą*, Gliwice 2010, 131 p.; *Archives 2.0*, [access: 26-28.08.2011], http://archives2point0.wetpaint.com; S. Gutsch, op. cit., pp. 23-25.

[368] K. Uhde, *Archive…*, ibid. This issue was also discussed in *Das Internet-Archiv*, ibid.., p. 37; Uhde defined online presentation of digitized items on the Internet as the fourth criterion. P. Flamme, U. Herkert, V. Viergutz, ibid.; *Neue Informations-Infrastrukturen…*, ibid.; M. Black-Veldtrup, *Erschließung…*, ibid., pp. 607-609; G. Maier, 'Qualität…', ibid.

tent, the authors suggest dividing it into chapters, using short and simple sentences, and linking with a table of contents. They also discuss the importance of updating a website, particularly the areas where it is required, such as news. A situation in which a visitor to the website is surprised with out-of-date information is unacceptable[369].

Other important aspects of websites include the advantages of their use, including the relatively low cost of publishing and updating information about an archives and its holdings, facilitating and speeding up the contact with users, and the ability to provide access to digital copies of records. In the future, if German archives start to apply Web 2.0 concepts, as well as benefiting from value mentioned above, they will be able to engage the virtual community in voluntary service to its benefit. This is also connected with the issue of user-generated content[370]., which is becoming increasingly popular in the European archival environment, as new tools make it possible to involve Internet users in enhancing descriptions of records, for example by tagging them[371].

With the popularization and increasing complexity of websites, archives began to go beyond the standard content, such as the address, terms of use for records, and basic information on holdings. The presence of archives on the Internet should help them to go beyond their local environment, to which they are connected because of their specific responsibility for the oldest archival cultural artefacts associated with that particular region. Moreover, access to the global network helps eliminate the obstacles of working hours, as people can use numerous on-line services 24 hours a day, no matter where they are. The Internet also makes it possible for archives to enter areas in which they have so far been unimportant or unnoticed. Thanks to appropriate web portals, they can now contribute to increasing interest in a given region among local people or tourists. Archives can also influence the shape of school curricula more dynamically, offering archival classes organized at its premises, at schools, or on the Internet, thanks to the increasing popularity of e-learning systems. The web facilitates the acquisition of new groups of users who have not been interested in archives so far, for reasons such as lack of awareness of their existence or the conviction that they do not contain anything interesting. As a result of their focus on electronic databases and digitization, archives contribute to speed-

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[369] W. Reininghaus, F. M. Bischoff, *Archive in Nordrhein-Westfalen im Internet*, „Der Archivar" 1998, 3, [access: 17.02.2013], http://hdl.handle.net/2027/mdp.39015072446787, pp. 411-412; K. E. Lupprian, L. Saupe, *Internetauftritte als Form archivischer Öffentlichkeitsarbeit*, in Archive und Herrschaft, ed. J. Murken, Siegburg 2002, pp. 382-388.

[370] The term covers content created by users of both private and public Internet services which adds value to the service, taking it beyond merely providing access to individuals' or institutions' works; see: *Participative Web and User-Created Content: Web 2.0, Wikis and Social Networking*, 2007, [access: 11.09.2012], http://browse.oecdbookshop.org/oecd/pdfs/free/9307031e.pdf, pp. 17-18.

[371] Ibid.

ing up the circulation of archival information and academic research. Most important of all, by using new technologies, arechives can secure a stable position on the Internet, which makes them widely recognized and treated as an important element of the information society[372].

The development of websites resulted in the addition of new content, such as inventories of fonds – first in the form of text files, and later as searchable databases. These kinds of material, being the result of archivists' work, were previously published in printed forms that had limited circulation, which made it difficult for its main users – researchers – to get access to them. They could use inventories at a given archives, at others that had copies of them and at libraries, or borrow them from other researchers. There also appeared a problem related to publishing. Not all archives could afford regular publishing of inventories, not to mention their updating. The Internet has facilitated access to the latest information on holdings[373] and lowered the costs of printing and typesetting associated with such publications. It has also provided new promotion opportunities in the virtual environment and facilitated contact with institutions[374].

Thanks to added databases that serve as inventories, websites started to function as electronic guides to an archives, which give required information on the institution, its history, holdings and terms of use. However, as in the case of traditional websites, they lack a uniform standard that would help users feel comfortable at a new site. They are developed according to analogue patterns and have similar information architecture, but they differ in the depth of their information. Some of them are very concise, whereas others are too elaborate. Some archives do not share information on their holdings for various reasons – for example, when records are related to a controversial matter or when information has not been entered into electronic databases[375].

The assessment of the information architecture of websites and their functionality from the user's point of view has been discussed in numerous books and articles. However, these analyses usually refer to large international corporations. Websites of public institutions are rarely examined, although they are most frequently criticized by specialists. So far, no work that analyses solutions used in the public sector has been published. It probably results from the fact that public sector institutions do not attach much importance to this area, cannot afford such

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[372] *Handbook for Quality…*, op. cit., pp. 48-52.

[373] Many programs used for processing records enable the automatic addition and correction of data in databases made available on-line, by using data synchronisation, which can be performed on an ongoing basis.

[374] B. Ryszewski, *Przegląd oraz systematyka pomocy archiwalnych polskich i obcych opublikowanych w ostatnim ćwierćwieczu*, „Archeion" 1990, 88, pp. 7-21.

[375] Ibid, pp. 16-17.

analyses, or find them unnecessary. In the case of German archives, those articles that have been written mostly present individual websites or discuss the contents they should cover[376].

German archives do not use Web 2.0 solutions[377] – after all, one cannot treat as such a simple photo gallery or a lecture shared as a podcast, which can neither be commented on nor marked as favourite so that the user could later return to it. There are several profiles of archives on Facebook, but they have not been created by the entities they represent[378]. One can find descriptions of archives of differing quality also in Wikipedia, which usually cover their history, information on holdings and terms of use. However, as in the previous case, their authors are not members of the institutions to which the published information refers. If they were created by archives, they could be used by them for the purposes of image creation. An entry in an on-line encyclopaedia can provide users with information on an institution. Blogs, microblogs, or social networking sites could have a similar function. Moreover, they could be used to inform people about events organized by the archives in a less official, more direct and quicker way than through a website, official invitations sent by mail, posters, leaflets, and local or nationwide media. The new tools could be used not only for contacts with custom-ers, but also for contacts between archivists in their daily work. B. Gillner assumes that they would be interested in acquiring information about what their colleagues in another archives currently do, or writing about their efforts. The possibility of providing access to holdings in order to enrich other websites is also interesting. Bundesarchiv agreed to the use of scans of photographs by 'Wikipedians' for the encyclopaedia articles they publish. Benefits derived by the archives include the popularization of Bildarchiv's photo website and receiving a database containing information that supplements the descriptions of shared photographs, with links to articles in the encyclopaedia and to a name catalogue of the Deutsche Nationalbib-liothek. Archives sometimes use Wikipedia for yet another purpose. They compare their own data with it, in order to check whether there are any important persons on appraisal lists. How-ever, one can assume that the common passive attitude in the use of second-generation solutions may result from the fact that these institutions are still focused only on supplying content rather

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[376] W. Reininghaus, F. M. Bischoff, *Archive…*, op. cit., pp. 411-426; B. Dorfey, *Internet-Auftritt des Landeshauptarchivs Koblenz*, „Der Archivar" 1999, 3, [access: 17.02.2013], http://www.archive.nrw.de/Archiva r/hefte/1999/Archivar_1999-3.pdf; G. Maier, *Internet-Portal „Archive in der Arbeitsgemeinschaft Alpenländer"* (http://www.lad-bw.de/argealp), „Der Archivar" 1999, 3, [access: 17.02.2013], http://hdl.handle.net/2027/mdp.3 9015072446639.

[377] Some municipal and county archives do use them.

[378] Such a profile was used, for example, by the Bundesarchiv and its branches in Berlin, Koblenz, Rastatt, Freiburg and by several state archives in Schwerin, Münster, Bremen, Sigmaringen and Saarabrücken. Their con-tents were supplemented with data taken from Wikipedia. Unfortunately, the researcher was unable to establish who created them and why. They were not created by Wikipedia, and Facebook did not provide any answer.

than receiving it from users, who could support content with in technical aspects and in subject matter[379]. There may be numerous reasons for this situation, the first of which is a belief that researchers, who do not need any 'attractions' to hold their interest in the institution, are the main users of archives. They will certainly come back without any incentives. Other target customers using services such as thematic portals include students and teachers – also a group that is still considered to receive and process data in Web 1.0 model. However, Marc Prensky's theory on digital evolution in teaching digital natives argues that this is not true any more[380]. Another argument is that archives belong both to an academic circle and to public administration, which is obviously not geared towards active promotion. A third possible reason is related to money and time. The development of Web 2.0 strategy does not take 5 minutes; just the opposite, as it is a very complicated process, which requires proper preparation. There also appears the problem of constant supervision of the implementation of adopted goals and responding to users. When starting to use these modern technologies, one must know that it is not an easy task. The fourth reason is related to the fact that the institution is not entirely user-oriented. Unfortunately, the closed mentality and habits from previous centuries, when archives functioned as institutions protecting records rather than providing access to them, still have a certain influence[381].

Another important issue, which is also often ignored by archives, is users' feedback. Users of websites are not often surveyed to establish whether they are satisfied with services offered and are not asked about their expectations. Hardly any archives analyses branding or has a marketing strategy in the context of the use of Internet tools.

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[379] The experiences of archives using crowdsourcing show that users can find errors in descriptions published in databases, can have necessary knowledge to supplement them, can support retroconversion (retype data from archives' scans manually or proofread texts prepared with the use of OCR software) and indexing, or can draw attention to the improper functioning of a website.

[380] 'Digital natives' are people born surrounded by technology and used to its ubiquitous existence; for more, see M. Prensky, *Digital Natives, Digital Immigrants*, (Part I), "On the Horizon" 2001, 5, pp. 1-6, http://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part1.pdf; and *Digital Natives. Digital Immigrants. Part II: Do They Really Think Differently?*, "On the Horizon" 2001, 6, http://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part2.pdf, [access: 23.03.2016].

[381] B. Gillner, op. cit., pp. 4-42; J. Kemper et al, op. cit., p. 136; S. Gutsch, op. cit., pp. 20-22, 60-73, 121; O. Sander, *„Der Bund mit Wiki" – Erfahrungen aus der Kooperation zwischen dem Bundesarchiv und Wikimedia*, „Archivar" 2010, 2, [access: 22.09.2012], http://www.archive.nrw.de/Archivar/hefte/2010/ausgabe2/Archivar_2_10.pdf, p. 158; O. Sander, *Das Bundesarchiv und WikiMedia. Neue Kooperationsmodelle im Web 2.0*, in: *Archive und Medien. Vorträge des 69. Südwestdeutschen Archivtags am 20. Juni 2009 in Münsingen*, eds. E. Lersch, P. Müller, Stuttgart 2010, pp. 67-71; P. Haber, *Das Web 2.0 und die Archive. Anmerkungen aus der Sicht lines Historikers*, ibid, pp. 75-77; M. Glauert, *Archiv 2.0…*, ibid, p. 44.

The following subchapters present the analysis of basic elements and design of websites and portals. No detailed studies have been carried out in relation to the fulfilment of the discussed standards, since this was not the main purpose of this work.

5.1.1. Websites of state archives

For the purposes of this section, generalized results of the content analysis of the websites of all state archives have been presented. The text contains screenshots of selected websites[382].

Only five out of 16 state archives have their own websites[383], 10 of them place their websites in state portals[384] and one was not included, as the network does not have a common website, but a separate one for each branch[385].

Despite their diversity, websites of state archives have numerous common features. It turns out that all of them consist of more or less the same elements, although their structure is varied. The home page contains navigation panels enabling quick transfer to selected thematic groups. They can be arranged in any way, but they are usually located in the upper part of a page (53.33%) or on sides (33.33%) – usually on the left. Sometimes there are two panels – the upper and the lower one (46.67%).

Not all home pages contain links to tabs with the terms of use of records in an obvious place. For example, the Thüringer Staatsarchiv hides them in the 'Legal Grounds' (*Rechtsgrundlagen*) tab. Yet, in most cases they are called 'Use' (*Benutzung*) or, less frequently, 'Service'. They contain information on the principles of providing access to records, available equipment, such as microfilm reading devices or computer stations, the possibility of making or ordering reproductions or performing research and reading documents written in a Gothic

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[382] The study covered home pages and sub-pages linked directly to them.

[383] Landesarchiv Baden-Württemberg www.landesarchiv-bw.de, Staatsarchiv Bayern http://www.gda.bayern.de, Landesarchiv Berlin http://www.landesarchiv-berlin.de, Landesarchiv Brandenburg http://www.landeshauptarchiv-brandenburg.de, Landesarchiv Rheinland Pfalz http://www.landeshauptarchiv.de, [access: 2.11.2009].

[384] Landeshauptarchiv Sachsen-Anhalt http://www.sachsen-anhalt.de/LPSA/index.php?id=32012, Sächsisches Staatsarchiv http://www.staatsarchiv.smi.sachsen.de, Landesarchiv Nordrhein-Westfallen http://www.archive.nrw.de/LandesarchivNRW, Die Thüringischen Staatsarchive http://www.thueringen.de/de/staatsarchive, Landesarchiv Saaraland http://www.saarland.de/landesarchiv.htm, Staatsarchiv Hamburg http://www.hamburg.de/staatsarchiv/, Niedersächsisches Landesarchiv http://www.staatsarchive.niedersachsen.de/master/C504_L20_D0.html, Landesarchiv Schleswig-Holstein http://www.schleswig-holstein.de/LA/DE, Staatsarchiv Bremen http://www.staatsarchiv.bremen.de, Hessische Staatsarchive http://www.archive.hessen.de, [access: 2.11.2009].

[385] This is an archival network in Mecklenburg-Vorpommern. Landeshauptarchiv Schwerin has its website on the portal of the State Culture and Monuments Preservation Office (Landesamt für Kultur und Denkmalpflege): http://www.kulturwerte-mv.de/cms2/LAKD_prod/LAKD/content/de/Landesarchiv/Landeshauptarchiv_Schwerin/Oeffnungszeiten/index.jsp, whereas Landesarchiv has a website with an individual domain: www.landesarchiv-greifswald.de, [access: 2.11.2009].

script that is not currently used. There is also a price list for all non-standard services. Occasionally, one can find here links to inventories or descriptions and literature on holdings, as well as educational offers for schools, trips, press news and tips for junior researchers. These websites also contain links to the information on the organization of the institution (93.33%) and news concerning the archives (86.67%). They usually include information on events in the archives, organized exhibitions and meetings, changes of opening hours or the conditions of the archives' operation, as well as its latest publications and newly prepared inventories. There are links to the information on holdings on home pages of slightly more than 66% of websites. This does not mean that the remaining 34% do not provide such data. They are placed deeper, in other tabs, as in the example at the beginning of this paragraph.

Direct access to contact information for the institution is also very helpful for users. However, only 26.66% of archives provide their address on the home page, 53.33% have a 'Contact' tab, whereas the remaining 20% place their address in tabs related to individual branches or, as in the case of the archives in Saxony, under a link enigmatically called 'Functions of the portal' (*Portalfunktionen*)[386]. More than half of archival networks provide links to lists of archives' publications. The same percentage of websites contain information on services provided for municipal archives, libraries or public agencies. They cover mainly support and consultancy related to the shaping of historical records and the management of documentation. Other tabs direct to websites dedicated to archives – archival portals (33.33%) and an impressum (40%) that provides information on the entity responsible for the contents published on the Internet.

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[386] *Kontakt* [online], [access: 5.11.2009], http://www.archiv.sachsen.de/4362.htm.

Link	%
Use	100
About the institution	93.33
News	86.67
Overview of holdings	66.67
Contact	60.00
Publications	53.33
Consultancy – public agencies	53.33
Site map	46.67
Events	46.67
Impressum	40.00
Links	33.33

Table 8 Contents of archives' websites [access: 5.11.2009]

Obviously, not all tabs that can be found on home pages of German state archives' websites are mentioned here; only those that appeared most frequently are noted. The author's intention was to show certain common features of websites. It was not necessary to mention all tabs, as most of them were used only once.

The quality of information on holdings published on the Internet varies, from a short descriptive note with the information on the kinds of available sources (20%) to electronic inventories that can be searched with using a search engine (13.33%). The most common are inventories in the form of websites that can be browsed by clicking on individual fonds and going to the level of records (53.33%). PDF files are used half as frequently. Mention should also be made of electronic inventories with digital reproductions of archival units for selected fonds stored in the Landesarchiv Baden-Württemberg[387]. So far, 12 inventories with digitized items that can be viewed in a separate portal offering functions such as the enlargement of an entire item or its fragment and the ability to change resolution, brightness or quality, have been made available.

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[387] List of hybrid fonds [access: 13.11.2009]: https://www2.landesarchiv-bw.de/ofs21/olb/findbuecher.php?archiv=5&bilder=1, https://www2.landesarchiv-bw.de/ofs21/olf/ergebnis1.php
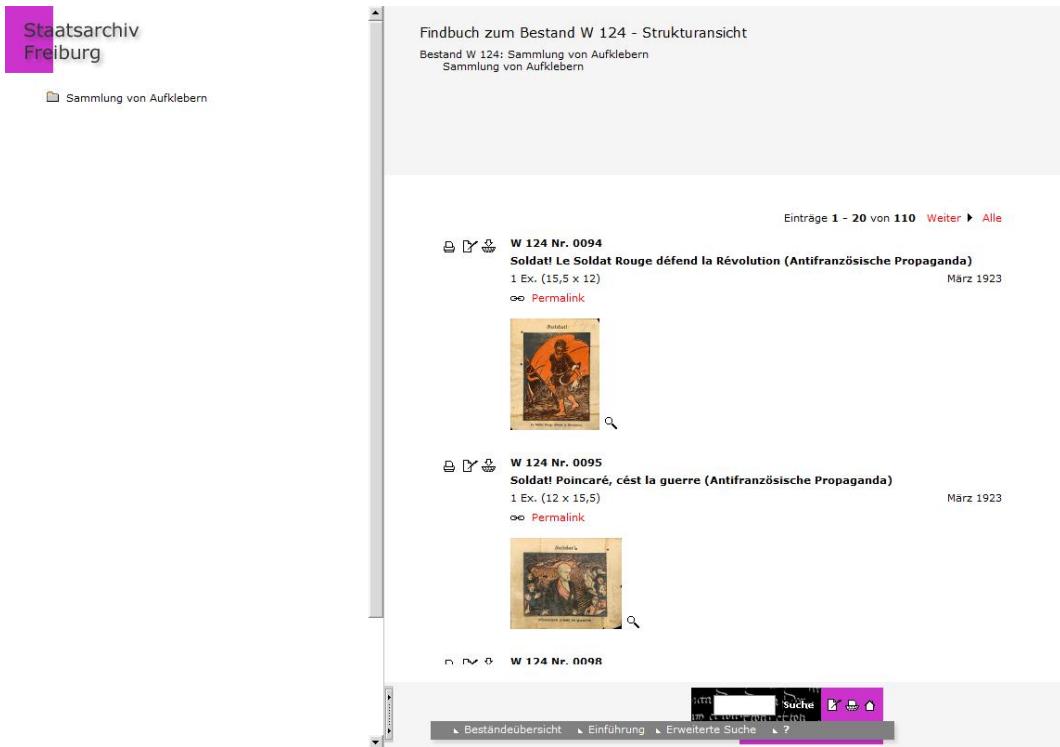
Screenshot 5 Example of an inventory of W124 Stickets Collections (*Sammlung von Aufklebern*), Landesarchiv Baden-Württemberg in Freiburg, [access: 13.11.2009], https://www2.landesarchiv-bw.de/ofs21/olf/struktur.php?bestand=10601&klassi=&anzeigeKlassi=001

One can observe that websites of German state archives usually offer basic information for their potential new users, as they contain mainly contact details and information on the institution and its activity. The most important problem is the lack or shortage of information on holdings, particularly on published inventories. The website of the Landesarchiv Baden-Württemberg can be currently recognized as the best in terms of structure, easy navigation, content and inventories[388].

5.1.2. Websites of the Bundesarchiv

Both Bundesarchiv and almost every *Landesarchiv* has one website common for all its branches[389]. This allows them to maintain proper standards related to the quality and public relations policy. In the case of Bundesarchiv, three different versions of the website used during the last 20 years can be analysed.

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[388] More information on selected websites of state archives can be found in D. Brendel, *Neue Homepage des Staatsarchivs Marburg*, „Archivar" 2004, 2, pp. 141-142; M. Klein, op. cit., pp. 236-238.
[389] Excluding Mecklenburg-Vorpommern.

Bundesarchiv's website was the first to present a German archives in the virtual space and it can be found in the Internet Archive[390]. The first version[391], dated February 1998, is the the earliest one available[392]. It has a very simple structure and design – a grey background, black text and blue buttons with white letters. The heading contains the archives' name and the statement that it is an official website of this institution. In the middle is a clear and easy to navigate menu divided into six parts: general information (history, use, archival act); branches (opening hours and contact details); holdings (lists of fonds, collections and personal papers with a simple search engine enabling search by reference code, fonds name, storage place and date range); publications by the archives and in cooperation (a search engine enables searching by author/publisher, volume, title, description, year and ISBN number); calendar of events; and e-mail address. As one can see, it was a typical informative and administrative website[393].

Screenshot 6 Bundesarchiv's website (first version) from 14.01.1998 preserved by the Internet Archive, [access: 12.08.2012], http://web.archive.org/web/19980114085711/http://bundesarchiv.de/

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[390] The Internet Archive, a non-profit organization, maintains an archive of websites, the Wayback Machine: http://archive.org/web/web.php.
[391] The copy of the website in the Internet Archives' Wayback Machine may not be the oldest one. The system that harvests the websites is not designed to take snapshots of the website when it is updated or introduces new layout; it only does so from time to time.
[392] The Bundesarchiv first appeared on the Internet in 1996.
H. Krajewska, op. cit., p. 156.
[393] Unfortunately, not all elements work in the preserved version. During the study, the use of search engines which displayed results, but did not match the criteria specified in the query, was most problematic.

As found in the Internet Archives' Wayback Machine, the website dated in the middle of 2003 seems to be the earliest of the second version preserved. It contained much more information and was more visually pleasing than the previous one. The central part of the home page of the Bundesarchiv contained information divided into thematic groups: search aids (databases) and projects, news, meetings, exhibitions and job offers. Navigation was based on using a menu located in the upper part and on the left (news, tasks, fonds and finding aids, use, services and contacts), directing to various thematic sections, and of function buttons (search engine, home page, site map, webmaster, impressum, printing), located under hyperlinks. The division of a menu bar into sections enabled quick finding of searched information. Clicking the 'News' (*Aktuelles*) tab caused the display of further sections on the left: from the archives (for example, periodic electronic exhibitions on a selected subject, periodical: *Mitteilungen aus dem Bundesarchiv*), specialist information (for example strategies), projects, new publications, press news, the construction (of a new facility of the Bundesarchiv in Berlin), exhibitions (organized in the Bundesarchiv), meetings and job offers. The left menu was grouped in a similar way:

- 'News': press news, job offers, specialist information, cultural events, from the archives, projects, new publications and meetings[394];

- 'Tasks and organization': tasks, history, organization, branches and offices, places where Bundesarchiv's facilities are located[395];

- 'Fonds and finding aids: photo archives, news concerning fonds and processing, a book in memory of persecuted Jews, source editions, personal files, library catalogue – this tab contained also a link to ARGUS inventory search engine (ARchivGUt-Suche) [396];

- 'Use': general advice, visit at the archives, questions and queries, legal grounds, research, archival training courses, studies on the DDR[397];

- 'Service/services': publications, consultancy for offices, ARK, education, links, FAQ[398];

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[394] *Aktuelles* [online], [access: 29.10.2009], http://www.bundesarchiv.de/aktuelles/index.html.
[395] *Aufgaben & Organisation* [online], [access: 29.10.2009], http://www.bundesarchiv.de/aufgaben_organisation/index.html.
[396] *Bestände & Findmittel* [online], [access: 29.10.2009], http://www.bundesarchiv.de/bestaende_findmittel/index.html; E. Dolatowski, K. John, A. Menne-Haritz, *ARGUS – die Entwicklung der archivischen Rechercheplattform und Erfahrungen mit ihrer Nutzung*, „Mitteilungen aus dem Bundesarchiv" 2009, 1, http://www.bundesarchiv.de/imperia/md/content/bundesarchiv_de/oeffentlichkeitsarbeit/fach-publikationen/mitteilungenausdembundesarchiv/mitteilungen_1_2009.pdf, pp. 15-21.
[397] *Benutzung* [online], [access: 29.10.2009], http://www.bundesarchiv.de/benutzung/index.html.
[398] *Service* [online], [access: 29.10.2009], http://www.bundesarchiv.de/service/index.html.

- 'Contact': contact form and information on possible forms of contact with the archives[399].

As one can see, Bundesarchiv's website (second version) contained detailed information on all the most important issues, from the preparation of the first visit, through research, to strategies pursued by the archives. This website design enabled the users to find in-depth information. A division into sections corresponded to various areas of interest. The first thematic group provided information on the latest achievements and events at the archives – also those related to data update. The second group described the functioning of the archives as an institution – its tasks and structure as well as the location of individual branches. The third part, just as the fourth one, was intended especially for the users of archives. One could find there search engines enabling the search of databases containing information on records, personal papers and digitized photographs. There was also the option for using lists of fonds – series and sub-series appeared after clicking on them. Moreover, they included information on critical editions published by the archives. The fifth thematic group was mainly intended for offices and other archival institutions cooperating with the Bundesarchiv, as it contained information on services offered to them. The sixth section was used for contact purposes[400].
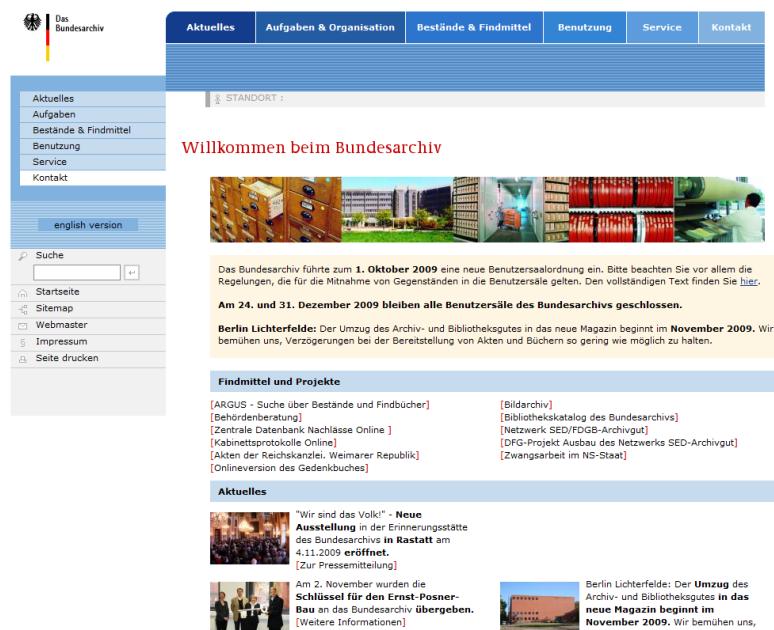
Screenshot 7 Bundesarchiv's website (second version), [access: 5.11.2009], www.bundesarchiv.de

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[399] *Kontakt* [online], [access: 29.10.2009], http://www.bundesarchiv.de/kontakt/index.html.
[400] P. Ławniczak, op. cit., pp. 204-206.

The third version of the website, from the first half of 2011, has a yet different structure. The archives departed from a typically informative and administrative concept for a research portal, in which elements important for users, that is, search engines and information on the archives' cultural and research events, are highlighted. A section on the archives' activity and structure was placed deeper. The new website has an upper navigation panel, which contains the following tabs: 'Archival Research'; 'Use'; 'Consultancy'; 'Public Relations' (*Öffentlichkeitsarbeit*); 'Specialist information'; and 'Contact. The first is presented in full on the home page, so that one can begin one's research right away, choosing an appropriate search engine or thematic web portal, or navigate according to the chronology or division by types of records (official forms, library, photographs and posters, films, maps, plans and technical documentation, military bodies and organization, personal papers, personal records, collections). Other tabs have also been divided into narrower areas: 'Use' – opening hours, tips, reprographic services and research; 'Consultancy' – for public administration, private individuals, associations, institutions and companies, transferring films and the army; 'Public Relations' – news, events, galleries, archival education, publications, source editions, press; 'Specialist Information' – search engine enabling the search of articles by indices; 'About Us' – organization, branches, tasks, mission, legal grounds, history, profession and career, education. The central part of the website contains the latest news. The right side is divided into: galleries; events; archival education; preparation for visiting the archives (opening hours, tips, reprographic services and research); profession and career (job offers, education, traineeship); and Bundesarchiv (tasks, organization, branches).

Screenshot 8 Bundesarchiv's website (third version), [access: 13.10.2011], www.bundesarchiv.de

As one can observe, the analysis of the three website versions shows the change of not only the information presentation technique, but also the trends of image building on the Internet. The Bundesarchiv's website has developed into a vortal, enabling research based on the analysis of available information on records and the improvement of specialist knowledge. It can be recognized as one of the best prepared websites not only in terms of the content published, but also in its clarity and user-friendliness, thanks to its relatively intuitive navigation.

5.2. Archival portals

Vertical archival portals, known as vortals, are websites offering information on a given area. Only those related to archival records have been analysed for the purposes of this study. Their main purpose is to present information on archival records and sometimes reproductions. Just like websites, they fulfil informative functions for a narrowly defined user group. They are mainly characterized by functionality, which facilitates their use and ensures user satisfaction, and depend on three factors: website design; specificity of the contents and information architecture. Vortals should be adjusted to the needs of advanced users as well as inexperienced ones. An efficient, accurate and quick search engine is very important for their effectiveness. The remaining aspects of web portal design are the same as those of traditional websites. Among other important functions is the integration of dispersed information suppliers, which is especially important from the point of view of archives' customers, as it enables them to search holdings of various archives in one place. More and more vortals of cultural institutions offer additional mechanisms, such as the generation of notes so that users know how to refer to sources they use in their work. Web 2.0 solutions are rarely used, because of the cost and size of portals[401].

According to the Fraunhofer IAIS, the creation of common platforms provides the possibility of developing professional services of the best quality and even long-term management of produced scans. It is particularly important for archives that would find it difficult to carry out such an undertaking on their own. Building common platforms requires standardi-

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[401] W. Reininghaus, F. M. Bischoff, *Archive…*, op. cit., pp. 411-412; K. Piądłowski, *Portale internetowe*, Warsaw 2006, pp. 14-27; *Functional specification for the Europeana Danube release. Europeana v1.0*, edition D3.2, 2010, [access: 13.12.2012], http://group.europeana.eu/c/document_library/get_file?uuid=42fdf604-8bd7-4fe4-8d3e-36cce6fcad65&groupId=10602, pp. 10-18; B. Matusiak, op. cit., pp. 493-494; K. Olszówka, *Personalizacja portali internetowych*, in *Strategie i modele gospodarki elektronicznej*, eds. C. M. Olszak, E. Ziemba, Warsaw 2007, p. 377; B. Martin-Weber, *Access…*, op. cit., p. 121; J. Sobotta, *Archivportal*, in *Terminologie…*, op. cit., [access: 13.12.2012].

zation of as many areas as possible, particularly in relation to metadata. It is only recently that archives have realized how important standards are. The approach proposed by the Fraunhofer IAIS could be very siginificant, especially from a financial point of view, since the establishment of central platforms and the departure from individual ones should reduce the costs of their maintenance. Maybe this idea will win more supporters in the future. The development of high-quality portals would also be of great value for users, who will be able to easily find the information they are searching for in one place[402].

The Fraunhofer IAIS concept seems to be the most appropriate, but this study has found that in reality there is little evidence of any tendency towards is adoption yet either in Germany nor in Europe. Europeana and Archives Portal Europe are also interesting, but their purpose is not to assume any responsibility for data entrusted to them, but only to present those data.

The following part of this section of this chapter presents the diversity of websites of state and federal archives in Germany, operating at the level of a state, a nation and the world. They have been grouped according to the archives that was the main creator or contractor, or to the range of a project.

5.2.1. State portals

State archival portals started to appear at the beginning of the 21st century, as W. Dippert pointed out in a paper on archival inventories on the Internet. Initially, they served as electronic versions of guides to archives, of which Dippert presents the example of the Bavarian Archives Portal launched in 2003[403]. He claimed that it did not use the entire potential associated with this medium. Over the next few years, websites started to become more and more professional working tools for their users[404].

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[402] *Bestandsaufnahme…*, op. cit., p. 99.

[403] *Bayerisches Archivportal eröffnet*, „Nachrichten aus den Staatlichen Archiven Bayerns" 2003, 47, [access: 6.12.2009], www.gda.bayern.de/publikationen/nachrichten/pdf/heft_47.pdf, p. 3; http://www.bundesarchiv.de/sed-fdgb-netzwerk/benutzung.html.
For more see: *Aufbau eines Archivportals* [online], [access: 6.12.2009], http://www.bundesarchiv.de/aktuelles/fachinformation/00049/index.html (informational meeting at the Bundesarchive 11th May 2006); *Ausbau des "Netzwerk SED-Archivgut" zu einer Referenzanwendung für ein Archivportal D* [online], [access: 6.12.2009], http://www.staff.uni-marburg.de/~mennehar/sedportal/Projekt%20Netzwerk%20SED-Archivgut.html (informational meeting at the Bundesarchive 10th July 2007).

[404] B. Martin-Weber, *Access…*, op. cit., p. 121; W. Dippert, *Das Portal „Archive in Bayern'' und Webauftritte kommunaler Archive* [online], 23.02.2005, [access: 16.11.2009], http://www.gda.bayern.de/findm.htm (conference paper: *Archivische Findmittel im Internet*).
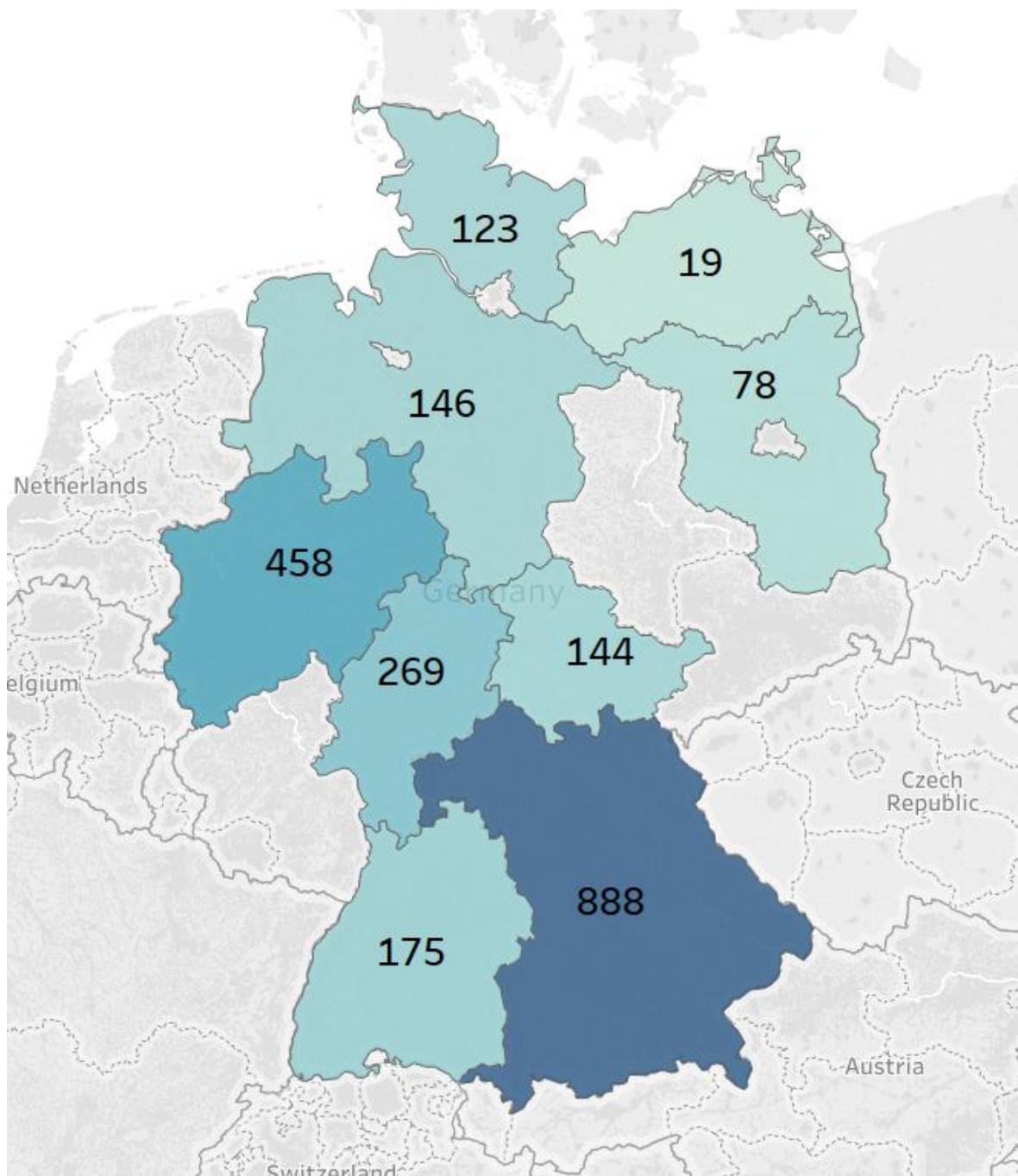
Map 1 Map of Germany with numbers of archives in each *land*, compiled from data on existing archives portals [access: 17.03.2009]

Land / Archives type	Baden-Württemberg	Bavaria	Brandenburg	Hesse	Mecklenburg-Vorpommern	Lower Saxony	North Rhine-Westphalia	Schleswig-Holstein	Thuringia	Total
National archives	10	11	4	3	2	8	4	0	6	**48**
Municipal archives	126	472	66	183	14	113	400	111	94	**1579**
Church archives	6	72	2	4	2	10	14	2	8	**120**
Archives of companies	8	7	0	16	0	1	13	0	7	**52**
Private and family archives	3	240	0	15	0	0	7	0	0	**265**
Parliament, party, organisation archives	1	6	0	0	0	2	6	3	1	**19**
Media archives	1	18	1	19	0	7	3	0	4	**53**
Archives of universities and scientific institutions	20	62	5	29	1	5	11	7	24	**164**
Total	**175**	**888**	**78**	**269**	**19**	**146**	**458**	**123**	**144**	**2300**

Table 9 Amount of archives in each land, compiled form data on existing archives portals [access: 17.03.2009] [405]

[405] There is no data included here for Berlin, Rhineland-Palatinate, Saarland and four other *land*s that did not have portals at the time of this research.

In 2009, there were 11 state archival portals. Rhineland-Palatinate and Saarland had a common portal. Four *land*s, Bremen, Hamburg, Saxony and Saxony-Anhalt, did not have portals. The portals contained information on about 2,300 archives and their records. The quality of published information was varied. The German archival environment is considered as the largest one in the world[406].

The purpose of a portal is to provide a common area for all archives from a given *land*, to facilitate access to information on records, and to encourage the retroconversion of paper archival aids. Use of the portal is free of charge for participating institutions, although there are costs associated with the administration of a portal; each particular archives covers the costs of the preparation of its information, uploading it to the portal, updating and Internet access.

The users of services provided by archival portals may find information at various levels of detail in the portals. There are two types of websites, the first of which contains only contact details of an institution and short information on holdings. These are websites whose administrators have not progressed beyond the initial phase of the development of portals. The second type enables detailed browsing of inventories of individual archives (Bavaria, Hesse, North Rhine-Westphalia, Saxony, Rhineland-Palatinate and Saarland).

Based on the analysis of information architecture of all portals, a model description of an archives has been prepared. The percentage of the use of each criterion is provided in brackets[407]:

- photograph presenting the archives' building (36.36%);
- short description of the archives (27.27%);
- methods of contacting the archives, for instance: address, phone, fax, e-mail, website (90.91%);
- information on the use of the archives, for example: opening hours, how to get to the archives, registration, available equipment (e.g. photocopiers, laptops), ordering, rules of the reading room, service price list (90.91%);
- area of responsibility (36.36%);
- description of archival and library holdings (90.91%);
- literature about the archives (81.82%);
- gallery of selected digitized records (18.18%).

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[406] T. Klüttig et al, *Die deutschen Archive…*, op. cit., p. 28.
[407] The first two elements usually occur on a page concerning a particular archives, and the remaining criteria are covered in tabs linked with the opening home page.

	Baden-Württemberg	Bavaria	Berlin	Brandenburg	Hesse	Mecklenburg-Vorpommern	Lower Saxony	North Rhine-Westphalia	Rhineland-Palatinate /Saarland	Schleswig-Holstein	Thuringia	Total	%
Archives' picture	1	0	0	0	0	0	0	1	0	1	1	4	36,36
Archives' description	0	0	0	0	0	0	1	1	0	1	0	3	27,27
Contact	1	1	1	1	1	0	1	1	1	1	1	10	90,91
Use	1	1	1	1	1	0	1	1	1	1	1	10	90,91
Territory of the archives' responsibility	1	1	0	0	0	0	0	1	1	0	0	4	36,36
About archives' and library holdings	1	1	1	1	1	0	1	1	1	1	1	10	90,91
Literature about the archives	1	1	1	1	1	0	1	1	1	0	1	9	81,82
Gallery of digitized objects	1	0	0	0	0	0	0	1	0	0	0	2	18,18

Table 10 Website structure by land portal [access: 17.03.2009]

The model is used mainly in the portals of Baden-Württemberg, Lower Saxony, North Rhine-Westphalia and Rhineland-Palatinate and Saarland. The information these portals offer is content-rich, which makes them valuable for users. Other portals use only half of the mentioned elements.
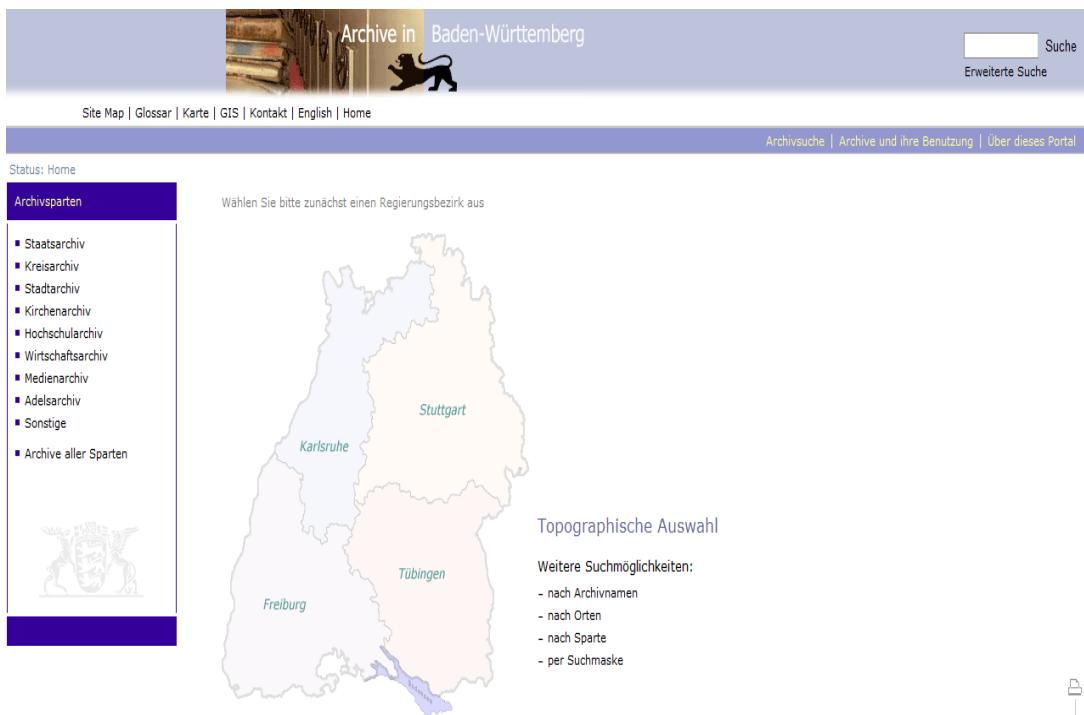
Screenshot 9 Archives portal: Archive in Baden-Württemberg, [access: 18.11.2009], www.archive-bw.de

All archives using the archives portal Archive in Baden-Württemberg present the same elements; they only differ in the extent to which they offer additional content. Some archives provide access to very detailed information, while others, unfortunately, present only basic information which does not always enable accurate assessment of records without visiting the archives.

The navigation panel on the portals examined in this study is arranged horizontally and, in half of all cases (45.45%), it has been placed at the top and bottom of a page. More than a quarter of portals have an upper panel (27.27%), and the same percentage have a lower panel of tabs (27.27%)[408]. Generally, descriptions of records are placed directly on the website of a particular archives. Websites that have subjects presented on separate pages are clearer, as they redirect to selected sections. However, individual issues are sometimes discussed

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[408] Portals with an upper and lower panel: Baden-Württemberg, Brandenburg, North Rhine-Westphalia, Rhineland-Palatinate and Thuringia. Portals with an upper panel: Bavaria, Berlin and Lower Saxony. Portals with a lower panel: Hesse, Mecklenburg-Vorpommern and Schleswig-Holstein.

on a single page and are only linked to a navigation panel that allows the user to jump to individual fragments.

As far as the quality of published information is concerned, the portal of Schleswig-Holstein is the poorest. Descriptions of records are presented as continuous text. Individual issues are not divided into separate areas within one page or into sub-pages. There is no description of the institution and its fonds, which would enable the user to learn about its specific contents. A description of the municipal archives in Brunstorf is a good example: 'Brunstorf archives holds records of a small place near Schwarzenbek. They cover around 400 units from the years 1900-1960'[409]. Additional information concerning the possibility of using records and the address is given below. There is really no data concerning holdings, even valuable ones, other than the information on their volume and time range. The users, faced with the description presented on the website, must contact the archives directly to obtain the information they require.

Das **Gemeindearchiv Brunstorf** enthält die Überlieferung einer kleinen Gemeinde bei Schwarzenbek, die ca. 400 Nummern und den Zeitraum 1900 bis 1960 umfaßt.

Gemeindearchiv Brunstorf, c/o Amt Schwarzenbek-Land, Gülzower Straße 1, 21493 Schwarzenbek, Telefon 04151/3903; Zugangsmöglichkeit nach Vereinbarung

Allgemeines
Veranstaltungen
Archivstandorte
Landesarchiv Schl.-H.
kommunale Archive
kirchliche Archive
weitere Archive

Screenshot 10 Archives portal: Schleswig-Holstein with the description of the holdings of the Archives in Brunstorf, [access: 17.03.2009], http://www.archive.schleswig-holstein.de/kreis_hzgt/gabrunst.html

Information on events organized by individual archives or on publications is also an important part of web portals but not in Germany.

In analysing the contents of websites, it is hard to assess the accuracy of published information. However, it is assumed that no institution would intentionally provide incorrect information, although information could be out-of-date or incomplete for various reasons, incuding those arising form formal and legal or personnel and financial issues.

Portals offer the possibility of searching, via a navigation tree, by type of archives (such as church archives (not available in Berlin and North Rhine-Westphalia portals)), by name

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[409] About the holdings of the Archives in Brunstorf, [access: 17.03.2009], http://www.archive.schleswig-holstein.de/kreis_hzgt/gabrunst.html.

of archives (except in the Brandenburg, North Rhine-Westphalia, Schleswig-Holstein and Thuringia portals), via an interactive map, by clicking on a given region, district, town or village (offered by Baden-Württemberg, Bavaria and Lower Saxony portals), or using a search engine into which any term can be entered.

Finding aids that can be used on portals have also been analysed in this study. Archives publish two kinds of information on their holdings: complete inventories and/or short notes describing them. Entire inventories, some with an introduction, are only published by some of the archives accessible through portals in Lower Saxony, Hesse, Mecklenburg-Vorpommern and North Rhine-Westphalia. More than 60% of the remaining portals publish only very basic information.

The search options on the four portals that provide access to inventories are noteworthy. Their search engines enable simple search for any topic. The user can encounter difficulties, as without knowing what keywords have been used in the descriptions, they will not be able to find the searched records easily. Usually two levels of searching are provided – a simple search that allows a user to search the contents of description fields concerning a particular unit, and an advanced search that allows a user to enter combinations of several words and/or to limit the scope of their search, for example, to one archives only or to a selection of archives, or by date range, or by location range. It may also be possible to search for archival units using their reference code, but this function is likely to be used rarely, as materials are searched for this way only when their name or the fonds in which they are located are not known.

Archival portals of Baden-Württemberg and Mecklenburg-Vorpommern have enabled archives to publish examples of digitized records according to their own criteria. However, they do not look like platforms that could become portals in the near future, such as Archives Portal Europe, or digital repositories of digitized objects that can be used by users. Another function that is noteworthy is a forum on the portal of Bavaria, although no new posts have been published on it for several years before this part of the study was completed in 2009. Some portals, such as Baden-Württemberg, offer the possibility of logging in and requesting archival units online. Sometimes there is also information on the portal, its idea and purposes for which it was created. Novice researchers can occasionally find tabs related to the organization of research.

In conclusion, archival portals are places where one can find basic information on archives from a given region and sometimes on their holdings. Progressing informatization and retroconversion of finding aids should contribute to the development of these portals in the future in terms of the number of archival inventories made available through them. The functionality of these portals is not yet very well-developed. They are usually easy to use,

but this is not because they have structures that are well-thought-out, but rather because they are not very elaborate. Users are only offered elementary navigation based on hyperlinks or search engines. They have no functions that enable any more sophisticated adjustment of searches and options for saving search results. The portals do not even offer the possibility of printing prepared order forms. Few of them allow users to order records and book a visit directly. It is hard to say how these portals will expand, as at the time of this study a certain stagnation was observed. No new functions have been added since their creation. Furthermore, one cannot predict whether they will be developed, since a German nationwide archival portal is being developed, and other initiatives, such as the Deutsche Digitale Bibliothek, are also in preparation[410].

5.2.2. Federal portals

The Bundesarchiv creates and co-creates numerous online offerings. In the years 2009-2011, there were as many as nine websites:

1. Zwangsarbeit im NS-Staat (Forced Labour in Nazi Germany)[411],

2. Zentrale Datenbank Nachlässe (Central Database for Personal Papers)[412],

3. Digitales Bildarchiv (Digital Photo Archives)[413],

4. Archivgut der Sozialistischen Einheitspartei Deutschlands, SED und des Freien Deutschen Gewerkschaftsbundes (FDGB) (Records of the Socialist Unity Party of Germany and the Free German Trade Union Federation)[414],

5. DFG–Projekt: Ausbau des Netzwerks SED-/FDGB-Archivgut zu einer Referenzanwendung für ein Archivportal Deutschland (DFG-Project: Construction of the SUP/FGTUF Archival Holdings Network as an Example for the German Archival Portal)[415],

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[410] More information about selected portals: F. M. Bischoff, *Erweiterungen des Internet-Informationssystems der Archive in Nordrhein-Westfalen*, „Der Archivar" 2002, 1, p. 41; K. E. Lupprian, *Bayerisches Archivportal eröffnet*, „Der Archivar" 2004, 2, [access: 22.02.2013], http://www.archive.nrw.de/archivar/hefte/2004/Archivar_2004-2.pdf, p. 141; M. Wiech, *Neues Internetportal* „Archive in NRW" online, „Der Archivar" 2007, 3, pp. 248-250; P. Graf, *„Archivportal Niedersachsen" eröffnet*, „Der Archivar" 2007, 4, pp. 349-351.
[411] http://www.bundesarchiv.de/zwangsarbeit/
[412] http://www.bundesarchiv.de/zwangsarbeit/
[413] http://www.bild.bundesarchiv.de/
[414] http://www.bundesarchiv.de/sed-fdgb-netzwerk/
[415] http://www.archivgut-online.de/

6. Gedenkbuch Opfer der Verfolgung der Juden unter der nationalsozialistischen Gewaltherrschaft in Deutschland 1933-1945 (The Memorial Book for the Victims of the Persecution of Jews in Germany 1933-1945)[416],

7. Online-Version der Edition Akten der Reichskanzlei Weimarer Republik (Online Version of the Publication – Documents of the Chancellery of the Weimar Republic)[417],

8. (Online-Version der Edition „Die Kabinettsprotokolle der Bundesregierung (Online Version of the Publication – Minutes of the Cabinets of the Federal Government")[418],

9. Digitalisiertes Archivgut in Online-Findbüchern <daofind> (Digitized Archival Holdings in Online Inventories)[419].

The Zwangsarbeit im NS-Staat vortal which came into existence between 1 April 2007 and 31 March 2009, was developed with the support of the Erinnerung, Verantwortung und Zukunft (Remembrance, Responsibility and Future) foundation. As presenting the archives of the organizing institution, it gathers various archives from Germany and Europe[420]. This project is intended mainly for all persons who experienced forced labour, their families and researchers studying this subject area[421].

Screenshot 11 Main page of the vortal: Forced Labour in Nazi Germany, [access: 12.08.2012], http://www.bundesarchiv.de/zwangsarbeit/

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[416] http://www.bundesarchiv.de/gedenkbuch/index.html
[417] http://www.bundesarchiv.de/aktenreichskanzlei/1919-1933/0000/index.html
[418] http://www.bundesarchiv.de/cocoon/barch/0000/index.html
[419] www.daofind.de
[420] Archives of Lithuania, Latvia, Estonia, Czech, Austrian, Polish, Ukraine, Russia, the Netherlands, Belgium and France.
[421] K. Kühnel, *Das Informationsportal „Zwangsarbeit im NS-Staat" als Folgeprojekt der Nachweisbeschaffung für ehemalige NS-Zwangsarbeiter/innen*, „Mitteilungen aus dem Bundesarchiv" 2008, 1, [access: 7.12.2009], http://www.bundesarchiv.de/imperia/md/content/abteilungen/abtg/mitteilungen1_08/digitales_bildarchiv.pdf.

The navigation menu has been divided into the following sections: fonds (*Ar-chivbestände*), list of detention places (*Haftstättenverzeichnis*), literature (*Literatur*), history (*Geschichte*), indemnities (*Leistungen*), documents (*Dokumente*) and links (*Links*). One can search fonds by selecting a project partner on the map of Europe or through a search engine by three criteria: search term, place, and type of institution storing records. When using the map, after clicking on a flag symbolising the archives, a window with the name of the archive is displayed, together with the results of the search for interviews with forced labourers from another portal dedicated to this subject area[422]. Pages on the archives' websites contain information such as address, area of activity, information on holdings (type of archival materials, fonds, dates) and finding aids (paper and online inventories). Unfortunately, it is not possible to search for particular archival materials. It seems that users usually start by searching for information on particular sources and then by place of storage. Another section of the portal contains a list of 3,800 camps and places where forced labourers were held. As in the case of fonds, one can use a search engine using the following criteria: search term, place, country, camp type, camp name, place in the years 1939-1945, region within that date range, and sex; or to select them from a list or a map. As with the archives search described above, the name of a camp appears after clicking on a flag that represents it; once selected, a page is displayed with the following information: camp, location, map, use, related camps, sources and literature, and contact. The 'Literature' tab contains a bibliography of 2,200 publications related to this topic and links to the catalogues of libraries[423]. Another tab leads to historical informa-tion, covering topics related to the economic development of Germany before and after the First World War, to the hiring of forced labourers and their experiences immediately after the Second World War. The purpose of these texts is mainly informative and not typically academic. In another section of the portal, one can become familiar with the issue of indemnities paid

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[422] Zwangsarbeit 1939-1945 digital archives, created by Erinnerung, Verantwortung und Zukunft, Freie Universität Berlin and Deutsches Historisches Museum, in which around 600 interviews with forced labourers have been collected: http://www.zwangsarbeit-archiv.de.

[423] Available catalogues:

- Bibliographie zur Zwangsarbeit im NS-Staat: Bundesarchiv Berlin-Lichterfelde, Dokumentationszentrum NS-Zwangsarbeit Berlin-Schöneweide, Zeitschriftenauswertung der Bibliothek der Stiftung Topographie des Terrors;
- Virtuelle Fachbibliothek Osteuropa (vifaost): Bayerische Staatsbibliothek, Herder-Institut, LMU/Historisches Seminar, Abteilung für Geschichte Ost- und Südosteuropas, Institut für Ost- und Südosteuropaforschung (before: Osteuropa-Institut München/Regensburg), Niedersächsische Staats- und Universitätsbibliothek Göttingen;
- Gemeinsamer Katalog der Arbeitsgemeinschaft der Gedenkstättenbibliotheken: Aktives Museum Faschismus und Widerstand in Berlin e.V., Anne-Frank-Shoah-Bibliothek (Lipsk), Deutsche Nationalbibliothek, Gedenk- und Bildungsstätte Haus der Wannsee-Konferenz (Berlin), Gedenkstätte Deutscher Widerstand (Berlin), Stiftung Neue Synagoge Berlin – Centrum Judaicum, Stiftung Topographie des Terrors (Berlin).

by the government of the BRD. In the 'Records' tab, a collection of 16 photographs presenting forced labourers from Bundesarchiv's collection was also published. There are also links to other websites and portals dedicated to this subject area.

The Zentrale Datenbank Nachlässe was established in 2002. It is an online database, which began development in 1992. It was based on the work of W. Mommsen, who gathered information about the personal papers of 7,000 outstanding Germans (politicians, scientists, columnists, artists, public persons) and where they are held[424], as well as surveys sent out to German and foreign archives. This database covers more than 25,000 records from over 1,000 institutions. It is regularly updated by entities involved in the project. It has also been combined with the Kalliope online catalogue[425], under the oversight of the Staatsbibliothek zu Berlin and collects records related to personal papers and autographs[426].

Searching is not limited to the use of an alphabetical list of personal papers or institutions, but is also possibly by people's names, pseudonyms, institutions, biographies, contents of the fonds, place of birth, date ranges, correspondence partners, descriptions of the contents of personal papers, and keywords[427].

The Digitales Bildarchiv (DBA) project, which was made available on the Internet on 11 September 2007, is also noteworthy. On the first day, the website had six million visits, including 170 people who registered as users. Thanks to cooperation with external companies, Digital Collections and comm-X, the partners managed to create a portal that allowes users not only to view photographs, but also to order them by one click of a mouse. Work on this project was done between 2003 and 2005[428]. In the first two years of the archives' existence, several new digital collections appeared. However, not all scanned collections have ever been

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[424] W. A. Mommsen, *Die Nachlässe in den deutschen Archiven*, v. 1-2, series: Schriften des Bundesarchivs 17/I und 17/II. Boppard: Boldt, 1971, 1983, 1076 p.

[425] http://www.kalliope-portal.de/

[426] B. Martin-Weber, *Access…*, op. cit., pp. 120-121; *Das Bundesarchiv, Zentrale Datenbank Nachlässe (ZDN)*, in *Tätigkeitsbericht 2005/2006, Wissen bereitstellen. Quellen erschließen. Geschichtsverständnis fördern*, [access: 10.01.2010], http://www.bundesarchiv.de/imperia/md/content/stab/taetigkeitsbericht2005_06.pdf, p. 47; W. Buchmann, M. Hollmann, op. cit., pp. 323-329, 334-336.

[427] W. Buchmann, M. Hollmann, op. cit., pp. 329-336.

[428] *Freischaltung des Digitalen Bildarchivs* [online], [access: 7.12.2009], http://www.bundesarchiv.de/aufgaben_organisation/abteilungen/bundesrepublik/audiovisuell/01197/index.html; H. Schäfer, M. Salewski, *Präsentation des Digitalen Bildarchivs des Bundesarchivs am 11. September 2007*, „Mitteilungen aus dem Bundesarchiv" 2008, 1, [access: 7.12.2009], http://www.bundesarchiv.de/imperia/md/content/abteilungen/abtg/mitteilungen1_08/digitales_bildarchiv.pdf; B. Pistora, *Der Einsatz der Bilddatenbank DC 5 im Bundesarchiv*, „Mitteilungen aus dem Bundesarchiv" 2005, 1, [access: 7.12.2009], http://www.bundesarchiv.de/imperia/md/content/abteilungen/abtg/mitteilungen1-05/mitteilungen2005-1_bilddatenbank.pdf, p. 25; *Das Bundesarchiv, Bilddatenbank*, in *Tätigkeitsbericht 2005/2006, Wissen bereitstellen. Quellen erschließen. Geschichtsverständnis fördern*, [access: 10.01.2010], http://www.bundesarchiv.de/imperia/md/content/stab/taetigkeitsbericht2005_06.pdf, p. 22; O. Sander, *Das Digitale Bildarchiv des Bundesarchivs*, „Archivar" 2008, 1, [access: 22.02.2013], http://www.archive.nrw.de/archivar/hefte/ausgabe1/Archivar_2008-1.pdf, pp. 20-25.

available simultaneously. One could find on the Internet collections of photographs by, among others, M. Beier[429] (N 1648 *Bild Sammlung Beier*), M. Skladanowsky[430] (N 1435 *Bild Max Skladanowsky*), and A-B-C Photo Agency (Bild 102 *Die Fotoagentur A-B-C*). At the end of 2009, the photo database contained more than 200,000 items[431].

Screenshot 12 Main page of the project: Digitales Bildarchiv Bundesarchiv [access: 10.01.2010], http://www.bild.bundesarchiv.de

Users registered on the portal can add items to favourites in the 'Light Table' (*Leucht-tisch*) tab. Internet collections are changed from time to time, with newly imported photographs presented under a Newly imported photographs (*Neu importierte Bilder*) link[432].

One can search for holdings without logging in, and the scope of search can be limited using a simple search (*Volltextsuche*) or advanced search (*Erweiterte Suche*) search that allows

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[429] Beier (1927–2002) was an amateur photographer who documented Berlin after the Second World War and everyday life in the DDR, particularly of his family.

[430] Skladanowsky (1863–1939) was the first to show a film publicly in Europe, on 1 November 1895 at Varieté Wintergarten in Berlin. He was an inventor in the area of cinematography, inventing, for example, the Bioscop projector.

[431] Compare: A. Sobczak, *Bundesarchiv – największa sieć archiwalna w Niemczech*, „Archiwista Polski" 2008, 3, pp. 67-76; idem, *Archiwa polskie i niemieckie przez pryzmat różnic i podobieństw*, in *My i obcy. Wzajemne postrzeganie*, eds. P. E. Serwońska, W. Stępiński, Toruń 2012, pp. 49-64.

[432] O. Sander, *Abschluss des Digitalisierungsprojekts Bild 183 Allgemeiner Deutscher Nachrichtendienst-Zentralbild. Ein selbstkritischer Bericht zum Projektmanagement*, „Mitteilungen aus dem Bundesarchiv" 2007, 1, [access: 13.09.2012], http://www.bundesarchiv.de/imperia/md/content/bundesarchiv_de/oeffentlichkeitsarbeit/fach-publikationen/mitteilungenausdembundesarchiv/heft_1-2007__15._jahrgang.pdf; idem, *Kooperation des Bundespresseamts und des Bundesarchivs im Rahmen des „Digitalen Bildarchivs"*, „Mitteilungen aus dem Bundesarchiv" 2008, 2, [access: 13.09.2012], http://www.bundesarchiv.de/imperia/md/content/bundesarchiv_de/imperia/md/content/bundesarchiv_de/oeffentlichkeitsarbeit/fach-publikationen/mitteilungenausdembundesarchiv/mittbarch_heft_2-2008__16._jahrgang.pdf.

the selection of terms related to a subject area, personal data or place. It is possible to download high-resolution photographs without a watermark, for which a fee is charged and paid by bank transfer or a debit card. There is also a current price list and rules concerning the access to digitized materials[433].

As part of the cooperation between the DBA and the Presse- und Informationsamtes der Bundesregierung (Press and Information Office of the Federal Government), a much wider collection of photographs has been made available for free download. The project functions as a separate web portal under the name: Digitales Bildarchiv des Presse- und Informationsamtes der Bundesregierung (Digital Photo Archives of the Press and Information Office of the Federal Government) [434]. This portal does not differ from Bildarchiv, in which these collections can also be viewed. By the end of 2009, 64,510 photographs were published on the portal. The photographs from the two portals discussed above have been made available to Wikipedia under Creative Commons 3.0 BY-SA licence[435,] as a result of cooperation with the editors of Wikipedia.

Archivgut der Sozialistischen Einheitspartei Deutschlands und des Freien Deutschen Gewerkschaftsbundes (FDGB) (Records of the Socialist Unity Party of Germany and the Free German Trade Union Federation) is a portal presenting information on which archives store particular records. Additionally, a collection of 59 photographs[436] and two video recordings with political lectures of the Board of the FDGB, offering limited searching possibilities, was also made available[437].

The idea for this project arose in 2002, when representatives of the Stiftung Archiv der Parteien und Massenorganisationen der DDR (Archives of Parties and Mass Organisations of the DDR of the Federal Archives Foundation) and the Landesarchiv Berlin decided to exchange finding aids related to the SED. It was developed and formalized when the project was joined by other state archives[438]. The first working meeting took place on 5 November

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[433] http://www.bild.bundesarchive.de

[434] http://www.bundesbildstelle.de

[435] For more see: O. Sander, *Bundesarchiv präsentiert im Digitalen Bildarchiv jetzt auch Bilder der Bundesbildstelle*, in *Tätigkeitsbericht 2009/2010. Wissen bereitstellen. Quellen erschließen. Geschichtsverständnis fördern*, Berlin 2010, [access: 10.01.2010], http://www.bundesarchiv.de/imperia/md/content/stab/taetigkeitsbericht 2005_06.pdf, pp. 56-57.

[436] One can browse photos in a gallery, but no options for searching the gallery are available to the user.

[437] http://www.bundesarchiv.de/sed-fdgb-netzwerk/index.html; *Galerie. Freier Deutscher Gewerkschaftsbund (FDGB) [online]*, http://www.bundesarchiv.de/sed-fdgb-netzwerk/galerie.html; *Dia-Ton-Vorträge. Freier Deutscher Gewerkschaftsbund (FDGB)* [online], [access: 6.12.2009], http://www.bundesarchiv.de/sed-fdgb-netzwerk/videos.html; *Das Bundesarchiv, Netzwerk SED-Archivgut*, in *Tätigkeitsbericht 2005/2006, Wissen bereitstellen. Quellen erschließen. Geschichtsverständnis fördern*, [access: 10.01.2010], http://www.bundesarchiv.de/imperia/md/content/stab/taetigkeitsbericht2005_06.pdf, pp. 46-47.

[438] Berlin, Brandenburg, Mecklenburg-Vorpommern, Saxony, Saxony-Anhalt and Thuringia.

2003 at the Bundesarchiv in Berlin. It was then that the initial ideas of making the project available online were proposed. In the following years, new participants joined the initiative. In 2005, the preparation of inventories concerning the FDGB was also proposed. In 2006 its official name was adopted. The project received financial support from the Deutsche Forschungsgemeinschaft. The website was launched in 2005, initially providing access only to finding aids related to the SED. Materials on the FDGB appeared in 2007[439].

Eight archives provide online access to their inventories. Those institutions are also responsible for updating them. The portal supported by MidosaSEARCH[440] can be browsed with the use of four methods: structural navigation; full-text search; by indices; and by leafing through inventories. Additionally, an advanced search option enables the selection of date ranges and search elements such as title, contents, reference code, and inventories to be searched. The use of inventories is based on fonds structure and full-text search. It is also possible to go directly to the website of a particular institution, where one can find more information on a given fonds. The portal also offers a glossary of terms and abbreviations used in descriptions of fonds. Tabular lists of members of political organizations and congresses, as well as the territorial structure and advice on the use of archival materials in research are also provided[441].

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[439] *Antrag an die Deutsche Forschungsgemeinschaft auf Gewährung einer Sachbeihilfe Ausbau des Portals „Netzwerk SED-Archivgut'' zu einer Referenzanwendung für ein Archivportal Deutschland 31. Juli 2006 (ergänzte Fassung vom 22. August 2006)*, [access: 6.12.2009], http://www.bundesarchiv.de/sed-fdgb-netzwerk/files/Antrag_Archivportal.pdf, pp. 3, 5; *Projekt* [online], [access: 8.11.2012], http://www.bundesarchiv.de/sed-fdgb-netzwerk/projekt.html; *Erstes Arbeitstreffen* [online], [access: 6.12.2009], http://www.bundesarchiv.de/sed-fdgb-netzwerk/html/projekt_1meeting.html; *Zweites Arbeitstreffen* [online], [access: 6.12.2009], http://www.bundesarchiv.de/sed-fdgb-netzwerk/html/projekt_2meeting.html; P. Rauschenbach, *Erweiterung des SED-Archive-Netzwerks durch FDGB-Bestände*, [access: 10.01.2010], http://www.bundesarchiv.de/imperia/md/content/abteilungen/sapmo/texte/14.pdf; A. Menne-Haritz, *DFG fördert ein Referenzportal für Archivportal im Internet* [online], [access: 6.12.2009], http://www.bundesarchiv.de/aktuelles/pressemitteilungen/00187/index.html; *Netzwerk „SED-FDGB-Archivgut''* [online], [access: 6.12.2009], http://www.bundesarchiv.de/aufgaben_organisation/abteilungen/sapmo/00992/index.html; *Webseite SED-FDGB-Archivgut. Erläuterungen zum Internetangebot*, [access: 6.12.2009], http://www.bundesarchiv.de/imperia/md/content/abteilungen/sapmo/archiv/reader_sed_fdgb.pdf; *Das Bundes-archiv, Netzwerk SED-/FDGB-Archivgut,* in *Tätigkeitsbericht 2007/2008. Wissen bereitstellen. Quellen erschließen. Geschichtsverständnis fördern*, [access: 10.01.2010], http://www.bundesarchiv.de/imperia/md/content/tagderarchive/barch_tb_2007-08.pdf, p. 12.
For more: *DFG-Projekt: Ausbau des Netzwerks SED-/FDGB-Archivgut* [online], [access: 7.12.2009], http://www.archivgut-online.de; *Ausbau des "Netzwerks SED-Archivgut" zu einer Referenzanwendung für ein Archivportal Deutschland Zwischenbericht an die Deutsche Forschungsgemeinschaft (DFG)*, [access: 8.12.2009], http://www.bundesarchiv.de/imperia/md/content/archivportald/zwischenbericht_DFG.pdf; *Ausbau des Portals Netzwerk SED-Archivgut zu einer Referenzanwendung für ein Archivportal Deutschland* [online], [access: 8.12.2009], http://www.archivgut-online.de.
[440] For more see: E. Dolatowski, *Integration neuer Findmittel in die Suchmaschine MidosaSEARCH*, [access: 6.12.2009], http://www.bundesarchiv.de/imperia/md/content/abteilungen/sapmo/texte/6.pdf (PowerPoint from the meeting about the development of the portal held at Bundesarchiv 11.05.2006).
[441] *Antrag...*, op. cit., pp. 3-4; *MidosaSEARCH* [online], [access: 6.12.2009], http://startext.net-build.de:8080/barch5/MidosaSEARCH/search.htm; *Führungsgremien* [online], [access: 6.12.2009], http://www.bundesarchiv.de/sed-fdgb-netzwerk/fuehrungsgremien.html.

Digitalisiertes Archivgut in Online-Findbüchern <daofind> is a portal dedicated to archival standards. Between 2004 and 2007, a tool used for the online presentation of inventories was created, based on EAD and METS standards – Midosa Editoren für XML-Standards, MEX (Midosa XML Editor). Thanks to a second grant in 2008 <daofind+>, additional inventory models were developed[442].

Materials produced as part of the project are made available on the website. In the left-hand navigation panel, one can find links to documents concerning EAD, EAC and METS standards, their translations and MEX software. The upper navigation has been divided into four sections: 'Project Documentation, 'Technological base', 'Pilot studies' and 'Project'. On the left, news on the recent changes in the portal is published. The site has German and English versions. Research for the development of MEX was financed by the Andrew W. Mellon Foundation[443].

Screenshot 13 Main page of the portal: Digitized Archival Holdings in OnLine Inventories, [access: 10.01.2010], www.daofind.de

The second portal, DFG-Projekt: Ausbau des Netzwerks SED-/FDGB-Archivgut zu einer Referenzanwendung für ein Archivportal Deutschland, is an example of a German archival portal[444]. It is not much different from the one described above in terms of the structure and function. It has been divided into the following tabs: 'Project', 'Project documentation',

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[442] The *Projects <daofind> and <daofind+> of The Federal Archives (Bundesarchiv)* [online], [access: 13.08.2012], http://www.bundesarchiv.de/daofind/en/.
[443] G. Maier, *Der Aufbau einer „Deutschen Digitalen Bibliothek" und der „European Digital Library Europeana"*, „Archivar" 2004, 4, pp. 399-401.
[444] http://www.archivgut-online.de

'Standards' and 'Contact. The project was supported by the DFG and its aim was to prepare a model for the construction of future archival portals.

Screenshot 14 Main page of the project: Ausbau des Netzwerks SED-/FDGB-Archivgut zu einer Referenzanwendung für ein Archivportal Deutschland, [access: 25.02.2013], http://web.archive.org/web/20101206111338/http://www.bundesarchiv.de/archivgut_online/

Another portal is the Gedenkbuch Opfer der Verfolgung der Juden unter der nationalsozialistischen Gewaltherrschaft in Deutschland 1933-1945, which is the third electronic edition of a printed publication that was prepared in 1980s as part of the cooperation between the Bundesarchiv and the Stiftung Neue Synagoge Berlin – Centrum Judaicum (New Synagogue Berlin – Jewish Centre Foundation). The portal has been active since 2007[445].

Holocaust victims can be searched by their name and surname (including maiden name), date of birth, place of birth, place of residence, date and place of deportation and emigration. In the results, next to the names of individual persons, there is sometimes information on such things as their arrest, concentration camps, and the date, place and kind of death[446].

There are also articles that give the research methods, as well as sources and publications, used to collect data on Jewish people in Nazi Germany and their persecution.

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[445] U. Völschow, C. Zenker-Oertel, *„Gedenkbuch – Opfer der Verfolgung der Juden unter der nationalsozialistischen Gewaltherrschaft in Deutschland 1933–1945". Die Onlineversion*, „Mitteilungen aus dem Bundesarchiv" 2008, 1, [access: 7.12.2009], http://www.bundesarchiv.de/imperia/md/content/abteilungen/abtg/mitteilungen1_08/digitales_bilda rchiv.pdf.
[446] *Suche im Namenverzeichnis*, [access: 7.12.2009], http://www.bundesarchiv.de/gedenkbuch/directory.html.

They cover details (date, place, number of expelled people and destination) concerning deportation from France, Belgium, the Netherlands and Germany[447].

Screenshot 15 Main page of the project: Gedenkbuch Opfer der Verfolgung der Juden unter der nationalsozialistischen Gewaltherrschaft in Deutschland 1933-1945, [access: 29.12.2010], http://www.bundesarchiv.de/gedenkbuch/

The Online-Version der Edition Akten der Reichskanzlei Weimarer Republik portal is, like the previous one, an electronic version of a printed publication that appeared in the years 1968-1990 and covered 23 volumes of source documents. This project of the Bayerischen Akademie der Wissenschaften (Bavarian Research Academy) and Bundesarchiv, undertaken from 2005 to 2007, was supported by the Deutsche Forschungsgemeinschaft[448].

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[447] *Einführung in die Neubearbeitung* [online], [access: 7.12.2009], http://www.bundesarchiv.de/gedenkbuch/einfuehrung.html?page=1; *Die jüdische Bevölkerung im Deutschen Reich 1933-1945* [online], [access: 7.12.2009], http://www.bundesarchiv.de/gedenkbuch/einfuehrung.html?page=2; *Erarbeitung der ersten Auflage des Gedenkbuches [online]*, [access: 7.12.2009], http://www.bundesarchiv.de/gedenkbuch/einfuehrung.html?page=3; Neubearbeitung des Gedenkbuches [online], [access: 7.12.2009], http://www.bundesarchiv.de/gedenkbuch/einfuehrung.html?page=4; *Hinweise zur Darstellung der Personenangaben* [online], [access: 7.12.2009], http://www.bundesarchiv.de/gedenkbuch/einfuehrung.html?page=5; *Chronologie der Deportationen aus dem Deutschen Reich* [online], [access: 7.12.2009], http://www.bundesarchiv.de/gedenkbuch/chronicles.html?page=1; *Chronologie der Deportationen aus Belgien* [online], [access: 7.12.2009], http://www.bundesarchiv.de/gedenkbuch/chronicles.html?page=2; *Chronologie der Deportationen aus Frankreich* [online], [access: 7.12.2009], http://www.bundesarchiv.de/gedenkbuch/chronicles.html?page=3; *Chronologie der Deportationen aus den Niederlanden* [online], [access: 7.12.2009], http://www.bundesarchiv.de/gedenkbuch/chronicles.html?page=4; *Auswahlbibliographie* [online], [access: 7.12.2009], http://www.bundesarchiv.de/gedenkbuch/bibliography.html.
[448] Ibid; M. Reinert, *Digitalisierung der Edition „Akten der Reichskanzlei. Weimarer Republik" – ein Prototyp für die Präsentation im Internet*, „Mitteilungen aus dem Bundesarchiv" 2006, 2.

Documents can be browsed by work structure (chancellors – documents) or by any word, and browsing can be limited to individual parts of a publication (introduction, reports, notes), selected cabinets, dates or pages[449].

Screenshot 16 Main page of the Online-Version der Edition Akten der Reichskanzlei Weimarer Republik

In 2003, also archival materials of the BRD government from the years 1949-1964 were made available as the Online-Version der Edition „Die Kabinettsprotokolle der Bundesregierung". This project was initiated as part of the BundOnline 2005 E-Government Initiative programme (E-Government-Initiative BundOnline 2005). Searches are performed the same way as in the Online-Version der Edition Akten der Reichskanzlei Weimarer Republik[450].

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[449] *Suche*, [access: 8.12.2009], http://www.bundesarchiv.de/aktenreichskanzlei/1919-1933/0001/TextSucheKaPr.html.

[450] *Das Bundesarchiv, Kabinettsprotokolle der Bundesregierung*, in *Tätigkeitsbericht 2005/2006, Wissen bereitstellen. Quellen erschließen. Geschichtsverständnis fördern*, [access: 10.01.2010],], http://www.bundesarchiv.de/imperia/md/content/stab/taetigkeitsbericht2005_06.pdf, pp. 23-24; B. Martin-Weber, *Access…*, op. cit., p. 120.

Screenshot 17 Main page of the Online-Version der Edition „Die Kabinettsprotokolle der Bundesregierung"

As far as the architecture of archival portals created mainly by the Bundesarchiv is concerned, they are visually almost identical to the home page of the Bundesarchiv's website (second version). There are logos of partners in the top left-hand corner. The colours as well as the arrangement of panels (left and upper ones) and tabs directing to related topics are the same. The difference lies in the appearance and functioning of search engines, which results from the specific character of individual portals. However, some portals differ in their layout.

Another portal to be discussed is the BAM-Portal[451]. BAM is an acronym of the three main project partners: *Bibliotheken* (libraries), *Archiven* (archives) and *Museen* (museums). The idea emerged in May 2001, thanks to the support of the DFG. It was founded by the representatives of the Bibliotheksservice-Zentrum Baden-Württemberg (Library Service Centre of Baden-Württemberg) and the Stiftung Landesmuseum für Technik und Arbeit in Mannheim (Foundation of the State Museum of Technology and Work in Mannheim). After several years, a common base of the holdings of these institutions was created. At first, only collections concerning industrialization, broadly defined, were made available. XML-based data exchange formats were worked out, which were supposed to speed up work on integration and facilitate searching of holdings, using open-source software in the future. In the following years, other institutions also joined the initiative. The main purpose of the portal is to create a common online platform that would provide simultaneous access to holdings (information

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[451] www.bam-portal.de

on them and digitized items) of libraries, archives, museums and other cultural institutions. Another goal is to combine the holdings with Europeana[452].

A search engine, advice and information on news have been placed in the central part of the home page. On the left, there are examples of searched items and in the top right there are links to information about the portal, FAQ, questionnaires relating to the use of the BAM services, and contact details of the portal creators.
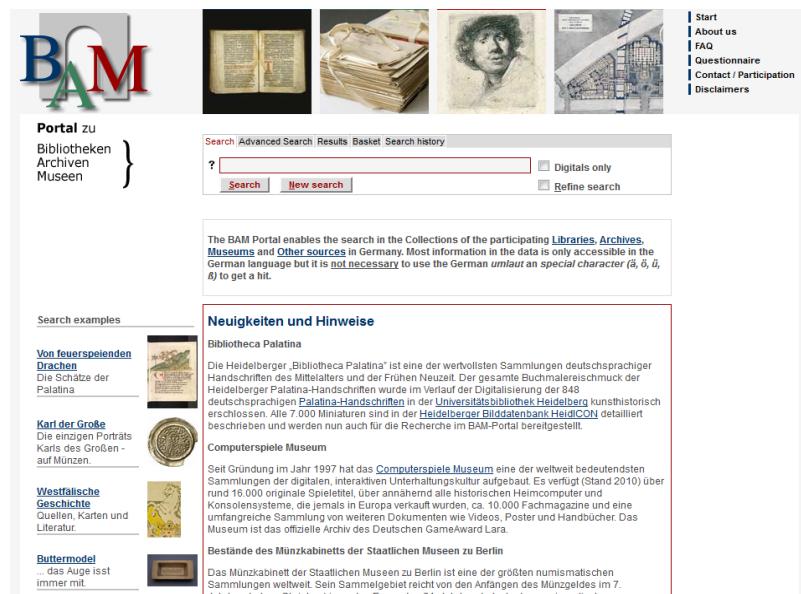
Screenshot 18 BAM's main page, [access: 25.02.2013],
http://web.archive.org/web/20100801055247/http://www.bam-portal.de/

The simple search is limited to entering a term and deciding whether to limit the search to digitized items. Displayed results cover information such as: dates, reference code, fonds, owner. They can be limited to the selection of a contents supplier and thumbnails. Clicking on a selected item immediately redirects the user to a website on which it is located, but problems arise when the user is not taken directly to the desired item, but to a list of items, in which they must find the proper one. This results from the structure of the portals of the suppliers of scanned materials, to which the BAM simply redirects the users. The advanced search allows

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[452] Bundesarchiv, Stadtgeschichtliches Museum Leipzig, Württembergisches Landesmuseum Stuttgart, Badisches Landesmuseum Karlsruhe, Stiftung Preußischer Kulturbesitz, Stiftung Domäne Dahlem-Landgut und Museum. *Über uns* [online], [access: 9.01.2010], http://www.bam-portal.de/searchEngine.do?action=showProject; G. Maier, *Neue Wege zu digitalen Kulturgut-Informationen. Das BAM-Portal – Gemeinsames Internetportal für Bibliotheken, Archive und Museen* (http://www.bam-portal.de), „Bibliothek" 2005, 2, [access: 13.12.2012], www.b2i.de/fileadmin/dokumente/BFP_Bestand_2005/Jg_29-Nr_2/Jg_29-Nr_2_Aufsaetze/Jg_29-2005-Nr_2-S_220-229.pdf, pp. 220-223; idem, *Common Internet Portal for Libraries, Archives and Museums – BAM-Portal* (http://www.bam-bw.de), 4 p., [access: 13.12.2012], http://ifla.queenslibrary.org/IV/ifla68/papers/023-144e.pdf (conference paper: 68th IFLA Council and General Conference August 18-24, 2002); J. Sieglerschmidt, *BAM-Portal und Deutsche Digitale Bibliothek*, [access: 10.01.2010], http://opup.bsz-bw.de/swop/volltexte/2009/796/pdf/sieglerschmidt_koeln091118a.pdf.

searching by item description elements: title, person/corporation, keyword, participating institution, full text, number, dates. It should be noted that some of these criteria are ambiguous, which can cause problems for users as they try to figure out their meanings. Additional functions related to the search, such as listing favourites or searched terms, do not meet expectations, as the users' lists cannot be saved so that they can return to them later. The portal saves current results only in a cookie[453], which is usually automatically deleted when a browser is closed[454].

The portal offers information on supplied materials and entities that provide them. As presented in the table below, almost 90% of holdings are provided by libraries, nearly 10% by archives and less than 1% by museums[455].

Supplier	Number of records
Archives (11)	3,345,304
Libraries (6)	37,565,372
Museums (21)	300,712
Other (6)	822,708
Total	**42,034,096**

Table 11 Number of records by supplier (calculated on the basis of data published on BAM-Portal [access: 9.01.2010])
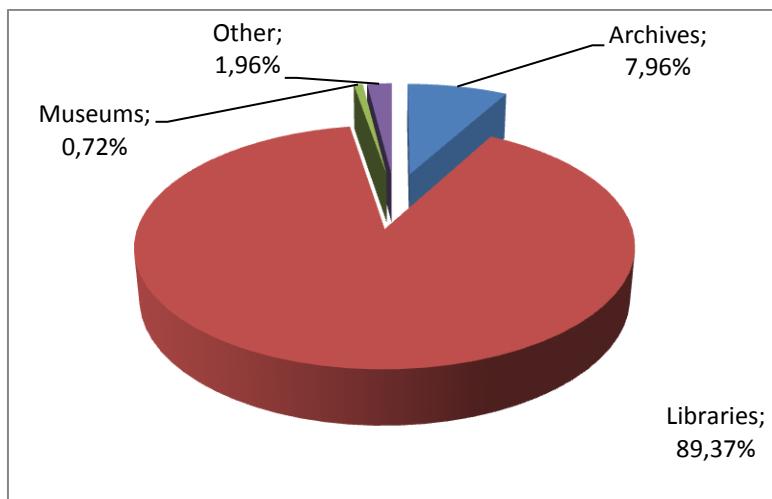
Graph 1 Number of records by supplier (calculated on the basis of data published on BAM-Portal [access: 9.01.2010])

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[453] Cookies are temporary text files in which a browser saves various pieces of information, such as users' settings for a particular website.
[454] *Über uns…*, ibid.; G. Maier, *Common Internet Portal…*, ibid.; id., *Neue Wege…*, ibid., pp. 223-225; J. Sieglerschmidt, ibid.
[455] Rearch result generated on 9.01.2010.

As far as the number of digitized items is concerned, more than 77% of digitized items are supplied by libraries. The second largest source is museums, which offer over 15%, and the remainder are supplied by archives[456].

Supplier	Number of records
Archives (3)	104,921
Libraries (4)	1,313,905
Museums (14)	268,536
Other (4)	5,723
Total	**1,693,085**

Table 12 Number of digitized items by supplier (calculated on the basis of data published on BAM-Portal [access: 9.01.2010])
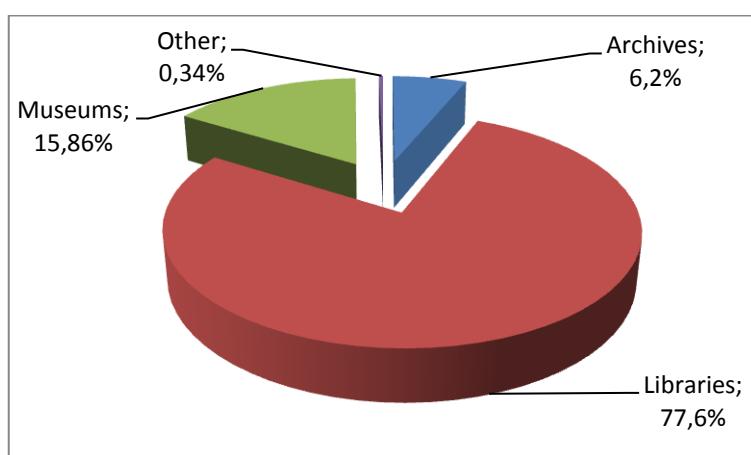
Graph 2 Number of digitized items by supplier (calculated on the basis of data published on BAM-Portal [access: 9.01.2010])

Although it has been active for many years and provides access to more than 42 million items. The portal functions are so poorly that it does not present German cultural assets to its users very well at all. One of the reasons for this is that the portal is the result of an experiment started by the Landesarchiv Baden-Württemberg, before work had started on the new German nationwide portal the Deutsche Digitale Bibliothek.

Finally, mention should also be made of a planned project for a German nationwide archival portal – Archivportal D[eutschland]. The main partners of this initiative are Landesarchiv Baden-Württemberg, Bundesarchiv and Archivschule Marburg, with Deutsche Forschungsgemeinschaft as sponsor[457].

As can be seen in the preceding paragraphs, numerous projects in which archives and other cultural institutions are engaged have been implemented throughout the Germany.

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[456] Rearch results generated on 9.01.2010.
[457] B. Martin-Weber, *Access…*, op. cit., pp. 121-122.

The portals differ not only in their appearance, but also in the target groups for which they have been created and in their functionality. They now exist in the virtual space, but they do not co-operate with each other in any way in terms of data sharing, so that the user can get to one while visiting another. The initiatives that have been observed for this study appear to be rather experimental, probably with no serious intention of building interoperable portals which, if equipped with proper tools, could exchange data between each other. But some archivists also say that a German nationwide archival portal is awaited and, because of this, the exisiting portals are not being further developed.

5.2.3. International portals

The first attempts to publish guides to records of archives throughout the world were made in 1930s. Archivists from many countries put a lot of time and effort into cooperating in these attempts. Among the advantages of this publication were the standardization of information depth and structure of all descriptions, covering contact details, short notes on the holdings of individual archives and a bibliography of published finding aids. There were also publications on particular subject areas, which covered several countries for which each subject are was relevant. Technological developments have brought new possibilities for implementing similar plans in the form of a web portal, although no such undertaking has not been attempted globally. Archives Portal Europe is the largest project of this kind. It is discussed in later in this section[458].

The need to create web portals was noted in mid 1990s, for example, in a 1994 report on the possibilities for cooperation among archives in the EU, prepared at the request of the European Board of National Archives. Even back then, the authors underlined the importance of providing access to information on archival holdings on the Internet. Further research in this area was recommended. In 2003, the Board adopted a resolution in which they suggested, among other things, that an expert group for new technologies be established because of the need for their wide application in archives and the importance of cooperation and exchange of good practices in developing modern Europe. Citizens' rights of access to information, which would be supported by developing a portal, were also mentioned. It was assumed that data about archives would be organized locally and then combined, or sent directly to the portal by interested parties. The Board also envisaged using appropriate standards

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[458] B. Ryszewski, *Przegląd…*, op. cit., p. 13.

for presenting archival information, providing access to the contents of records and searching them. It was assumed that the portal would be used not only by researchers, but also by ordinary people interested in cultural heritage. At first, existing archival portals were assessed. Then goals, implementation phases, a budget and time-line were specified, to consider and plan the creation of a European project. Out of these actions arose, among other things, MICHAEL Plus (Multilingual Inventory of Cultural Heritage in Europe) and Archives Portal Europe[459].

The countries participating in the MICHAEL[460] and MICHAEL Plus[461] projects[462] pre-pared catalogues and inventories of digitized holdings, which were then made available in a common portal, where they could be searched by collections (by subject, geographic loca-tion and time), institutions (type, address) or services (users, subject area, places, time). The purpose of the project was also to develop cooperation and to share experience to support portals that provided access to information on digitized collections in individual countries[463].
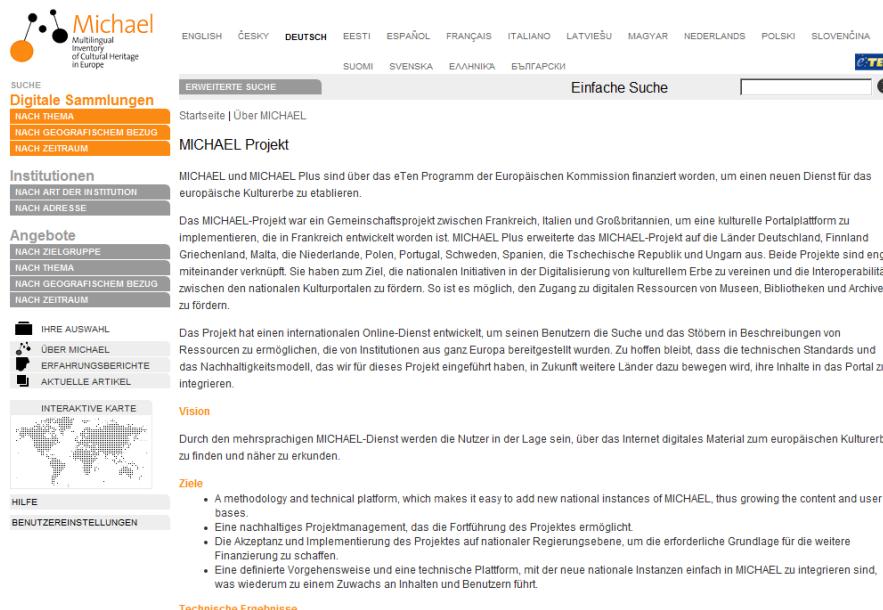
Screenshot 19 Main page of the project: MICHAEL (Multilingual Inventory of Cultural Heritage in Europe), [ac-cess: 13.08.2012], http://www.michael-culture.org/de/about/project

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[459] *Raport o archiwach w Unii Europejskiej po rozszerzeniu…*, op. cit., pp. 14, 68-94; *Council Resolution of 6 May 2003 on Archives in the Member States (2003/C 113/02)*, [access: 14.08.2012], http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2003:113:0002:0002:EN:PDF.
[460] MICHAEL participants: Italy, France, Great Britain.
[461] MICHAEL Plus participants: Belgium, Germany, Latvia, Finland, Greece, Malta, Holland, Poland, Portugal, Sweden, Slovakia, Spain, Czech Republic, Hungary, Italy, France, Great Britain.
[462] http://www.michael-culture.org.
[463] From Germany the Bundesarchiv, Bayerische Staatsbibliothek, Deutsche Nationalbibliothek, Deutsches Museum, Landesarchiv Baden-Württemberg, Senckenbergisches Naturforschendes Gesellschaft, and Stiftung Preußischer Kulturbesitz took part. Ch. Wolf, *EU-Projekt MICHAEL Plus. Kooperationsprojekt „Digitales Archiv Thüringen"*, „Archivar" 3/2008, [access: 22.07.2012], http://www.archive.nrw.de/Archivar/hefte/2008/ausgabe3/Archivar/hefte/2008/ausgabe3/ARCHIVAR-03-2008_Internet.pdf, pp. 281-282; *MICHAEL Projekt* [online], [access: 13.08.2012], http://www.michael-culture.org/de/about/project.

The goal behind the creation of the APE in 2007 was to create a common virtual gateway to archives and their holdings. It was mainly intended for the Europeans, as the archival holdings are mostly related to their history. It was envisaged that the portal would combine all previous online initiatives of archives presenting finding aids and repositories of digitized items from the entire European Union[464].

Fourteen state archives participated in this project. Germany, as one of key partners, tried to create a logical model according to which the portal would function in the future. The model specified elements such as types of data, conservation, supervision, users, partners, suppliers, etc. Other participating state archives focused on other issues, such as the technical aspects of creating a portal, cooperation with Europeana, data structure, promotion, financing, contact with potential content suppliers, among many other things[465].

The project's website uses simple navigation based on a hierarchical structure. Links redirect to the home page, information on APEnet, project members, news, links and contact details. The latest news and the logo of Europeana, the main partner, were placed on the right. In the middle, was a information about the portal and about conferences. Although the portal has been active for several years, no information on the results of the tasks performed by individual teams could be found on the website during research for this study.

At the beginning of 2011, a browser was made available at a different web address[466], which enables users to browse inventories made available by archives. The service does not collect data from the portals of project partners. They are responsible for providing them, which has a negative effect on information about holdings. The finding aids that are made available through the website have been prepared in accordance with an EAD profile adjusted

[464] *O programie APEnet* [online], [access: 12.01.2010], http://www.apenet.eu/index.php?option=com_content&view=article&id=47&Itemid=61; Objectives [online], [access: 12.01.2010], http://www.apenet.eu/index.php?option=com_content&view=article&id=48&Itemid=61; W. Stępniak, *Archiwa w polityce europejskiej. Uwagi wstępne*, in *Archiwa w nowoczesnym społeczeństwie*, op. cit., pp. 33, 35; B. Martin-Weber, *Access…*, op. cit., pp. 121-122; A. Menne-Haritz, *The standards for…*, op. cit., pp. 53-55.

[465] K. Arnold, *Erfolgreicher Abschluss des APEnet-Projekts zum Archivportal Europa – Ausblick auf das Nachfolgeprojekt*, „Mitteilungen aus dem Bundesarchiv" 2012, 1, [access: 30.07.2012], http://www.bundesarchiv.de/imperia/md/content/bundesarchiv_de/oeffentlichkeitsarbeit/fach-publikationen/mitteilungenausdembundesarchiv/mitteilungen_1-2012.pdf, pp. 5-9; *O programie APEnet…*, op. cit., http://www.apenet.eu/index.php?option=com_content&view=article&id=47&Itemid=61; Workpackage 1, [access: 12.01.2010], http://www.apenet.eu/index.php?ooption=com_content&view=article&id=56&Itemid=76; *Work-package 2*, [access: 12.01.2010], http://www.apenet.eu/index.php?option=com_content&view=article&id=56&Itemid=76; *Workpackage 3*, [access: 12.01.2010], http://www.apenet.eu/index.php?option=com_content&view= article&id=54&Itemid=78;*Workpackage 4*, [access: 12.01.2010], http://www.apenet.eu/index.php?option=com_content&view=article&id=53&Itemid=79; Work-package 5, [access: 12.01.2010], http://www.apenet.eu/index.php?option=com_content&view=article&id=52&Itemid=80; *Workpa-ckage 6*, [access: 12.01.2010], http://www.apenet.eu/index.php?option=com_content&view=article&id =51&Itemid=81.

[466] www.archivesportaleurope.eu

to the project's needs. The portal cooperates with Europeana, see below, in giving access to archival descriptions and thumbnails of digitized items[467].

Screenshot 20 Main page of the project: APEnet, [access: 12.10.2010], www.apenet.eu

Archival holdings can be searched using a simple search or an advanced search. Using the simple search the user can refine their research to the context, digital materials or one of the searched terms. In the advanced search option, the use can search by countries, archives, or limit a search to individual fragments of a document (title, summary, reference code), a finding aid (guide, inventory) or a creation date, and add criteria to the simple search. Other elements of the navigation panel include: 'Archives in Europe' (a list of institutions participating in the project[468]); 'Tools' (a section on software and standards used in developing the portal); 'About us'; and 'My sites' (user account, which allows saving of search results)[469].

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[467] K. Arnold, op. cit., pp. 5-9.
[468] German participants include Bundesarchiv and selected state and municipal archives: Archive in Baden-Württemberg, Archive in Bayern, Berliner Archive, Hessisches Archiv-Dokumentations- und Informations-System, ARIADNE – Archivverbund in Mecklenburg-Vorpommern, Archivportal Niedersachsen, ANKA: Arbeitsgemeinschaft der niedersächsischen Kommunalarchivare e. V., Archive in NRW, Archive im Südwesten, Schleswig-Holsteinische Archive, Archivportal Thüringen.
[469] K. Arnold, op. cit., pp. 5-9.

Screenshot 21 Main page of the portal: APE, [access: 13.08.2012], www.archivesportaleurope.eu

German archives, both state and federal, participate in the Europeana [470] project as partners (Bundesarchiv) or content suppliers (Landesarchiv Baden-Württemberg). However, it is not possible to check, using data published on the website, whether more archives participate, as the section concerning partners is not updated regularly.

Europeana was launched on 20 November 2008 as a platform to gather information on the holdings of libraries, archives, museums and other similar institutions throughout Europe. Its main goal is to popularize cultural heritage[471].

The idea behind Europeana came from representatives of six countries (France, Spain, Germany, Poland, Hungary, Italy), who proposed its creation in a letter to the European Commission and the European Council of 28 April 2005. In response, as part of its vision of creating an information society, the EC called for the establishment of a digital library and the mass digitization of Europe's cultural heritage. These efforts were supported by the European Parliament, which adopted a resolution on the creation of a digital library. In the following years, work on developing the portal began. The project was led by the European Digital Library Foundation, as part of eContentplus project. Maintenance costs were divided between the EC (80%) and the states participating in the project (20%). Europeana's headquarters were established in the Koninklijke Bibliotheek (National Library of the Netherlands), which is where work on its creation began. The portal is co-created by 106 partners (12 archives, 7 institutions

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[470] www.europeana.eu

[471] *Press Release*: September 2007, 28.11.2007, 11.02.2008; Memo: 08/724 (20.11.2008), 08/733 (21.11.2008); www.europeana.eu, http://dev.europeana.eu, [access: 3.01.2009]; H. Hollender, *Europeana – uwagi użytkownika* [online], [access: 11.04.2012], http://www.ebib.info/2009/107/a.php?hollender.

with audiovisual collections, 38 libraries, 11 museums, 12 research institutions, 26 other institutions) and 71 content suppliers from 28 European countries[472].
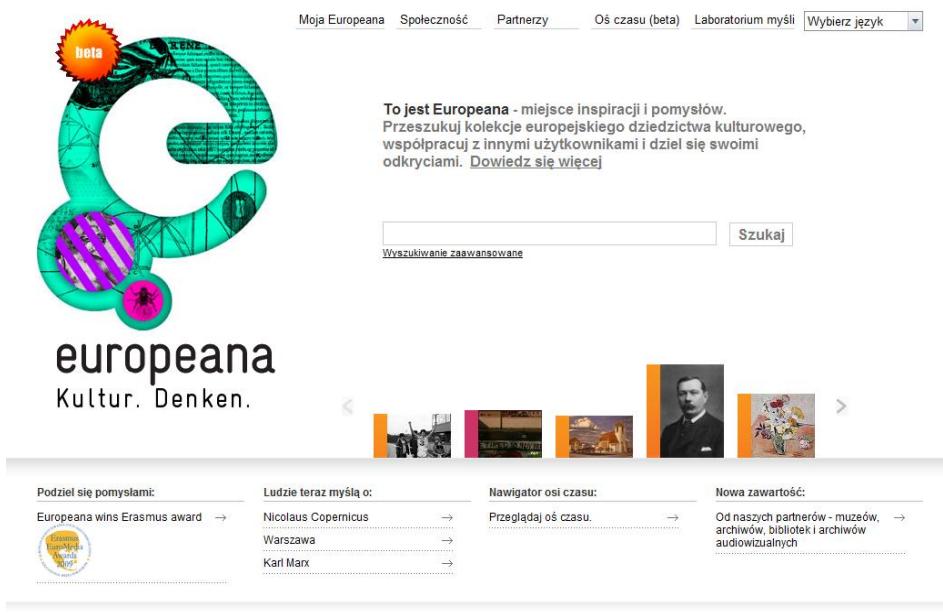
Screenshot 22 Main page of the portal: Europeana, [access: 12.01.2010], www.europeana.eu

As the platform collects only thumbnails and metadata of items, the user is redirected to a relevant repository to view selected records. Europeana has six million records of four types: images text, sound and film[473].

The portal offers two navigation panels. The upper panel allows users to select links that enable them to register and create a user account ('My Europeana'), where they can add items to their favourites and tag them. From there, one can go to the portal's demonstration section, where a community forum is planned for the future. Other menu elements include: a list of partners and suppliers, a timeline allowing the user to browse the contents of the portal by year, and a 'Thought Lab' in which the latest technologies and ideas for further development are presented. The lower panel contains mainly news, information on content being viewed by other users, and a link to the timeline and a list of newly added items[474].

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[472] The letter of 28 April 2005 is available at [access: 29.10.2016], http://ec.europa.eu/newsroom/dae/document.cfm?doc_id=5978.
Press Release: September 2007, 28.11.2007, 11.02.2008; *Memo*: 08/724 (20.11.2008), 08/733 (21.11.2008); www.europeana.eu, http://dev.europeana.eu, [access: 3.01.2009]; http://Europeana.eu/portal/partners.html, [access: 11.01.2010]; M. Kowalska, op. cit., pp. 87-88.
[473] *About us* [online], [access: 10.01.2010], http://europeana.eu/portal/aboutus.html.
[474] www.europeana.eu, [access: 11.01.2010]. For more see: Europeana_Mozart_Launch_1, [access: 3.01.2009], http://dev.europeana.eu (PowerPoint Presentation).

The standard search through the holdings of Europeana allows for simple and advanced searching by metadata elements, such as any field, title, creator, date and subject area. Additional search criteria include language of materials, country and supplying institutions, date of creation and type of item (text, video, audio and graphics).

Analysing information gathered on the basis of web portals in which Germany participates at the international level, one can observe that some changes are coming. The newer a portal is, the better its design and functionality and the greater the emphasis on interoperability with other tools offered by partners and on the acquisition of as many participants and users as possible. In the case of large projects, such as Europeana or APE, as well as securing funding for the projects' duration, long-term activities are planned to ensure their continuity and further development. Moreover, foundations to acquire funding from non-EU sources have also been established. These projects are no longer occasional and spontaneous initiatives, but have become fixtures in the virtual environment of cultural institutions, and thus give an impression of maturity and commitment not to waste taxpayers' money that supports cultural institutions. One can observe in Europeana efforts aimed at involving business in the development of additional services and sponsorship[475]. The projects show a trend among the creators of portals in their tendency to develop pan-European portals covering all cultural institutions and to create services that can work interoperably.

The example of archives in the BRD shows that the development of projects described in this chapter requires urgent acceleration of the retroconversion of finding aids and of the digitization of holdings. However, costs constitute a serious obstacle in this area. It has been observed that there are still no professional studies of users' needs, analyses of the technological development and application possibilities, or research concerning competitive services provided by the business sector. The fact that EAD has been taken into account was a very positive aspect of all the projects, as it facilitates data sharing. The use of ill-considered solutions may have a negative impact on the cooperation, as was noted in the case of Europeana, which used a metadata standard based on Dublin Core for libraries, which did not enable the hierarchical structure of records to be reproduced and discouraged archives from supplying their items[476].

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[475] For more see: J. Cousins, *Introduction* [online], [access: 17.01.2012], http://youtu.be/oP6ta4nOKcI (conference paper: Europeana Tech, 3-4 Ocotober 2011).
[476] For more see: A. Sobczak, *Archiwa i Europeana…*, op. cit.

Imagine a world in which every single person on the planet is given free access to the sum of all human knowledge. That's what we're doing.

─ J. Wales (Wikipedia founder), *WikiQuote*, [access: 28.02.2016], https://en.wikiquote.org/wiki/Jimmy_W ales.

6. Future Archives

6.1. Virtual archives

The term 'virtual archives' is closely connected with the development of informatization and is directly related to the management of archives' activities principally linked to cultural heritage[477]. Although the term 'virtual archives' has been discussed in specialist literature for some time, it has not been explained in detail or defined in any dictionary[478]. In a narrow sense, a virtual archives corresponds to the structure of collections of digital records, but in a broader sense, one can perceive them as a system consisting of three main elements. The first element is the 'back office', where tasks related to an entity's functioning are performed, such as financial management, accounting and human resources management and the management of holdings, all of which are supported by hardware and software. Activities related to the administration of records are increasingly performed using electronic tools, such as databases in which information on records and on digital warehouses[479] storing digital records is collected, together with information on conservation, preservation and access mechanisms. The next element is the 'front office', which is responsible for customer service broadly defined, provided both in-house and remotely through online services. The third element is the 'middle office', that is, a financial department related to the 'back' and 'front offices' of the organization. Thanks to the constantly developing informatization, all three elements work within an infrastructure that enables efficient data exchange and information flow, which improves the functioning of the organization. Analysing development concepts of electronic records in the 'back office', one can observe a focus on managing holdings using integrated data management systems. Issues related directly to the administration of an archives, as an organization, are developed separately and usually less dependent on IT tools[480].

To sum up, the idea of creating an electronic integrated system continues to be applied in a narrow sense – it will be limited to the management of holdings, that is, information as well as born-digital and digitized holdings. The idea of digital archives originated in the application of software that supported archival processing, to which digital holding management systems were then added. It can be recognized as an effect of a tendency to integrate IT systems used

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[477] B. Matusiak describes the characteristics of a virtual organization in detail. It is assumed that more and more archives will be digitized in the years to come. B. Matusiak, op. cit., pp. 493-494

[478] The term has not been defined in any recently published dictionary: A. Menne-Haritz, *Schlüsselbegriffe der Archivterminologie*, series: Veröffentlichung der Archivschule Marburg, 20, Marburg 1999, 122 p.; *Terminologie der Archivwissenschaft…*, op. cit.

[479] Often called digital archives.

[480] A. Menne-Haritz, *Büroautomation und Schriftgutverwaltung. Der…*, op. cit., p. 370.

by archives. The first attempts to create comprehensive IT platforms for use in archives were made as early as the 1980s, as part of the HADIS project, which involved developing possibilities for using IT technologies for the appraisal and description of records, publication of inventories and administration. According to W. Schüler, it was the most advanced informatization idea at the time, as it covered so many archives' activities. Other concepts were developed in 1990s in the Bundesarchiv (Bundesarchiv IT-System (BASYS)) and at the beginning of the 21st century in Landesarchiv Baden-Württemberg MIDOSA 21. Both undertakings are still developing and adjusting to the needs of archives and to actual technological possibilities. They focus on the integrated management of information on archival holdings. The Bundesarchiv's system will ultimately consist of the following components:

- management of archival records;

- management of accession;

- processing and generation of inventories;

- management of warehouses;

- access.

The project from the Landesarchiv Baden-Württemberg will cover:

- integration of archival descriptions with digitized and born-digital items as well as other representations of records[481];

- records management using acustomer relationship management with public agencies to which archival services are provided, document management system for keeping documentation and managing the processes of acquiring records, acquisition assistant used for the integration of electronic transfer lists with a record description module;

- process-oriented management of acquisitions and disposals, as well as historical holdings (loss of records, information on reproductions and backup copies);

- warehouse (physical location of records, condition of protective packaging, preparation of materials for long-term preservation[482], amount in linear meters, physical condition);

- processing based on hierarchical structure of fonds in accordance with the ISAD(G) standard (appropriate forms for describing various types of records, indexing);

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[481] In order to integrate born-digital holdings with traditional ones, which may be in various physical forms, a representation model has been introduced. For example, in the case of parchments, one can prepare a scan, a microfilm, a copy, or a photocopy, while an electronic document can be saved in various formats and can have a use copy and a master, just like a scanned document.

[482] Checking such things as whether metal elements have been removed and whether materials have been packed in archival boxes, etc.

- access (research, borrowing, statistics), including the preparing of data and scans for use in a separate online presentation system, which protects the production database version by shielding it from direct contact with the Internet.

- search;

- conservation;

- statistics;

- presentation of holdings on the Internet (archives' portals, etc.) in the form of electronic inventories of records and scans, with a search engine and ordering function;

- data exchange with other systems (ensuring interoperability) and printing paper inventories[483].

From a technical point of view, electronic archives can be described as an ICT system consisting of connected IT hardware (for example, servers and end-use workstations) and software enabling the processing, storing and exchanging data with other systems through an external or internal telecommunications network[484].

It is important for an organization that the operation of such archives is based on information management, so that society and the economy can make practical use of knowledge. It should not be difficult for an archival institution to fulfil this condition. It is enough that, by using appropriate IT tools, analogue holdings or, initially, information about analogue holdings, are converted into electronic form and integrated with born-digital materials. One should remember that the conversion of archives into digital form may take many decades, given the progress of current technological development[485].

The Open Archival Information System (OAIS) model [486] specifies very simply the environment of records as consisting of four actors: producer, consumer and management (external), and archives (internal). Their roles can merge or change. For example, a record creator can be both a producer and a consumer of materials transferred to an archives. A consumer is an entity using the holdings. An archives manages information that it receives and is responsible for its access, storage, administration and protection. The role of management involves planning

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[483] E. Büttner, *Internet-Präsentation…*, op. cit.; MIDOSA 21. Projekt…, op. cit.; *Ein einheitliches IT-System…*, op. cit.; *Pflichtenheft…*, op. cit., pp. 1-23; W. Schüler, op. cit., p. 545.

[484] M. Terschüren, *Begriffsdefinitionen und Erfahrungsbericht aus der Sicht eines kommunalen Rechenzentrums*, in *Handlungsstrategien für Kommunalarchive im digitalen Zeitalter. Beiträge zu einem Workshop im Rathaus Oberhausen 14.12.2005*, Münster 2006, p. 13.

[485] B. Matusiak, op. cit., pp. 476, 484; A. Toffler, *Trzecia fala*, pp. 305-329, 434.

[486] OAIS is intended as a guide for the long-term preservation of electronic information. It was developed by the Consultative Committee for Space Data Systems and is accepted as an international standard (ISO 14721:2003).

a strategy concerning items to be archived. The system works properly if all its participants carry out their responsibilities[487].
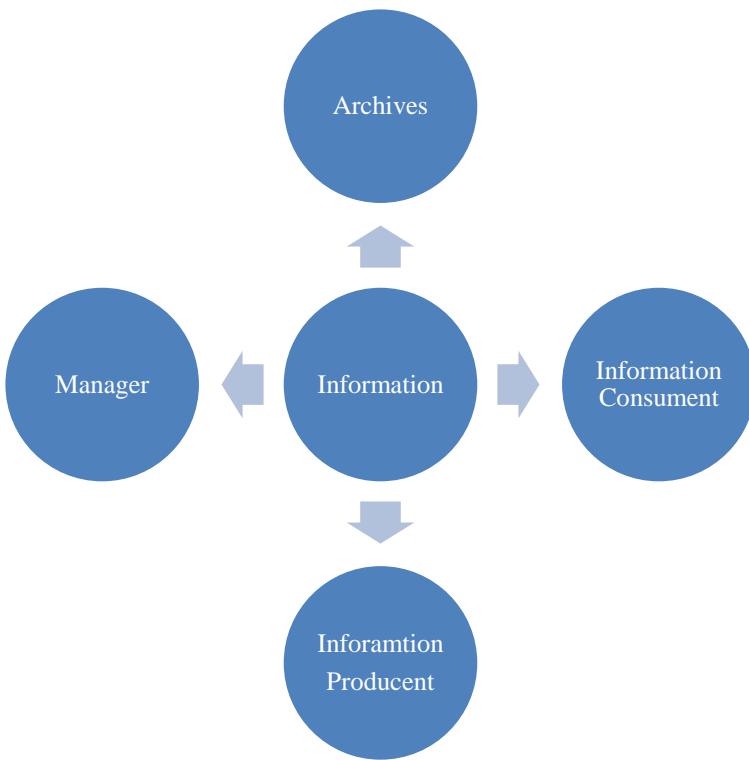
Scheme 3 Environment Model of OAIS as in *Figure 2-1: Environment Model of an OAIS*, *Reference Model for an Open Archival Information System (OAIS)*, 2002/2007, p. 2-2 , interpreted by the author, [access: 13.11.2011], http://public.ccsds.org/publications/archive/650x0b1.pdf

One should note that the new type of archives, as the authors of the OAIS claim, manages information, which means that attitudes to materials received by archives are changing. Because of constant development in computer technology and the arrival of digital materials, records are no longer perceived in terms of the carrier on which they have been saved, but in terms of the information contained in them. This is particularly important for electronic files, as it blurs not only the line between a copy and its original, but also between a carrier and a format in which a document has been prepared or to which it will be converted. Previously, records transferred to archives were stored in the form in which they were created. Sometimes, owing to natural wear and tear or damage, materials were conserved, but such conservation work did not involve changing their carrier. On the contrary, materials were repaired so that they could fulfil their function. This started to change in the digital world. Values such

[487] N. Brübach, *OAIS – Das „Open Archival Information System": Ein Referenzmodell zur Organisation und Abwicklung der Archivierung digitaler Unterlagen*, 10 p., [access: 1.11.2012], http://www.archiv.sachsen.de/download/pp_bruebach.pdf.

as external appearance and properties of contemporary documents prepared electronically are, in terms of information preservation, practically meaningless. The new paradigm envisages that only selected and reliable data will be preserved. Because of the variety of formats in which files can be saved and the technical and legal problems associated with them, selective preservation is now the only possible solution[488].

The main purposes and tasks of digital archives include, as in the case of traditional institutions, the general functions of supervising and cooperating with public agencies under its jurisdiction, processing, providing access, storing and collecting. The OAIS model covers six main functions of archives related to information management, which can be automated to varying extents, depending on their need:

- transfer from the creator and preparation for storage;
- storage and preservation of information (for example, migration to other formats, making use copies);
- management and processing of stored information;
- administration, covering negotiation with information creators and its consumers;
- planning OAIS preservation and monitoring;
- making information available to consumers[489].

When one analyses functions considered traditional, one can notice a progressive transformation in the perception of materials stored in archives, in automation and in archivists' work practices. If born-digital records alone were taken into account, machines would perform almost all the tasks of archivists, leaving only intellectual activities, such as preservation and quality control. In these new types of data warehouses, software automates the processes of acquiring records, of selecting materials, of appraisal and inventorying (overwriting metadata relevant to transfer to the archives or technical metadata, recognizing attributes and checking whether records can be made available and anonymized), and then places them on servers, while at the same time producing a backup copy and a use copy to be made available to customers.

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[488] Source code for programs that generate commercial formats, which would allow the reproduction of their contents if their manufacturer ceased supporting the formats in subsequent software versions, is not available. This would limit access to data collected in formats that are withdrawn from production. The use of replacement tools does not always solve the problem. For example, there is no program that makes it possible to open, edit and save Access databases that is as effective as the program in which they were originally created; in this case, long-term storage of data in their original format would therefore be very risky.

[489] B. Lavoie, *Meeting the Challenges of Digital Preservation: The OAIS reference model* [online], [access: 13.11.2011], http://www.oclc.org/research/publications/archive/2000/lavoie/; *Reference Model for an Open Archival Information System (OAIS)* 2002/2007, [access: 13.11.2011], http://public.ccsds.org/publications/archive/650x0 b1.pdf, pp. 2-1-2-10, 4-1-4.
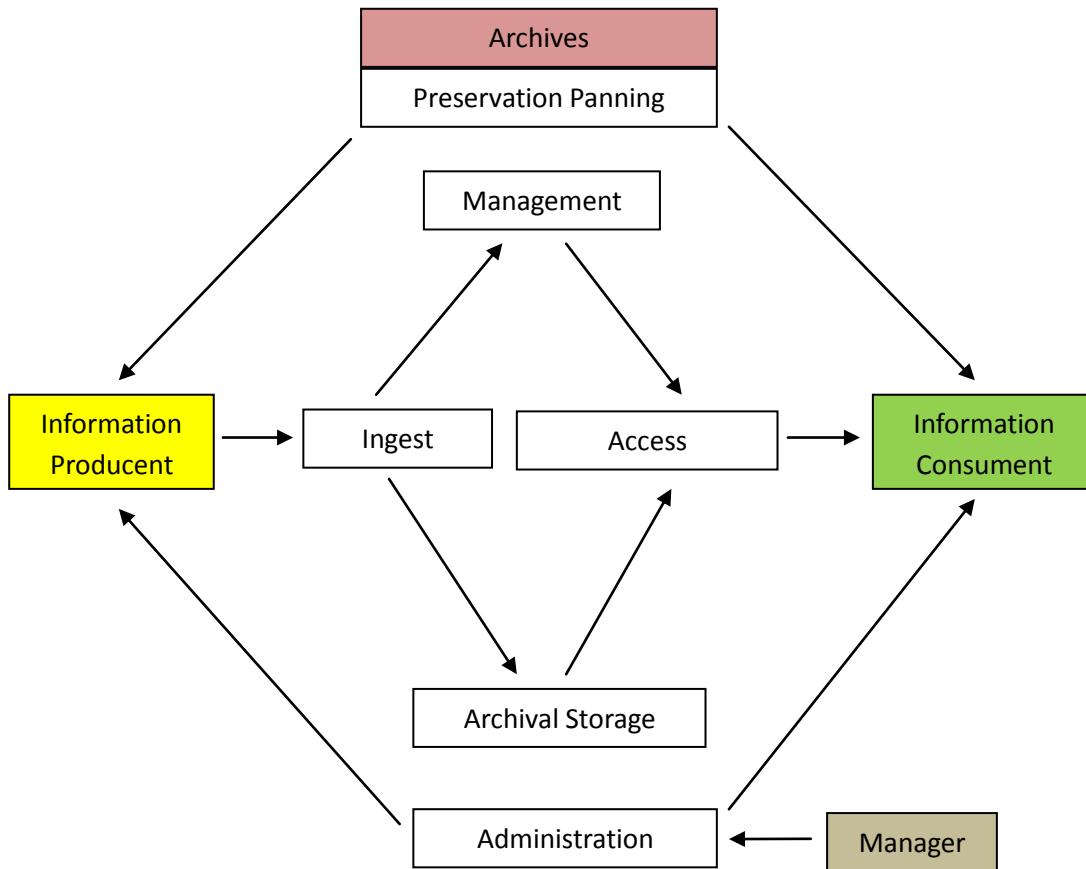
Scheme 4 Simplified functional OAIS model, from: Figure 4-1: OAIS Functional entities, Reference Model for an Open Archival Information System…, op. cit., pp. 4-1

The acceptance of records into a fully automated digital archive would procced as follows. The system informs an archivist that record creator X has prepared a new transfer list[490], which is available for analysis and appraisal. After the records on that list had been accepted or rejected, a message would be sent to the transfer list's sender, who would then send the records. If there were any reservations about the transfer, a submission information package could be sent automatically. Then an archivist would check the package receipt report and whether the records had been imported successfully, which would complete the records transfer process. A public agency would then receive confirmation of their acquisition. Further tasks, such as converting the records into safe formats, if this was not done before the transfer, and quaran-

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[490] A transfer list would be automatically generated by the electronic document management system at the the record creator's location once the system had calculated when records of potential historical value should be transferred to the relevant archives.

tining new data before uploading them to the repository, would also be performed automatically[491].

Timing of this activity would depend on communication between the archives and the public agency, the quantity of data transferred the speed of links on both sides, and the parameters of the transmitting and receiving infrastructure. Possible ways of submitting files are:

- on an external carrier: a pendrive, a flash disk, a magnetic disk (traditional hard disks) or an optical disk (CD, DVD, Blue-ray), which is one of the most popular solutions;
- FTP server[492];
- e-mail, by which only small amounts of data can be sent;
- via hosting server (data are uploaded to a hosting server for download to the repository)
- through a local network, to which entities sending/receiving data must belong.

Each of these methods would need to be properly secured against unauthorized access to the data, attempts to forge them by replacing them with false versions, and other risks associated with the electronic world, such as viruses, Trojan horses, etc[493].

Numerous issues arise for digital archives from the fact that they store records in the form of bitstreams. The first issue involves the selection of formats in which files, both digitized and born-digital, are to be saved. No ideal solutions have been worked out so far. There is a tencency to select open-source solutions and commonly used formats. Another method involves long-term preservation, based on the selection of formats and maintenance of IT infrastructure. One can choose any of these archiving methods, no one knows which is the best, as the technology is undergoing constant change. There are also financial aspects related to this issue. Despite falling prices of IT equipment and software, costs increase as increasingly advanced solutions are used and the amount of stored data grows rapidly. The costs of hiring specialists to support data archiving are also increasing[494].

It is important not only to supervise the development of digitization but also to actively participate in it. Archivists should have a real influence in shaping policy concerning the gen-

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[491] M. Manke, R. Wiese, *Aktenbewertung elektronisch – eine DOMEA – Lösung im Landeshauptarchiv Schwerin*, in *Archive im digitalen Zeitalter. Referate des 79. Deutschen Archivtages in Regensburg*, ed. H. Schmitt, Siegburg 2010, pp. 66-75.

[492] A communication protocol enabling the transfer of files to and from a data-sharing entity.

493 M. Mossek, *Problems of Depositing Electronic Records in State Archives and some Ideas for Solutions*, in *Archives in the New Age. The Strategic Problems of the Automatization of Archives information. Papers of the International Conference Warsaw, September 28-29, 2001*, A. Biernat, ed. W. Stępniak, Warsaw 2006, p. 53.

[494] M. Terschüren, op. cit., p. 14.

eration of documentation. They should also focus on new and current working tools used by clerks, as data collected in those tools may be significant for future generations[495].

In the process of creating electronic archives, especially in developing its model and strategy, one should take into account:

- cooperation with agencies that are to provide records, in order to agree on a common strategy of creating, processing and storing electronic documentation;

- standards, for creation of a digital archive, such as OAIS;

- description of records (descriptive, administrative, structural and provenance metadata);

- formats of files used for long-term preservation;

- possibility of the appearance of new, valuable types of electronic materials, which have not been intended for transfer to archives;

- technical issues related to the creation of electronic materials;

- keeping fonds provenance;

- deciding whether materials connected by hyperlinks (referring to born-digital materials), provided by other creators, will be preserved together with holdings;

- data authenticity and integrity;

- ensuring systematic transfer of records to the archives[496];

- creation of tools to extract information from records, particularly those saved in proprietary formats;

- procedures concerning public access;

- standardization of software used for creating future records;

- storage and related strategies;

- costs of the construction, maintenance and infrastructure management;

- training for employees (taking into account that new technologies will emerge regularly and will have to be learned);

- integration with descriptions of analogue records and their digital reproductions[497].

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[495] H. Bannasch, *Archive im Netzwerk der Büroautomation. Das Beispiel „Landessystemkonzept Baden-Württemberg"*, „Der Archivar" 1990, 1, [access: 17.02.2013], http://hdl.handle.net/2027/mdp.39015072446761, pp. 96-101; A. Menne-Haritz, *Büroautomation und Schriftgutverwaltung. Stand der Entwicklung und Konsequenzen für Archive*, „Der Archivar" 1990, 1, [access: 17.02.2013], http://hdl.handle.net/2027/mdp.3901507 2446761, p. 95; M. Mossek, op. cit., pp. 52-53.

[496] Electronic records should be transferred to archives without too much delay for technical reasons, as they may require timely conversion to newer/safer formats.

Digital archives have developed mainly in response to changes occurring in public agencies, which generate electronic documentation. A second factor in their development relates to the preservation of the Internet and to increasing interest in the digitization of analogue holdings and to the desire to preserve them and provide online access to copies, either directly on the Internet or in virtual reading rooms. The ideal concept of making all archival materials and inventories available online is still within the sphere of dreams, given present technological developments and the funds that archives have at their disposal[498].

Having discussed the present state of the development of digital archives, taking into account the current possibilities of modern technology, we turn to prospects for further development of a fully digital archives, which may go far beyond what has been presented here to include:

- an integrated technological solution that enables the storage, preservation, collection and management of archival information, including analogue, digitized and digital-born[499] holdings, as well as cooperation with agencies creating records, processing and providing access;

- a module for users, who could use records online throught to their individual accounts with relevant authorizations;

- an integrated electronic management of institutional processes, such as financial or personnel management and electronic document management, or database management in the future[500];

- an interoperability module enabling integration with other electronic services (archival and social networking portals, databases); in the future, it could be expanded with artifi-

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[497] M. Mossek, op. cit., pp. 53-54; T. Klüttig, *Strategies of German State Archives for the Preservation of Electronic Records,* in *Archives in the New Age. The Strategic Problems of the Automatization of Archives information. Papers of the International Conference Warsaw, September 28-29, 2001*, A. Biernat, ed. W. Stępniak, Warsaw 2006, pp. 56-58; M. Terschüren, op. cit., p. 17; M. Wettengel, *Überlieferungssicherung…*, op. cit., p. 36; A. Menne-Haritz, *Büroautomation und Schriftgutverwaltung. Der…*, op. cit., pp. 383-384.

[498] J. Kistenich, M. Wiech, op. cit., pp. 135-147.

[499] There is currently no complete integration of these three types of holdings. Many archives create one database that combines information on analogue holdings with information on digitized material, and another for born-digital holdings.

[500] The application of a database concept to public administration does not involve document circulation, but only the updating of public registers.

cial intelligence used to support of research and analysis of data collected in archives, and integrated with them[501].

Put simply, a digital archives would be a fully automated and intelligent creation, which would not only manage archival holdings, but also analyse them. It would accommodate other areas of an archives' activity, including personnel, finance, accounting, and the institution's entire operational base. Assuming that all records would be digitized, a traditional warehouse and a reading room would no longer be in active use, except in special situations, such as the inability of the IT system used for managing records to perform an activity that was not envisaged when the system was developed, or if access to original documents is required. Given the current state of IT development, one could create an intelligent system that could reproduce the present model of archives' operations and services. Even access to sensitive data can be provided remotely, as such a system could identify an authorized user and authenticate their access. Archivists working in such an archives would mainly control, analyse whether the system is functioning accurately and securely, and supervise public agencies creating records. By using artificial intelligence, sufficiently trained in the philosophy of records management, they would not be involved in processing and research, as they would receive ready results giving information on where to look for answers to inquiries. Their task would be to check whether the system has taken into account all possible and known places in which the required information is stored. One can make a very futurist assumption that IT systems will in the future be so advanced that they will perform analyses and provide answers based on the interpretations of sources.

6.2. Phases of archives development

Analysing the development of archives, one can identify four types[502]:

- archives of digitized materials;
- archives of born-digital records;
- automatic digital archives, which preserve and process data independently;
- intelligent digital archives, also called virtual archives[503].

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[501] M. Terschüren, op. cit., pp. 9-18; B. Ryszewski, *Problemy komputeryzacji archiwów*, Toruń 1994, pp. 70-81; H. Robótka, *System informacji...*, op. cit., pp. 11-26; idem, *Opracowanie...*, op. cit.; M. M. Tytko, *Archiwum wirtualne*, „Archiwista Polski" 1998, 3(11), pp. 13-31; W. Kasperkiewicz, op. cit., pp. 221-223; B. Rassalski, *W kierunku archiwów dnia jutrzejszego (część II)*, op. cit., p. 57; B. Matusiak, op. cit., pp. 475-479; H. Hollender, *Europeana – uwagi...*, op. cit.; A. Sobczak, *Archiwa i Europeana...*, op. cit.

[502] N. Bończa-Tomaszewski, *Podstawowe problemy archiwistyki cyfrowej*, in *Narodowe Archiwum Cyfrowe...*, op. cit., pp. 130-132.

Such a categorisation presents the full picture of the development of archives to be observed in Germany and worldwide. Consequently, it is better to classify the development of archives by development phases rather than by types of archives, as suggested by N. Bończa-Tomaszewski, although they may seem unrelated to each other at first glance. This arises from the fact that individual solutions come into existence together with the appearance of new records and technological developments. So far, archives have created separate warehouses for digitized and born-digital materials (documents, audiovisual materials, websites) and their descriptions, although a tendency towards their gradual integration is now evident. They will ultimately develop into a fully-automated, intelligent mechanism for managing archival holdings.

The first three types of archives can be recognized as development phases in the creation of a virtual archives (that is, the fourth type). A digital archives is supposed to collect digitized and born-digital records, together with their metadata, and should do so by automated and intelligent means so that ICT systems can take over as many tasks as possible and archivists will no longer create them manually.

However, at the beginning of the development of digital archives, databases containing archival information began to be built. Then warehouses of scans, born-digital records (documents, audiovisual materials: films, audio recordings) and websites were developed. These repositories are characterized by the dispersion and separation of holdings. Currently the tendency is to gradually develop tools that are ultimately expected to form an integrated archival information and records management system. This will make it much easier to manage holdings and perform research, as all data will be gathered in one place.

In Germany, three types of archives are encountered – of digitized materials, born-digital records, and selected websites (commonly called Internet archives).

Archives of digitized materials appeared first, as they were used for online presentation and providing access to scans. They include Digitales Bildarchiv, launched by Bundesarchiv, and Digitales Archiv des Thüringischen Hauptstaatsarchivs Weimar[504]. They have been mainly created to facilitate the access to archival materials, especially to photographs. Little signifi-

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[503] As well as preserving and processing records automatically, intelligent digital archives interpret information contained in records independently, thus representing an ideal type of archive. Because of its dependence on artificial intelligence, this ideal is not yet achievable.

[504] http://archive.thulb.uni-jena.de/ThHStAW/content/below/index.xml

For more see: U. Grandke, M. Lörzer, B. Post, *Kooperationsprojekt „Digitales Archiv Thüringen"*, „Archivar" 2008, 3, pp. 282-287.

cance has attached to long-term preservation, as the original records are also stored and can, if required, be scanned again, as the originators of the concept claim[505].

The second type of archives – those storing born-digital records – are not yet common in Germany. In 2003 the DFG-Arbeitsgruppe Informationsmanagement der Archive (working group of the DFG-Information Management in Archives) assessed this situation negatively in its report on the situation of archives in the era of information society[506]. Archives usually did not realize that they were also responsible for electronic records and, therefore, had neither the required knowledge nor IT infrastructure to take up this responsibility. National archives that do store born-digital records include Bundesarchiv, Landesarchiv Baden-Württemberg, Hessische Staatsarchive [507] and Brandenburgisches Landeshauptarchiv [508]. Those currently in the process of preparing them are Staatlichen Archive Bayerns [509], Niedersächsischen Landesarchiv[510] and Landesarchiv Nordrhein-Westfalen. Electronic records have not been published on the Internet so far, although Staatlichen Archive Bayerns, just like Landesarchiv Baden-Württemberg[511], provides access to lists containing basic information on them[512].

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[505] N. Bończa-Tomaszewski, *Podstawowe…*, op. cit., p. 130; W. Kasperkiewicz, op. cit., pp. 224-225.

[506] T. Klüttig et al, *Die deutschen Archive…*, op. cit., p. 28-36.

[507] A solution originated by Landesarchiv Baden-Württemberg is applied.

[508] I. Stahlberg, J. Homberg, *XML-basierte Archivlösung zur Übernahme und Verfügbarmachung elektronischer Daten und Dokumente, ein E-Governmentprojekt des Brandenburgischen Landeshauptarchivs*, [access: 1.11.2012], http://subs.emis.de/LNI/Proceedings/Proceedings133/gi-proc-133-005.pdf, pp. 25-30; I. Stahlberg, *XML-basierte Archivlösung zur Übernahme und Verfügbarmachung elektronischer Daten und Dokumente, ein E-Governmentprojekt des Brandenburgischen Landeshauptarchivs*, [access: 1.11.2012], http://www.staatsarchiv.sg.ch/home/auds/11/_jcr_content/Par/downloadlist_1/DownloadListPar/download.ocFile/Text%20Stahlberg.pdf, pp. 48-51.

[509] M. Kirstein, K. E. Lupprian, op. cit., pp. 43-47; K. E. Lupprian, *Die Archivierung digitaler Unterlagen der Verwaltung: Ein Projekt der Staatlichen Archive Bayerns, gefördert von der Deutschen Forschungsgemeinschaft*, [access: 1.11.2012], http://www.staatsarchiv.sg.ch/home/auds/10/_jcr_content/Par/downloadlist_2/DownloadListPar/DownloadListPar/download.ocFile/Text%20Lupprian.pdf (conference paper: 10. Tagung des Arbeitskreises „Archivierung von Unterlagen aus digitalen Systemen", 14.-15. März 2006, Düsseldorf) pp. 89-92; *Archivierung digitaler Unterlagen der Verwaltung. Ein Projekt der Generaldirektion der Staatlichen Archive Bayerns gefördert von der Deutschen Forschungsgemeinschaft 2002-2005. Schlussbericht*, 11 p., [access: 1.11.2012], http://www.gda.bayern.de/projekte/DFG-Archivierung.pdf.

[510] This institution began by preserving mainly carriers and data saved on them rather than information. The contents of portable memory devices are temporarily uploaded on a server to make their management and access easier, but this is only a provisional solution and changes to this concept are being discussed.
B. Kehne, *Das niedersächsische Modell für die Archivierung elektronischer Daten*, [access: 1.11.2012], http://www.staatsarchiv.sg.ch/home/auds/06/_jcr_content/Par/downloadlist_3/DownloadListPar/download_3.ocFile/Text%20Kehne.pdf (conference paper: 6. Tagung des Arbeitskreises „Archivierung von Unterlagen aus digitalen Systemen", 5.-6. März 2002, Dresden).

[511] A list of available electronic inventories of archival holdings acquired by this archives: [access: 22.09.2012]: http://www.landesarchiv-bw.de/web/50811; B. Martin-Weber, *Erschließung und Nutzbarmachung Digitalem Unterlagen im Bundesarchiv*, [access: 1.11.2012], http://www.staatsarchiv.sg.ch/home/auds/05/_jcr_content/Par/downloadlist_0/DownloadListPar/download_4.ocFile/Text%20Martin-Weber.pdf (conference paper: 5. Tagung des Arbeitskreises „Archivierung von Unterlagen aus digitalen Systemen", 5.-6. März 2001, München), pp. 69-70; T. Klüttig et al, *Die deutschen Archive…*, op. cit., pp. 28-29.

[512] *Maschinenlesbare Dateien des Bundesarchivs – Datenbestandskatalog*, Koblenz 2003, [access: 1.11.2012], http://www.bundesarchiv.de/imperia/md/content/abteilungen/abtb/14.pdf.

It is assumed that the Bundesarchiv has the widest experience with electronic records, as it started to acquire electronic data as early as in 1976, and continued to do so 20 years later after the former German Democratic Republic reunited with the Federal Republic of Germany. In the 1990s, an archiving plan[513] was worked out and data-reading attempts were made. The Bundesarchiv focused mainly on statistics from the 1970s. Many data could only be read with the use of sample forms and surveys that explained the meaning of individual values recorded using difficult to understand data sequences without a clear context. An electronic archives was established between 2006 and 2011. Over a similar period, in Lower Saxony, decisions on the preservation of 'data on automatic processing carriers' were made[514], while in Baden-Württemberg, DIMAG (Digitales Magazin (Digital Warehouse)) was tested.

Electronic archives are usually created according to the previously mentioned OAIS model, which is adjusted to the needs of the specific methodological solutions that are applied. Systems used for electronic archiving take into account metadata standards, as well

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[513] It defines preservation principles, that is, a policy concerning formats, data carriers, double safety of storage on various carriers, warehousing as well as copying and migration related to the preservation of electronic holdings. U. Rathje, *Technisches Konzept für die Datenarchivierung im Bundesarchiv*, 6 p., [access: 1.11.2012], http://www.bundesarchiv.de/imperia/md/content/abteilungen/abtb/1.pdf; idem, *Archivierung von DDR-Daten im Bundesarchiv – ein Rückblick auf zehn Jahre*, „Historical Social Research" 2003, 1-2, [access: 1.11.2012], http://hsr-trans.zhsf.uni-koeln.de/hsrretro/docs/artikel/hsr/hsr2003_563.pdf.

[514] K. Huth, K. Schroeder, *Vom Piloten in den Produktivbetrieb - Das „Digitale Archiv" des Bundesarchivs*, [access: 27.10.2012], http://www.bundesarchiv.de/imperia/md/content/bundesarchiv_de/fachinformation/schroeder_huth_fruejahrstagung_vda_224_koblenz.pdf (conference PowerPoint: 12. Tagung des Arbeitskreises „Archivierung von Unterlagen aus digitalen Systemen", 21.-22.04.2008, Koblenz); T. Klüttig, *Strategies...*, op. cit., pp. 56-59; M. Wettengel, Archivierung…, op. cit., [access: 29.10.2012], pp. 223-227; B. Reiß, *Von EBCDIC nach XML: Das neue Konvertierungsprogramm des Bundesarchivs zur Migration von Altdaten*, in *Digitales Verwalten – Digitales Archivieren*, series: Veröffentlichungen aus dem Staatsarchiv der Freien und Hansestadt, v. 19, Hamburg 2004, eds. R. Hering, U. Schäfer, pp. 83-86; U. Rathje, *Daten der Staatlichen Zentralverwaltung für Statistik der DDR im Bundesarchiv – Bewertung, Übernahme, technische Bearbeitung und Benutzung*, [access: 29.10.2012], http://www.staatsarchiv.sg.ch/home/auds/06/_jcr_content/Par/downloadlist_2/DownloadListPar/downloadListPar/download_9.ocFile/Text%20Rathje.pdf (conference paper: 6. Tagung, 5.-6. März 2002, Dresden), pp. 1-11; A. Hänger, K. Ernst, *Ein System – zwei Lösungen. Digitale Archivierung im Bundesarchiv und im Stadtarchiv Stuttgart*, in *Archive im digitalen Zeitalter. Referate des 79. Deutschen Archivtages in Regensburg*, ed. H. Schmitt, Siegburg 2010, pp. 77-78, 80-81; Ch. Keitel, *Elektronische Archivierung...*, op. cit., p. 117; M. Hollmann, *Das „Digitale Archiv" des Bundesarchivs. Die Archivierung genuin elektronischer Unterlagen im Bundesarchiv*, [access: 31.10.2012], http://www.bar.admin.ch/aktuell/00568/00702/00861/01572/?lang=fr&download=NHzLpZeg7t,lnp6I0NTU042l2Z6ln1ae2IZn4Z2qZpnO2Yuq2Z6gpJCDdn96gGym162epYbg2c_JjKbNoKSn6A--; K. Schroeder, *Das „Digitale Archiv". Möglichkeiten für den individuellen Umgang mit Massendaten*, „Mitteilungen aus dem Bundesarchiv" 2008, 1, [access: 15.08.2012], http://www.bundesarchiv.de/imperia/md/content/bundesarchiv_de/oeffentlichkeitsarbeit/fach-publikationen/mitteilungenausdembundesarchiv/heft_1-2008__16._jahrgang.pdf; *Digitale Überlieferung im Bundesarchiv* [online], [access: 1.11.2012], http://www.bundesarchiv.de/fachinformationen/00991/index.html.de; U. Rathje, *Technisches Konzept...*, op. cit., p. 1; B. Martin-Weber, *Erschließung und Nutzbarmachung...*, op. cit., pp. 69-76; B. Kehne, op. cit.; M. Wettengel, *Zur Rekonstruktion...*, op. cit., pp. 735-748.

as regulatory provisions for the creation of documents by public agencies, and feature modules for accessioning, managing and providing access to records[515].

DIMAG, which was developed in Germany as the first project of its kind, serves as an example of a typical electronic archives project. It came into existence in the Landesarchiv Baden-Württemberg and has recently been advanced in cooperation with Hessische Staatsarchive. It was created in three phases between 2002 and 2008. First, electronic documents produced by public agencies supported by the archives were analysed. When it became clear what kind of data would be handled in the future, software for the acquiring and registering documents was prepared, coinciding with the accessioning of the first electronic records[516]. During the subsequent phase, an access module was developed and the range of file formats supported was expanded. DIMAG currently consists of modules for appraisal, collection, processing, and access. In the future, thanks to cooperation with other archives, the accession and preservation of records and the reuse of metadata is to be automated. The structure of an electronic warehouse is the same as of the traditional one. Research can be performed by moving through the structure of an archives, by fonds, units or items, and its properties, that is, technical meta-

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[515] N. Hoppe, *Das Digitale Archiv des Bundesarchivs. Lösungsarchitektur*, [access: 27.10.2012], http://www.staatsarchiv.sg.ch/home/auds/13/_jcr_content/Par/downloadlist_1/DownloadListPar/download_14.ocFile/Praesentation%20Hoppe.pdf (conference PowerPoint: 13. Tagung des Arbeitskreises „Archivierung von Unterlagen aus digitalen Systemen", 27.-28.04.2009, St. Gallen), pp. 4-5; *Das Digitale Archiv des Bundesarchivs*, [access: 31.12.2012], http://www.bundesarchiv.de/imperia/md/content/bundesarchiv_de/fachinformation/information/informationstechnologie/digitalesarchiv/brosch_re_das_digitale_archiv_des_bundesarchivs_stand_august_2011.pdf (leaflet); *Leitfaden Aussonderung digitaler Unterlagen und deren Archivierung im Bundesarchiv*, 2010, [access: 31.12.2012], 37 p., http://www.bundesarchiv.de/imperia/md/content/abteilungen/abtb/bbea/behoerdenleitfaden-v1.2-2010-08-27-internet.pdf; P. Schieber, *Das digitale Archiv der hessischen Staatsarchive: ein Werkstattbericht*, „Archivar" 2011, 1, [access: 23.02.2013], http://www.archive.nrw.de/archivar/hefte/2011/ausgabe1/ARCHIVAR_01-11_internet.pdf, pp. 74-75; K. Huth, K. Schroeder, *Projekt „Aufbau eines Digitalen Archivs" im Bundesarchiv Werkstattbericht über den „individuellen" Umgang mit Massendaten*, [access: 1.11.2012], http://www.staatsarchiv.sg.ch/home/auds/11/_jcr_content/Par/downloadlist_1/DownloadListPar/download_16.ocFile/Text%20Huth%20Schroeder.pdf (conference paper: 11. Tagung des Arbeitskreises „Archivierung von Unterlagen aus digitalen Systemen", 20.-21. März 2007, Stuttgart), pp. 42-46; N. Brübach, *OAIS...*, op. cit.

[516] The archives began to acquire electronic records in 2002. Electronic censuses from 1961–1970 were the first to be transferred. K. Huth, K. Schroeder, *Projekt „Aufbau eines Digitalen Archivs" im Bundesarchiv. Werkstattbericht über den „individuellen" Umgang mit Massendaten*, [access: 28.02.2012], http://www.staatsarchiv.sg.ch/home/auds/11/_jcr_content/Par/downloadlist_1/DownloadListPar/download_4.ocFile/Praesentation%20Huth%20Schroeder.pdf (conference PowerPoint: 11. Tagung des Arbeitskreises „Archivierung von Unterlagen aus digitalen Systemen", 20.-21.03.2007, Stuttgart).

data. Data acquisition is based on importing an archival package, as specified in the OAIS model, containing metadata and records[517].

Screenshot 23 DIMAG screen for access by archives structure, [access: 12.11.2011],
http://www.landesarchiv-bw.de/web/44348

The third type of archives are those that focus on web archiving. The German National Library has ultimate responsibility for archiving selected websites in Germany, but it does not include websites at the regional and local level. At present, only three state archives collect the websites of selected institutions from their area of activity: Landesarchiv Baden-Württember[518], Landeshauptarchiv Rheinland-Pfalz and Landesarchiv Nordrhein-Westfalen[519].

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[517] Ch. Keitel, *Die Archivierung elektronischer Unterlagen in der baden-württembergischen Archivverwaltung. Eine Konzeption 12.6.2002*, [access: 12.07.2011], http://www.landesarchiv-bw.de/sixcms/media.php/25/keitel_elektronische_konz.pdf, p. 46; idem, *Automated Metadata Extraction and the Long Way to Significant Properties DIMAG and IngestList at the Landesarchiv Baden-Württemberg* [online], [access: 9.07.2011], http://metadaten-twr.org/2010/01/28/automated-metadata-extraction-and-the-long-way-to-significant-properties/; idem, *Digitale Archivierung beim Landesarchiv Baden-Württemberg*, „Archivar" 2010, 1, [access: 11.08.2012], http://www.archive.nrw.de/Archivar/hefte/2010/ausgabe1/Archivar_1_10.pdf, pp. 19-26; Ch. Keitel, R. Lang, K. Naumann, *Handlungsfähige Archive. Erfahrungen mit der Bewertung und Übernahme digitaler Unterlagen,* in *Erfahrungen mit der Übernahme digitaler Daten. Bewertung, Übernahme, Speicherung, Datenmanagement*, series: Veröffentlichungen des Archivs der Stadt Stuttgart, ed. K. Ernst, Stuttgart 2007, p. 10; idem, *Konzeption und Aufbau eines digitalen Archivs. Von der Skizze zum Prototypen*, in ibid., pp. 35-41; *Dimag. Das digitale Magazin des Landesarchivs Baden-Württemberg*, [access: 15.07.2011], http://www.landesarchiv-bw.de/sixcms/media.php/120/42596/Dimag_Archivtag2007.pdf, pp. 1-13; A. Sobczak, *Zarządzanie e-archiwaliami na przykładzie Landesarchiv Baden-Württemberg*, in *Biblioteka Zarządcy Dokumentacji. Współczesna dokumentacja urzędowa*, ed. H. Robótka, Toruń 2011, pp. 187-194; *Landesarchiv Baden-Württemberg. Projekt „Konzeption für ein digitales Landesarchiv". Metadaten für die Archivierung digitaler Unterlagen. AZ:V-7511. 9-5/Kei, Lg, Nau Stand: Dezember 2008*, 15 p., [access: 15.07.2011], http://www.landesarchiv-bw.de/sixcms/media.php/120/48392/konzeption_metadaten10.28354.pdf; P. Schieber, *Das digitale Archiv…*, op. cit., pp. 74-78; *Archivierung digitaler Unterlagen* [online], [access: 9.07.2011], http://www.landesarchiv-bw.de/web/46231; Ch. Keitel, R. Lang, *DIMAG und IngestList. Übernahme, Archivierung und Nutzung von digitalen Unterlagen im Landesarchiv Baden-Württemberg,* in *Archivische Informationssysteme in der digitalen Welt*, eds. G. Maier, T. Fritz, Stuttgart 2012, series: Werkhefte des Staatlichen Archivverwaltung Baden-Württemberg Serie A/23, pp. 53-63.

[518] www.boa-bw.de

In Baden-Württemberg, web archiving was initiated in 2002, when an agreement on the preservation of electronic publications between state archives, state libraries and a local computer centre was concluded. The creation and implementation of the project of BOA (Baden-Württembergisches Online-Archiv)[520] was made possible by support from the Ministry of Science and Arts.

Websites began to be collected in 2006[521] on the initiative of the archives. Previously, the focus was on the preservation of collected electronic publications. A website is not a typical publication, although it has recently been treated as such in order to exercise the legal deposit provisions of copyright which require libraries to collect copies of websites. However, it is not a good strategy, as the Internet fulfils social functions that are completely different from those of a publication.

When selecting websites to be collected, the Landesarchiv Baden-Württemberg limited its scope to sites of state-owned institutions and enterprises, taking into account also those dedicated to various projects and initiatives with different Internet addresses from those of the entities that organized them. So far, copies have been made twice a year, but the possibility of using tools that will enable the assessment of whether copies should be made more frequently by measuring changes in websites is also under consideration. However, as K. Naumann claims, this will not happen very soon, although such a mechanism would make the archiving process much easier and would provide better quality electronic materials for researchers. The Internet undergoes constant change, which makes it difficult to archive other than at regular intervals[522].

The possibility of providing free access to enable users to get to the information they are searching for is very important. Searching through the holdings of an online archives (using a simple search (entering the name of an entity that owns a website) or an advanced search (using metadata, for example by title, persons, subject areas)) or browsing them (by type of records

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[519] K. Naumann, *Gemeinsam stark. Web-Archivierung in Baden-Württemberg. Deutschland und der Welt*, „Archivar" 2012, 1, [access: 7.10.2012], http://www.archive.nrw.de/Archivar/hefte/2012/ausgabe1/Archivar_1_2012.pdf, p. 37; L. Derfert-Wolf, *Archiwizacja Internetu – wprowadzenie i przegląd wybranych inicjatyw*, „Biuletyn EBIB" 2012, 1, http://www.nowyebib.info/biuletyn/archiwum-numerow/916-ebib-12012-1283, pp. 15-16; V. Zahnhausen, *Das Digitale Archiv des Bundesarchivs – ein aktueller Überblick*, „Mitteilungen" 2012, 1, [access: 30.07.2012], http://www.bundesarchiv.de/imperia/md/content/bundesarchiv_de/oeffentlichkeitsarbeit/fach-publikationen/mitteilungen_1-2012.pdf, pp. 30-35.

[520] BOA: http://www.boa-bw.de/, Internet archives: http://la.boa-bw.de/menu.do?start.

[521] This is not the oldest Internet archiving initiative in Germany. Several years earlier, work began on an online archives for the Bundestag.
A. Ullmann, *ARNE – Archivierung von Netzressourcen des Deutschen Bundestages*, in *nestor Handbuch. Eine kleine Enzyklopädie der digitalen Langzeitarchivierung*, H. Neuroth et al, 2nd edition, Boizenburg 2009, [access: 8.10.2012], http://nbn-resolving.de/urn/resolver.pl?urn=urn:nbn:de:0008-20090811996, p. 23.

[522] K. Naumann, *Gemeinsam…*, op. cit., pp. 38-41.

or by Dewey Decimal Classification), one can encounter 100 systematically archived websites of various institutions operating within the state[523].

Screenshot 24 BOA Internet Archives, [access: 29.10.2012], http://la.boa-bw.de/menu.do?start

To sum up, it can be observed that German archives are increasingly digital, but they are far from providing a wide range of electronic services related to managing holdings and enabling access to them. Users can visit websites and web portals, where they can obtain information about an archives and its holdings and their reproductions. By maintaining customer orientation, the scope and quality of provided services will improve. However, if there is no technical revolution, both in mass digitization and in archiving of born-digital materials, it is unlikely that all holdings of archives will be digitized and made available to users online in this century. Consequently, some archivists suggest that a virtual archives should by recognized as one that offers archival descriptions at the level of a unit for all holdings and contains selected digital reproductions and representations of born-digital records. Such a concept could be adopted to some extent, but it would have to be treated as a form of a quasi-virtual archives, as it would not have all the features mentioned above as defining a virtual archives.

Current trends presented in digitization strategies and literature related to this subject show that information management systems will be increasingly integrated with various kinds of records, in order to become one central tool. The example of HADIS software used by archives in Hesse illustrates this. It has been developed from an archival description pro-

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[523] A. Brown, op. cit., pp. 127-129.

gram, through the management of users and holdings, searching and ordering, to a tool that makes it possible to provide access and cooperate with an electronic archives[524].

Archivists are increasingly interested in the IT solutions used by the public agencies that they support, in order to work out digital archiving methods. They also try to develop digital archives cooperatively; the example of cooperation between the state archives of Baden-Württemberg and Hesse show that it brings positive results[525].

6.3. Digital archives

Digital archival materials can be divided into digitized materials and born-digital records. The former include the products of the digitization process and include mainly scans of records, as well as audiovisual recordings. In Germany, this kind of materials is called *Digitalisat*. Born-digital records, on the other hand, are items originally produced as electronic records. German archivists have not been particularly interested in defining them. A. Ullmann attempted to analyse the terminology of born-digital records and she found the following terms in source literature: 'machine-readable data' (*maschinenlesbare Daten*), which was later replaced by 'digital data' (*digitale Daten*), 'digital' or 'electronic' documents (*digitale/elektronische Unterlagen*) and 'records' (*elektronisches/digitales Archivgut*) or 'documents from digital systems' (*Unterlagen aus digitalen Systemen*). In order to be consistent, one should also mention 'electronic systems', although, what is interesting, they do not appear in literature. The list can be expanded with 'automatically generated file' (*automatisiert geführte Datei*), 'automatic file' (*automatisierte Datei*), and 'electronic form of documents' *(elektronische Form Unterlagen)*. At the beginning of the 21st century, B. Martin-Weber suggested that the term 'digital archival object' (*digitales Archivobjekt*) should be introduced, but this expression has not become popular among archivists. According to A. Ullmann, an IT term, 'files', could be used to refer to records. They can be divided into text, audiovisual or graphic files. Using the word 'files', one does not have to add an adjective defining the origin of files, as it is obvious that they are electronic. This approach, which could be recognized as logical and introducing a natural, commonly used internal classification of archival materials, has not been adopted by archivists. However, the scope of the term 'files' does not cover archived websites. A. Ull-

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[524] J. Kistenich, M. Wiech, op. cit., pp. 135-147; C. Reinicke, *Landesarchiv NRW Personenstandsarchiv Brühl: Auf dem Weg zum digitalen Lesesaal*, „Archivar" 2007, 2, [access: 22.02.2013], http://www.archive.nrw.de/archivar/hefte/2007//Archivar_2007-2.pdf, p. 150; P. Schieber, *Das digitale Archiv…*, op. cit., pp. 74, 76; M. Kirstein, K. E. Lupprian, op. cit., p. 44.
[525] T. Klüttig et al, *Die deutschen Archive…*, op. cit., 33-34.

mann suggests that they should be referred to as 'online resources' (*Netzressourcen*), which would distinguish them from online publications (*Netzpublikationen*) collected by libraries. It should also be mentioned that librarians try to treat websites as publications, as this solves numerous problems with controversial legal issues related to the possibilities of archiving them[526].

The most general definition of electronic records describes them as data that are stored, transferred and processed by computers in the form of a code that is understandable only by computers. In order to use them, people must be equipped with special devices that are able to read them[527].

The rest of this section of the chapter is focused only on born-digital records. According to the *Charter for the Preservation of Digital Heritage*, they include 'texts, databases, still and moving images, audio, graphics, software and web pages', which can be saved in various file formats. Groups of electronic materials that are most frequently found in archives are electronic records (mainly in the form of documents), databases and websites created by public institutions. In the near future, geodata and e-mails, which are slowly starting to be archived, will be added to this group. One cannot exclude the probability that other types of data will appear in the future[528].

According to information in source literature, the oldest German electronic records include data from 1961 census carried out in Baden-Württemberg, which was part of the first population census in the BRD. Bundesarchiv's collections date back to the 1970s and the remnants of the DDR administration[529].

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[526] S. Ross, *Przesiadka w WIGAN…*, op. cit.; A. Ullmann, *Bewährt oder überholt? Archivarische Prinzipien und Arbeitsmethoden vor dem Hintergrund digitaler Überlieferung*, „Archivar" 2003, 2, [access: 22.02.2013], http://www.archive.nrw.de/archivar/hefte/2003/Archivar_2003-2.pdf, p. 118; idem, *Thesen zur Archivierung von Netzressourcen, series: Veröffentlichungen aus dem Parlamentsarchiv des Deutschen Bundestages*, [access: 14.10.2012], http://www.bundestag.de/dokumente/parlamentsarchiv/oeffent/ThesenArchivierungNetzressourcen.pdf, p. 1.

[527] L. A. Millar, *Archives. Principles and practices, series: Principles and Practice*, in *Records Management and Archives*, London 2010, p. 206.

[528] T. Klüttig, *Zur Bewertung…*, op. cit., pp. 40-42; M. Zuchet, *Pilotprojekte zur Email-Archivierung im Archiv der sozialen Demokratie*, [access: 28.10.2012], http://www.staatsarchiv.sg.ch/home/auds/16/_jcr_content/Par/down http://www.staatsarchiv.sg.ch/home/auds/16/_jcr_content/Par/downloadlist_2/DownloadListPar/download_9.ocFile/Praesentation%20Zuchet.pdf (conference PowerPoint: 16. Tagung des Arbeitskreises „Archivierung von Unterlagen aus digitalen Systemen", 13.-14.03.2012, Ludwigsburg); K. Naumann, *Dauerhafte Erhaltung von Geobasisdaten – ein Rundflug*, [access: 11.08.2012], http://www.staatsarchiv.sg.ch/home/auds/16/_jcr_content/Par/downloadlist_2/DownloadListPar/download.ocFile/Praesentation%20Naumann.pdf (conference PowerPoint: 16. Tagung des Arbeitskreises „Archivierung von Unterlagen aus digitalen Systemen", 13.-14.03.2012, Ludwigsburg); V. Zahnhausen, *Das Digitale…*, op. cit., pp. 32-34; Ch. Keitel, *Digitale Archivierung…*, op. cit., p. 24; P. Schieber, *Das digitale Archiv…*, op. cit., p. 74.

[529] K. Naumann, *Älteste digitale Archivquelle der Bundesrepublik gesichert: Daten der Volkszählung von 1961 für das Land Baden-Württemberg übernommen und aufbereitet*, „Archivar" 2007, 1, p. 53; K. Huth, K. Schroeder, *Projekt…*, op. cit., p. 42.

By the 1960s, archivists from the BRD were thinking about the impact of electronic data processing on the preservation and storage of archival holdings. Topics discussed at conferences and in publications were related to strategies, life-cycle and kinds of records, as well as a broad understanding of their care[530]. Even back in the 1960s the first ideas about electronic data archiving appeared in the form of computer printouts or microfilms. However, the prospect of archiving data from computer-generated population censuses and mortgage registers of the 1970s induced a change of approach. Further analyses made by the ARK showed that records facilitate research because of their function and should therefore, be preserved in their native form. At first, the Bundesarchiv suggested that it should acquire all materials, but federalist tendencies caused this idea to be abandoned. Similar problems were encountered by archives in the DDR, but they were focused more on finding an appropriate, highly durable carrier. Practical attempts to solve the problems of electronic records were not, however, begun until the 1990s[531].

German public agencies have undergone considerable change in the recent decades as far as the automation of work and information management is concerned. Many of them implemented various kinds of software for calculation, statistics, text creation, e-mail management, registering, journaling and collecting geographical data, and document management. The use of so much disparate and diverse software poses a considerable challenge for the preservation of materials in state and federal archives. Possible solutions include the implementation of a comprehensive approach at all levels of the state administration and such an approach was planned in Baden-Württemberg as early as the mid 1980s but not implemented because of its high cost. Public administration is currently undergoing further serious change related to the integration of systems to support electronic records management. In 2005, guidelines entitled *Dokumentenmanagement und elektronische Archivierung im IT-gestützten Geschäftsgang* (DOMEA) (Document Management and Digital Archiving in IT-

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[530] Care of digital archives is now called 'digital curation'. For more information see, for example, R. Harvey, *Digital Curation. A How-To-Do-It Manual*, London 2010, 225 p.

[531] A. Menne-Haritz, *Büroautomation und Schriftgutverwaltung. Der…*, op. cit., pp. 383-393; A. Ullmann, *Der EDV-Ausschuß…*, op. cit., pp. 599-600; T. Klüttig, *Strategies…*, op. cit., pp. 56-59; Ch. Keitel, *Elektronische Archivierung…*, op. cit., pp. 115, 117, 120-125; idem, *Digitale Archivierung…*, op. cit., p. 19; *Dimag. Das digitale Magazin…*, op. cit.; idem, Ch. Keitel, *Die Archivierung…*, op. cit., pp. 7-8; E. Suckow, op. cit., pp. 189-190; H. Weiß, op. cit., pp. 83-85; P. Kaufmann, op. cit., pp. 63-64; *Archivwesen der Deutschen…*, op. cit., p. 182; B. Lißner, op. cit., pp. 172-173.

supported Processes) were worked out, which were supposed to support informatization in public agencies[532].

Three scenarios for preserving electronic records are commonly understood. In the first scenario, it would be done by records creators and an archives would act as a consultant and supervisor ensuring proper performance. In the second scenario, digital preservation would be outsourced as an online service, and in the third an archives would accession records and be responsible for their preservation. After experiments, the first scenario was rejected by the originators because it involved too much risk of losing valuable data if an records creators did not perform their tasks for financial reasons or did not follow records security principles. The two remaining solutions are popular in Germany, at present, it is principally archives that collect and take care of holdings. Outsourcing of archiving services is just being developed and is intended mainly for low-budget archives, which will not be able to take care of their digital holdings themselves. Such an idea is being developed in cooperation with a local public computer centre in Baden-Württemberg. According to this concept, an archives shares its know-how and experience in the area of records management as well as software that it has developed for this purpose. A data centre is entirely responsible for IT safety and provides access to infrastructure. Such a solution was considered much earlier in a debate of the Electronic Data Processing Committee at the ARK, but was not applied until the 1990s because of legal issues related to the transfer of data to external entities[533].

T. Klüttig claims that Germany is a beginner in the area of digital holdings preservation. Ch. Keitel shares this opinion. Compared to Scandinavian and the United Kingdom, United States, Canada, Australia and New Zealand", one can observe a certain delay in the reaction to this challenging area. This is because of a lack of effort and action by the ARK and the entire archival community in Germany. Analysing the documentation of the Electronic Data Processing Committee, A. Ullmann noted that, throughout the 1980s and into the mid 1990s, there was discussion of whether electronic records should be stored in the analogue form, such as printouts, and if whether electronic archives were needed at all. It was not until 1994 that a set

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[532] M. Wettengel, *Überlieferungssicherung…*, op. cit., pp. 24-36; A. Menne-Haritz, *Optische und elektronische Speichermedien in der Verwaltung. Konsequenzen für Theorie und Praxis der Archive*, „Der Archivar" 1993, 1, [access: 17.02.2013], http://hdl.handle.net/2027/mdp.39015072446613, p. 70; H. Bannasch, op. cit., pp. 96-101; A. Menne-Haritz, *Büroautomation und Schriftgutverwaltung. Stand…*, op. cit., p. 89; idem, *Büroautomation und Schriftgutverwaltung. Der…*, op. cit., pp. 365-386; A. Ullmann, *Der EDV-Ausschuß…*, op. cit., p. 601; V. Zahnhausen, *Das Digitale…*, op. cit., pp. 31-32; *Das Digitale Archiv des Bundesarchivs* [online], [access: 31.10.2012], http://www.bundesarchiv.de/fachinformationen/00895/index.html.de; *DOMEA-Konzept* [online], [access: 17.02.2013], http://www.verwaltung-innovativ.de/cln_047/nn_684678/DE/Organisation/domea__konzept/domea__konzept/domea_koncept_node.html ?__nnn=true.

[533] L. A. Millar, op. cit., pp. 207-222; *Ochrona dziedzictwa cyfrowego…*, op. cit., pp. 21-53, 74-75.

of norms and standards concerning data carriers and the classification of software used in public administration, from which data should be archived, were introduced[534].

Electronic archives can be manipulated with the use of digital devices. They can be easily presented in any way and made available on numerous platforms at once to an unlimited number of users. They are easily created, changed, transferred and described, but with their flexibility comes certain risks. Their authenticity, integrity and long-term usability must be guaranteed. So far, no solutions that can guarantee total data security have been worked out, either in Germany or elsewhere in the world. The diversity of commonly used formats and system platforms constitutes a serious problem[535], and, unfortunately, hinders the planning of a long-term preservation strategy. That is why the Bundesarchiv recommends that file formats most commonly used by public agencies should be replaced with PDF/A or TIFF format and that the XML should be used for saving metadata, a view shared by the Staatlichen Archive Bayerns and the Landsarchiv Baden-Württemberg. Electronic records must be converted into safe formats early enough to ensure their continued usability, since the main purpose of archiving is to make records available to users. The issue of carriers on which records are stored is also important. Over the last few decades, the extensive development of data storage media, such as perforated tapes, magnetic tapes, floppy disks, CDs, DVDs, magnetic disks or flash disks can be observed. In the years ahead, other kinds of carriers will certainly appear, as specialists for data recording and collection continue to work on them. The problem of guaranteeing authenticity and data integrity and security should also be taken into account. Whatever approach is adopted needs to protect the entire environment against potential threats, such as hacking, modification attempts, theft, viruses and Trojan horses, as well as natural disasters and random incidents. A very important but rarely raised topic is guaranteeing the privacy of records creators and persons who are the subject of records. Their privacy must be ensured until access regulations permit publication of protected information, or indefinitely, if this is required by other regulations[536].

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[534] A. Ullmann, *Der EDV-Ausschuß…*, op. cit., p. 601; T. Klüttig, *Strategies…*, op. cit., pp. 56-59; Ch. Keitel, *Elektronische Archivierung…*, op. cit., pp. 115, 117, 120-125; idem, *Digitale Archivierung…*, op. cit., pp. 19; *Dimag. Das digitale Magazin…*, op. cit.; Ch. Keitel, *Die Archivierung…*, op. cit., pp. 7-8.

[535] Companies producing commercial solutions compete with each other in creating new formats that they consider the best, with no concern for their durability. Many similar products are incompatible for various reasons and recent versions of one format are not always fully compatible with earlier versions.

[536] Ibid, pp. 209-210; L. A. Millar, op. cit., p. 215; *Ochrona dziedzictwa cyfrowego…*, op. cit., pp. 40, 118-157; *Das Digitale Archiv des Bundesarchivs*, op. cit., http://www.bundesarchiv.de/fachinformationen/00895/index.html.de; K. Naumann, *Drei Minuten Digitale Bestandserhaltung*, [access: 29.09.2012], http://www.landesarchiv-bw.de/sixcms/_media.php/120/42098/Erhaltung_Archivtag2008_4_static.pdf; *Archivierung digitaler Unterlagen der Verwaltung…*, op. cit., pp. 4, 8; U. Rathje, *Technisches Konzept…*, op. cit.; I. Stahlberg, J. Homberg, op. cit., pp. 25-30; P. Gawrysiak, op. cit., pp. 328-329.

When preserving digital data, it is also important to preserve their context, so that archivists and potential users can interpret them. The best way of doing so is to use metadata containing a detailed description of the data, including their history[537].

Digital archiving involves costs related not only to establishing an archive, but also to its maintenance, which may increase over time. Every project for the preservation of electronic materials requires the specification of the entity that will implement it. Further preparation phases include risk analysis, to identify strong and weak points of an undertaking. It is also important to identify partners that may be interested in the programme or have a deciding influence on its operation, including creators, managers, distributors, users, and legislators, as well as the manufacturers of the equipment and software enabling the use of these materials and service providers that could perform some of the work involved. The duration and success of the project depends on financial liquidity, so costings and funding sources must be well-prepared. If possible, one should predict all expenses that may be incurred for several years. Costs can be generally divided into those related to human resources, to digital materials and to infrastructure. Few organizations are able to carry out a long and comprehensive programme for preserving digital items on their own, so working with partners, especially those in the private sector, can help. One cannot forget about using the experience of other initiatives and sharing ones own[538].

As far as the items to be preserved are concerned, they should be selected following consideration of the question of what is valuable from today's perspective and what will continue to be valuable for future generations. Such selection makes it possible to reduce the volume of material that is stored. Setting standards for the description of items and for formats in which they will be stored must also be done, together with specification of a preservation strategy, as was described in the section in Chapter 4 concerning preservation. The right to use the materials and provide access to them must also not be forgotten, as it is a very important issue requiring separate discussion and in-depth legal analysis[539].

German archivists are currently developing a preservation strategy for records, databases or websites, recognizing that the characteristics of each of these are very different so that they cannot be treated in the same way, although the general model for their preservation is identical.

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[537] L. A. Millar, op. cit., p. 215.
[538] *Ochrona dziedzictwa cyfrowego…*, op. cit., pp. 54-77, 87-97.
[539] Ibid, pp. 81-77, 98.

Changes are only introduced in tools that support selection, description and indexing, conversion to safe formats, preservation[540] and access[541].

Digital materials streamline certain processes of archives. They do not need to be processed, as most information is obtained in earlier phases of their lifecycle, if they have been produced by a management system or if relevant data have been collected outside the system. The records creator prepares metadata concerning the content, whereas technical metadata automatically supplements management systems. The situation is more difficult in the case of records created in a file system that contains no contextual information. In such a scenario, traditional methodology is applied in processing collected materials. The role of an archivist will be limited to the supervision and control of the proper performance of all activities. Thus they must become involved the moment that an institution supported by their archives decides to carry out informatization from scratch or to modernize its systems, so that they can jointly work out strategies that not only protect records when they are processed by their creators, but also enable their use after transfer to the archives. According to specialists dealing with the preservation and conservation of digital data, the best solution, given the state of today's technological development and a multitude of formats, is to select a limited number of formats and decide only on those that are the most durable or the easiest to store from today's perspective. Generally speaking, good and proven solutions should ideally be used in digital preservation, in which all potentially interested parties should actively participate[542].

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[540] In general, rules for the preservation of born-digital and digitized records are the same. The difference lies only in the approach to the problem, as at the present stage in the development of digitization and digital archiving, greater significance is attached to preserving born-digital materials, because of the conviction shared by many archivists that digitized records can be digitized again if the originals are kept. Unfortunately, this conviction is misguided, as, digitization may be the only way to preserve some records.

[541] A. Ullmann, *ARNE...*, op. cit., p. 28; Ch. Keitel, *Erste Erfahrungen mit der Langzeitarchivierung von Datenbanken,* in *Digitales Verwalten – digitales Publizieren*, eds. R. Hering, U. Schäfer, Hamburg 2004, pp. 71-81.

[542] *Das Digitale Archiv des Bundesarchivs*, op. cit.

Conclusion

This work, being a kind of a documentation of the epoch in which it was written, despite its focus on German examples, presents universal and common changes occurring with the growing use of IT solutions by archives throughout the world in recent decades. It is devoted to computerization, informatization, digitization and electronic records management. It is clearly evident that archives are increasingly focused on users' needs and on providing easier access to records, usually by publishing archival information on the Internet. This results from changes in the perception of an archivist's role in society.

On the basis of research results, one can observe that state archives in the BRD feel quite comfortable in the new conditions. Some of them have automated their services quickly, while others have done so more slowly. Among pioneers of the development of archival description standards, electronic finding aids, digitization, online presentation, and the long-term preservation of born-digital materials are the state archives of Baden-Württemberg and North Rhine-Westphalia, as well as the Bundesarchiv. The Bundesarchiv, especially since the unification of Germany, feels responsible for promoting and catalyzing modern solutions in archives.

In Germany, there is a very common tendency to observe at length developments in other countries and discussions on growing problems, as well as working out models and standards according to which the models are developed, before implementing the models. The long path to the acceptance of archival description standards, development of websites, and presentation of online inventories is adequate evidents of this tendency. However, the development level and available tools for financing projects by the DFG prove that such an approach works in the long run and guarantees slow, but very stable advancement in a particular direction. This approach involves a rational response to new challenges, but it also slows any reaction to the latest trends.

The previous experiences of German archives proved that the development of electronic services extended the circle of users beyond those in traditional reading rooms. Basic tools, such as databases, enable users to search the records of an archives before visiting it, and sample digitized fonds make it possible for them to check the contents of such records. Because results of Internet searches have displayed relevant results, archives are sometimes visited by casual users who would otherwise never have considered visiting. It also turns out that the customers of German archives prefer access to scanned records rather than to microfilms if they have the choice. They are also more willing to use them on the Internet, which enables them to limit the number of visits to an archives and gives them more freedom to carry out

research in convenient conditions and hours. In the distant future, the standard method of using records in a research room may, therefore, be replaced by electronic means of access.

One can observe particular tendencies in the perception of digitization in the BRD. It has become very popular among all state archives, although archivists are aware that, despite its practicality, the falling price of equipment and increasingly advanced technology, the process of digitizing archival holdings will take a very long time. Digitization is treated mainly as a means of facilitating the use of selected kinds of records (textual and cartographic records, photographs, posters) rather than as a long-term preservation method. It is treated as such only in the case of records that could be damaged because of their physical condition. Scans of records are made available not only on web portals of individual archives, but also on state, national and European portals shared by various archives and cultural institutions. Many archives digitize microfilms initially to avoid exposing records to possible damage and also for economic reasons, as it is a cheaper and faster method. Sometimes the scanning of microfilms, when the colour and appearance of records is not crucial for their interpretation, gives similar results, in terms of quality and comfort of use, to those produced from their direct digitization. M. Glauert calculated that within 10 years, scanning of microfilms would increase the digitized holdings of state archives by two and a half per cent more than scanning of originals[543]. He also attaches great importance to standards and workflow development in the digitization process. Scans of the country's most valuable original records are saved on microfilm, which is then stored in a specially prepared warehouse in Barbara drift. The development of the microfilm redigitization method is also an important achievement, in case scans were damaged or lost. Thanks to the support of the DFG, many projects for the digitization of archival heritage are being undertaken, covering retroconversion of inventories, as well as the scanning of records and preservation of the scans.

Great importance is attached to the quality of archival description and use of international standards. That is why interest in the retroconversion of finding aids is constantly increasing. The need to integrate archival information, including all kinds of representations of archival holdings, particularly scans, is also more and more often discussed. So far, only some archives combine their finding aids with digitized items. The integration of born-digital records is also marginal. Such works are carried out, for example, in Bundesarchiv or Landsarchiv Baden-Württemberg. With the popularity of readily availabe Web 2.0 tools, the involvement of online

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[543] M. Glauert, *Dimensionen der Digitalisierung…*, op. cit., p. 5.

communities that could support archivists by adding substantial content or tags to facilitate searching is considered more and more frequently.

A constant, but slow tendency to develop and maintain cooperation at the local, regional, state, national and European level can be observed, notably in projects that have been implemented that aim to consolidate finding aids and scans. According to the assumptions of the Fraunhofer IAIS, such projects will help solve problems arising from the development and further maintenance of a professional infrastructure for finding aids and for born-digital and digitized records. Archives cooperate increasingly with libraries and other cultural institutions, especially once they reach agreement on description standards for items that are to be presented on the Internet.

As mentioned in the Chapter 6, German archives are currently preparing to manage born-digital archival holdings and to modify previous policy on the acquisition of new kinds of archival materials, such as websites, databases and others that may appear in the future.

Their work in this area is indicative of the direction of changes occurring in managing archival holdings using of the latest IT tools. The example of the shows that the use of modern IT tools enables and facilitates the provision of better quality electronic services to users. One can observe that archives are ready to operate on the web and are aware of its importance as an element of their activity, particularly in shaping the role of archives as independent information brokers and building positive relations with society. So far, archives have been mainly focused on the documentation of the activity of the state and its citizens and on the development of social awareness of history. Digitization of records and finding aids makes it easier for archives to come out of hiding and win new users. It supports the preservation of holdings by making possible access to scans instead of to originals, and access to records, especially when they are published on the Internet. It facilitates the promotion of archival holdings on the Internet and makes the development of strategies for preserving digital reproductions necessary. In archives, almost all functions are supported electronically – from the accession and processing of scans, making them available through online and offline portals, to preservation.

Archival science needs to redefine currently used terminology and to introduce new terms thanks to the implementation of IT solutions. Questions arise about how to define the very basic issues, such as records that are composed of bits 'living' independently of their original environment, as well as: carriers, systems, and software. Archival fonds, which are increasingly hybrid, also deserve a new approach. There are also other issues. A fonds of a particular creator may be stored in various areas. The electronic component does not have an as-

signed place; its location on disks can be changed or can be stored on servers located at another end of a state or country or, in the future, maybe even Europe. In the digital world, there is also no division into copies and originals; all are identical. However, the question arises of how to set limits for fonds if electronic records have various forms and are often linked to other items. Taking other websites as an example, it is hard to find one that would not have a hyperlink to external sources of information. How to archive them? Should external materials be taken into account? Will material preserved without external links have the same value for researchers? What if the other party will not archive the material that the external links lead to? It can also happen that several entities will use a single system in which data are created, such as SIJUS (Siemens), a program for the administration of justice used by the police, the public prosecutor's office and courts of a particular state. It is obvious that it is the state archives should archive data created in SIJUS, but how are they to be treated in the context of *respect du fonds* if they are the output of three different creators? [544]

As well as these problems, there is a need to create new terms. The German term – *Digitalisat*[545] serves as an example. It refers to a digital reproduction that results from scanning an analogue original in any physical form: document, vinyl record, parchment etc. Less precise terms for these digital reproductions include: 'copy' (*Kopie*), 'digital form' (*digitale Form*), 'digital reproduction' (*digitale Abbildung*), and 'scan' (*Scan*). Archival science also adopts terms from other fields. Currently, most borrowings come from IT, for example, web crawling, meaning the creation of a website copy.

Archivists face numerous challenges also with respect to the appraisal and selection of born-digital holdings. There are also issues related to the management and use of records and their metadata. Mention should also be made of the issue of guaranteeing the authenticity and data integrity. Electronically saved information can be easily manipulated. Consequently, archivists and IT specialists cooperating with them must work out appropriate methods for preserving digital holdings[546].

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[544] M. Wettengel, *Überlieferungssicherung…*, op. cit., p. 34; N. Bończa-Tomaszewski, *Podstawowe…*, op. cit., p. 130; M. Herberger, *Herausforderung Informationsgesellschaft: Die Anwendung moderner Technologien im Zivilprozeß und anderen Verfahren* [online], [access: 25.02.2013], http://ruessmann.jura.uni-sb.de/grotius/english/Reports/brd.htm.

[545] The term Digitalisat is also used in German library science.

[546] *Wytyczne dobrej praktyki. Aplikacje…*, op. cit., pp. 155-179; A. Smith Rumsey, op. cit.; M. Deegan, S. Tanner, *Key issues in digital preservation*, in *Digital Preservation*, eds. M. Deegan, S. Tanner, series: Digital Futures Series, pp. 8-9; D. Giersberg, op. cit.; F. J. Ziwes, *Wikipedia und Co. statt Sisyphus? Konventionelle und digitale Hilfsmittel zur qualitativen Bewertung von Personalakten*, „Archivar" 2010, 2, [access: 22.09.2012], http://www.archive.nrw.de/Archive.nrw.de/Archivar/hefte/2010/ausgabe2/Archivar_2_10.pdf, pp. 177-178.

Another noticeable change occurring in archives is the departure from the traditional accession of archival holdings, which was intended to document the activity of a nation's public institutions. In the BRD, more and more significance is attached to people and materials are increasingly analysed to determine what will be of interest to archives' users. It is, however, very difficult to predict future research interests, so archivists seek the opinion of users more frequently about what items are worth collecting. In modern science, history, the social sciences, and other areas in which archival holdings are used in research, a very high level of research specialization can be observed. One solution to this problem would be to collect and store everything, which would be possible, theoretically and practically, in the virtual world and would lead to the archiving of all aspects of people's digital activity. In this scenario, however, questions immediately arise about the sense and real need of doing so, as well as legal issues. Consequently, archives will have to work out a compromise.

Moreover, archives are frequently turning to the idea of openness with respect to the electronic devices that are used and to holdings. Solutions based on open access, open software or open standards are commonly used, as they guarantee free access to archival materials (under relevant licences and agreements) and ensure independence from proprietary software and standards. As German experiences have shown, archives can create their own IT solutions, such as DIMAG, together with public computing centres. As a result, they can act as guarantors of the freedom of information and transparency of the processes of its creation, processing and management – a role that has not been fulfilled so far by archives to any great extent.

In the mid 1980s, archives were focused on their relationships with public agencies rather than users, but this is gradually changing. Archives are becoming service providers focused mainly on citizens. As a result, they are going beyond their traditional activity, which means that they must think about promoting their institution and educating present and future users, whether they be primary and secondary schoolchildren or adults (researchers, hobbyists, genealogists, lawyers, clerks). Numerous tools are used for these purposes: social media, education and entertainment zones on a website, online access to holdings and information about holdings.

However, from today's perspective, keeping up with IT developments and interpreting possibilities for applying the latest technologies to an institution's own purposes constitute the greatest challenge for all archives, not only German ones.

Because of current developments in the Internet and information society, German archives needs to be equipped with new tools. Every archives could have, as well as a properly

designed website or portal, a professional repository of databases and digitized and born-digital items that could be made available to users on the Internet. Additionally, new *freemium*[547] services should be introduced, which would include options for searching the holdings of other institutions from the level of a single archives, so that users do not have to conduct searchers in another website. It would also be advisable to assemble additional information on records from other sources (linked data), such as from Wikipedia, portals offering maps, dictionaries, electronic translators, etc. A response to the growing demands of archives' users might also be to introduce paid premium[548] services, such as translation of documents, downloading documents and ordering high-quality scans. Furthermore, businesses could be invited to develop such services. A modern archives should also be focused on engaging users and letting them create their own, profiled account that allows possibilities for integration with social networking websites, that would allow them to create lists of favourite records, generate contents (comments, tags) and contact with other users. The realization of these possibilities, with a focus on interoperability, would make it easier for researchers to use assets that have been collected by archives over the ages.
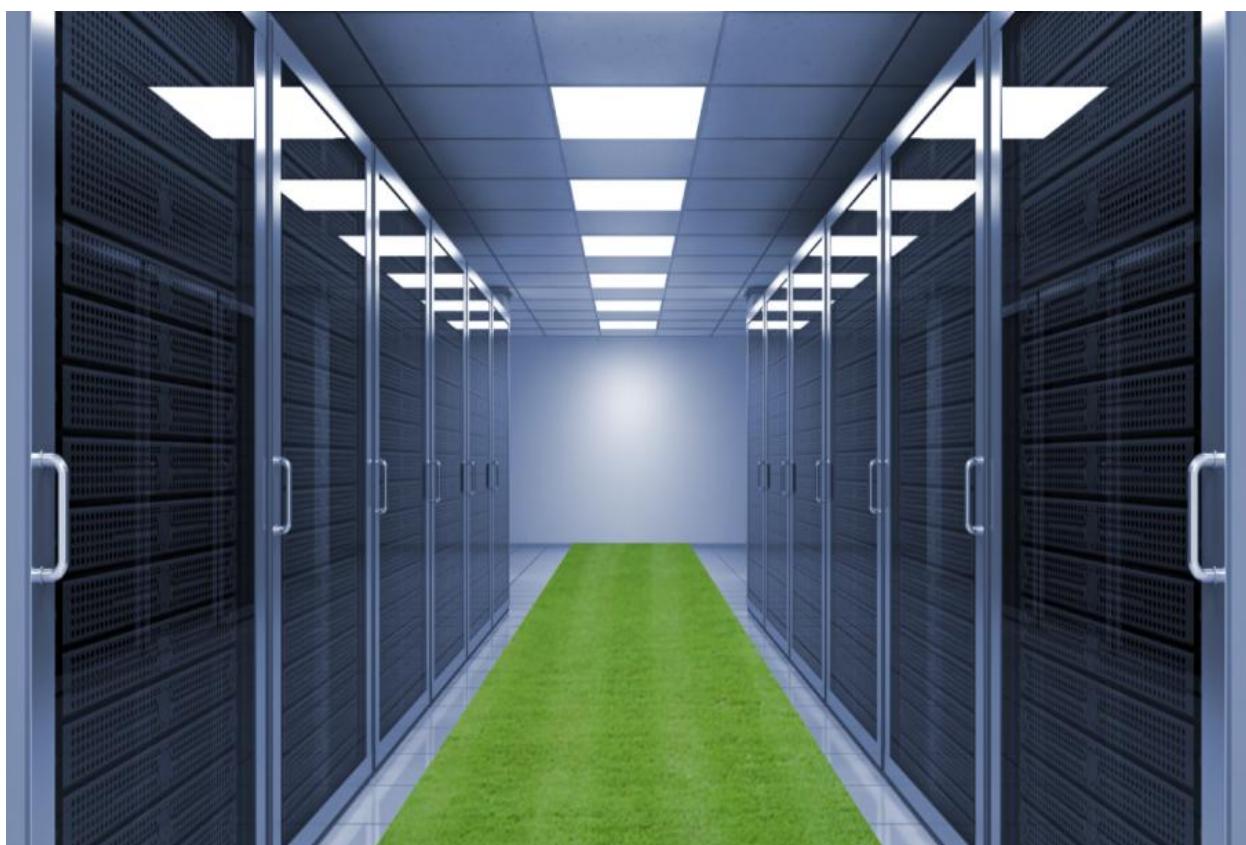
Illustration 16 A server room – what archives may look like in the future.

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[547] Basic services resulting from statutory tasks, which are provided free of charge.
[548] Additional services, going beyond basic ones, for which users must pay.

Lists

List of federal and state archives in Germany with Internet addresses

Archives	Website	Archival portal
Bundesarchiv	http://www.bundesarchiv.de/	Zentrale Datenbank Nachlässe: http://www.nachlassdatenbank.de Digitales Bildarchiv: http://www.bild.bundesarchiv.de Archivgut der Sozialistischen Einheitspartei Deutschlands, SED und des Freien Deutschen Gewerkschaftsbundes, FDGB: http://www.bundesarchiv.de/sed-fdgb-netzwerk Gedenkbuch Opfer der Verfolgung der Juden unter der nationalsozialistischen Gewaltherrschaft in Deutschland 1933-1945: http://www.bundesarchiv.de/gedenkbuch/index.html Online-Version der Edition Akten der Reichskanzlei Weimarer Republik: http://www.bundesarchiv.de/aktenreichskanzlei/1919-1933/0000/index.html Online-Version der Edition „Die Kabinettsprotokolle der Bundesregierung": http://www.bundesarchiv.de/cocoon/barch/0000/index.html
State Archives		
Baden-Württemberg	http://www.landesarchiv-bw.de	www.archive-bw.de
Bavaria	http://www.gda.bayern.de	www.archive-in-bayern.de
Berlin	http://www.landesarchiv-berlin.de	www.berliner-archive.de
Brandenburg	http://www.landeshauptarchiv-brandenburg.de/	www.blha.de/netCmsFrames.aspx?PageID=58&NavIndex=04.02
Bremen	http://staatsarchiv.bremen.de/	none
Hamburg	http://www.hamburg.de/staatsarchiv/	none
Hesse	http://www.hauptstaatsarchiv.hessen.de/	www.hadis.hessen.de
Mecklenburg-Vorpommern	http://www.kulturwerte-mv.de	www.ariadne.uni-greifswald.de
Lower Saxony	http://www.nla.niedersachsen.de	www.archivportal.niedersachsen.de
North Rhine-Westphalia	http://www.archive.nrw.de/index.html	www.archive.nrw.de
Rhineland-Palatinate	http://www.landeshauptarchiv.de/	www.archiverlp.de
Saara	http://www.saarland.de/landesarchiv.htm	www.archiverlp.de
Saxony	http://www.archiv.sachsen.de/	none
Saxony-Anhalt	http://www.sachsen-anhalt.de/LPSA/index.php?id=32012	none
Schleswig-Holstein	http://schleswig-holstein.de/LA	www.archive.schleswig-holstein.de
Thuringia	http://www.thueringen.de/de/staatsarchive/	www.archive-in-thueringen.de

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Glossary of basic terms

A

Archives: institution preserving material of historic value:

- **Federal archives** – archives supervising and managing archival holdings created by authorities at ministerial, governmental and presidential levels
- **State archives** – archives supervising and managing archival holdings created by authorities at a state level (i.e. German *Land*)
- **National archives** – Federal archives and state archives.

Archives (also archival material/records) – historically valuable materials, collected for permanent preservation by the archives, generated mostly as an act of record creation in the conduct of corporate activity. They are now hybrid in nature and incorporate analogue, born-digital, and reformatted materials.

C

Computerisation – nowadays it means to provide an institution with computer equipment

D

Digitization – the process of converting analogue materials to digital form suitable for computer processing.

E

Electronic inventory – finding aid, in digital form, providing descriptions of/describing the archival fonds.

I

Informatisation – the process of introducing computer hardware and information management system in an organisation.

P

Process – a set of actions to be completed with the aim of achieving an intended goal

R

Retroconversion – the process of transferring mostly analogue finding aids to the electronic database.

V

Virtual archives – an archives managing born-digital and reformatted archives/archive materials/archive records as well as their descriptions.

W

Webpage – an information package compiled using an appropriate programming language and made available on the internet under a unique address to perform informative, administrative, academic or entertainment functions.

Web portal – an internet service featuring information about archives and their holdings.